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BOOK OF ABSTRACTS

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Welcome

The European College of Sport Science (ECSS) welcomes you to Estoril for its 13th Annual Congress. Hosted by the Faculdade de Motricidade Humana of the Universidade Técnica de Lisboa, the ECSS is delighted to stage this major event at the wonderful and sunny coast of Estoril from 9 to 12 July 2008.

The 13th Annual Congress of the ECSS aims to provide an international forum for the presentation and discussion of the latest research in sports science and its related fields. The panel of distinguished scholars who are invited to share their expertise with the members of the scientific and professional community will, without any doubt, prove invaluable to its success.

The Scientific Programme is composed of more than 1,700 abstracts, which were accepted after being carefully reviewed. This year’s Congress is the largest in the history of the ECSS, underlining both the interest of the sport scientific community and the importance of the ECSS as an interdisciplinary forum for ongoing debate. In view of the multifaceted character of sport science, state-of-the-art presentations cover basic and applied sciences as they relate to sport, exercise and health. The presented abstracts comprise not only all relevant sub-disciplines of sport science but also all continents and 68 different nations. The abstracts are distributed among 4 Plenary Sessions, 36 Invited Symposia, 74 Thematic Sessions and 3 Poster Sessions, each presenting close to 400 Posters.

The choice of venue of the 13th Annual Congress of the ECSS shall provide you with a unique opportunity for either revisiting or an unforgettable first-time experience of the magic of Portugal.

On behalf of the ECSS we wish you all a very pleasant and productive stay in Estoril and hope that it will be both scientifically and socially successful.

José Alves Diniz

Chair Local Organizing Committee, Dean of the Faculdade de Motricidade Humana
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Invited symposia (IS)

IS-BN01 Propulsive forces in water sports

APPLYING TECHNOLOGY TO OPTIMISE SWIM-TRAINING: A LOOK IN THE (NEAR?) FUTURE

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Peak performances in sport require the full deployment of all powers an athlete possesses. The development of those powers require years of hard training. It may be argued that training-time will be especially efficient when devoted to the enhancement of those performance factors that are weak links in the individual performance chain. Developments of measurement technology (with special reference to the MAD-system) have aided the sport scientist in identifying several factors as determinants of performance. These include drag, propulsion technique, and mechanical power (2). The development of this knowledge provides the modern coach with some guide-lines how to design training programmes. However, it may be argued that training-time will be especially efficient when devoted to the enhancement of those performance factors that are weak links in the individual performance chain. This implies that on an individual level it is necessary to identify in what phase of the process the performance system first becomes insufficient. Those factors when improved would immediately contribute to overall performance and, consequently, training time allotted to these factors would be well spent.

In the training process it is rather challenging for coaches to determine which training load is sufficient to induce the required adaptation without risk of overtraining. More insight in the individual relation between training dose and adaptation response is necessary to optimise this training process. Training dose and changes in performance capacity can be modelled (1). In this model performance is a systems output varying over time according to the systems input; the training dose or training impulse (TRIMP), quantified from exercise intensity and volume. The subject is represented by a system with a daily amount of training as input and performance capacity as output.

In this paper a sketch will be given how, by the application of new technology developed in close cooperation with industry, training characteristics can be linked to improvement in performance such that optimization of the training process becomes possible.

References

DERIVING THREE-DIMENSIONAL FORCES AND TORQUES IN SWIMMING

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Forces and torques changing the motion of humans performing sport skills can be transduced directly or can be derived from kinematic data. Measuring forces and torques acting on free swimmers directly, and in a manner that doesn’t affect the performance, is complicated by the swimmer moving at the interface of two fluids, air and water, rather than being in contact with a solid supporting surface.

The purpose of this presentation is to describe methods by which net three-dimensional (3D) forces and torques acting on swimmers can be derived from digitised position-time data and to provide examples of how those methods can yield original insights into swimming performance. Prior to the presentation of original and interesting findings the methods will be briefly outlined. These include the marking of swimmers to define a full segmented body model, obtaining body segment parameter data including segment masses and centre of mass locations relative to segment endpoints, and segment moments of inertia using the ‘Elliptical Zone’ method; calibrating the 3D space, simultaneous recording by multiple underwater and above water cameras; transformation of the calibration and body markers digitised from each camera into 3D position-time data using the direct linear transformation (DLT) technique; and calculation of the net force components and torques about the three principal axes using a bespoke MATLAB program. The methods enable fresh insights into the mechanisms of propulsion in swimming, the contributions to body roll, and the influences of the forces and torques on the timing and rhythms of the swimmers’ linear and rotational motions.

COMPUTATIONAL FLUID DYNAMICS: A FUNDAMENTAL TOOL FOR SWIMMING RESEARCH

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Introduction

Swimming hydrodynamics has been studied since long with experimental tests and recently with numerical techniques using Computational Fluid Dynamics (CFD) models (e.g. Silva et al., 2008). The aim of this work was to present the already applied CFD techniques and to suggest new procedures that may be used by the research community in further studies under similar research topics.

Methods

The CFD methodology consists of a mathematical model applied to the fluid flow in a given domain that replaces the Navier-Stokes equations with discretized algebraic expressions and solved by iterative calculations. This domain consists of a grid or mesh of cells that simulate the fluid flow around physical structures. The boundary conditions were considered and implemented in the CFD commercial code Fluent®. In order to be able to simulate the fluid flow, models of the human body were used. Whole human body models were
used to analyse the hydrodynamic drag while the hand and forearm models were used to analyse the upper arm propulsion during swimming.

Results
Regarding the studies involving the hydrodynamic drag it was found that: (i) in a drafting situation the drag of the back swimmer increased with the distance between swimmers and at a 0.50 m distance the drag of the back swimmer was around 50% of that of the front swimmer, (ii) during the gliding after the starts and turns, the position with the arms extended at the front presented lower values of hydrodynamic drag (60%) than the position with the arms along the trunk. Regarding the upper arm propulsion, it was found that: (i) the hand/forearm drag was the coefficient that accounts more for propulsion, (ii) the coefficient of lift seemed to play a residual influence in the generation of propulsive force by the hand/forearm segment at angles of pitch of 0° and 90°, but it is important with an angle of pitch of 45°, (iii) under the accelerated flow conditions the hand/forearm models presented higher values of drag and lift coefficients than under the steady flow conditions.

Conclusion
The recent evidence suggests that the CFD technique can be considered an interesting new approach for hydrodynamic forces calculation in swimming, providing valuable considerations for defining new swimming techniques and other flow fields.

References

Acknowledgments
This work was supported by the Portuguese Government by a grant of the Science and Technology Foundation (POCI/DES/58872/2004, SFRH/BD/25241/2005).

Invited symposia (IS)
IS-SH01 Challenges on children sport

PREVENTING GLOBAL VIOLENCE TO CHILDREN IN SPORT: RESEARCH FROM UNICEF
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UNICEF’s mission is to advance humanity for every child through health, education, equality and protection. In order to establish an evidence base for its work, the Secretary General of the United Nations, through UNICEF, commissioned a global study of violence against children, which was published in 2006 (hereafter The UN Study). This presented details of the nature, extent and causes of violence against children, and proposed recommendations for action to prevent and reduce such violence. Barring one small reference, sport did not featured in this study, perhaps for the very good reason that it was not perceived as a social or economic priority. But UNICEF has demonstrated an awareness of the importance of sport in the lives of young people and an enthusiasm for incorporating sport-related items into its policy recommendations. Its own work in the field of sport has focused largely on two functions: sport as a mechanism for fund-raising and sport-for-development in developing countries and post-conflict reconstruction. Interestingly, in neither arena has UNICEF’s own commitment to children protection been strongly in evidence. In order to start redressing this, UNICEF’s Innocenti Research centre in Florence hosted an expert panel on sport and violence to children in May 2008 which led to two research projects. These projects are intended to develop a set of proposals about both the potential of sport for reducing violence to children through sport and also the importance of safeguarding children within sport.

The first project comprised systematic review of the published research and policy material on violence and abuse to children in sport. It will appear in mid 2008 as a UNICEF Digest which defines and presents the evidence base for different types of violence to children in sport, and reviews the policies and programmes that have been instituted to tackle these problems around the world. The Digest concludes with a list of geographic and knowledge gaps that were identified through the research and a set of measures related to these gaps that require future action.

The second project comprised a secondary analysis of all the supporting documents collected for the UN Study. The results will appear in an Innocenti Research Centre Working Paper in 2008. One part of the analysis focused on surveys returns for the UN Study from each of 122 countries and scanned these for mention of sport, sports policy and sport programmes for violence prevention. Interestingly, the returns from those countries known by the researchers to be the most advanced in terms of child protection and violence prevention in children’s sport did not reflect this. Thus, a communication gap was exposed between governments and sport NGOs in these countries. The presentation will discuss the findings from these two studies and suggest a number of future directions that this work might take.

BULLYING IN YOUTH SPORT
Fasting, K., Sisjord, M., Roberts, G.
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Over the last few years there has been increasing interest in and research on the problem of bullying. The previous research has been conducted primarily in schools, with very little conducted in sport settings. The few studies that exist focus on hazing and initiation rites, which may include bullying. The purpose of this paper is to present the experiences of being bullied among young Norwegian athletes. In the school context, some Norwegian studies have shown that boys are bullied more in schools than girls, and that boys and girls experience different forms of bullying. The research has revealed that the bullied child often is perceived as vulnerable and ‘different’. The main questions asked in this paper therefore are: what is the amount of bullying experienced by young people in a sport setting, are there any gender differences between girls and boys in their experiences of bullying in sport; do youths with non-western immigrant backgrounds experience more bullying than other youths; and what forms of bullying do they experience?

Participants in the study were 1514 Norwegian youths 12-16 years of age (males n=917, [M=13.5], females, n=597, [M=14.1]) competing in eight all- or multi-sport teams and individual sports in and around the greater Oslo area in Norway. The participants were asked if they had experienced any of the following three types of unpleasant behaviours: ridicule, being called nasty names or teased in an unpleasant and hurtful way being beaten, kicked, pulled by the hair, pushed or locked up being excluded or ignored. For each of these questions, they were asked if they had experienced it from a male or female coach, and/or from male peers or female peers in sport.
The analyses showed that 27% of the young people participating in this study had experienced one or more of the unpleasant behaviours from someone in sport. A chi square test revealed no statistically significant difference between boys and girls. In analyzing the three questions separately however it turned out that significantly more girls than boys were ridiculed and teased etc., but that significantly more boys than girls had experienced being excluded or ignored. The last category was the one that most often had happened to the participants (19%), followed by ridicule and teasing (15%), while only 5% had been beaten or kicked etc. Youths with a non-western immigrant background had more often experienced bullying (32%) compared with other youths. This difference was however significant only for the two first forms of bullying (ridicule and being beaten).

The results are discussed in relation to studies from bullying in other settings, such as in schools, and in relation to gender theories.

MONITORING PARTICIPANT GROUP CONDUCT IN YOUTH SPORT: THE JUSTPLAY BEHAVIOUR MANAGEMENT PROGRAM

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The Justplay Behaviour Management Program (henceforth the BMP) has been collecting data regarding the conduct of players, coaches and spectators, on a game by game basis for sports such hockey, soccer, football, basketball and baseball for seven years. The data is input by officials via the internet where it is organized and displayed as a library of graphs available 24/7 to sport administrators of each member organization. The library of graphs allows administrators to make data-driven staffing and policy decisions necessary to anticipate, respond or avoid problematic behaviour of players, coaches and spectators. Monthly reports are provided to administrators which highlight both positive and negative trends in participant group behaviour, as well as, an analysis of which factors are most positively or negatively affecting official ratings and official satisfaction.

Importantly the BMP yields important feedback to administrators regarding the effectiveness of initiatives implemented to resolve or respond to identified problems. For example many member organizations with persistent behaviour/conduct concerns have submitted their behaviour policy to Justplay for a review and analysis. Using the data, the summary reports and comments provided by officials we are able to determine precisely which elements of policy are consistently violated, and therefore ineffectual. At this point we work with the organization to help develop policy and behaviour standards that they support and enforce. With the information gathered from the BMP, success is easily monitored.

Over the past couple of years Civic Sport Group has used the Justplay BMP to collaborate on a number of research projects, some of which are on-going. The volume of data in the system, the diversity of sports and geographical areas in which we are working (and able to work), the ease of data collection and analysis, as well as, the ability to correlate/contrast the data with official data and socioeconomic markers combine to make the BMP a valuable research tool. Recently we adapted the program to collect data from the players (children). In an effort to examine ‘bullying’ in the hockey environment we had players ages 8-18 fill out an on-line card following every game. Children could do this in the privacy of their own home, under the supervision of their parents if necessary. In November 2007 we began another project which focuses on studying the factors which contribute to official’s satisfaction. The presentation will consist of a brief demonstration of the BMP, followed by a discussion of program applications and research results of the above mentioned projects.

Invited symposia (IS)

IS-SH02 Physical Education and Teacher Preparation - Present and Future

THE FUTURE OF PHYSICAL EDUCATION AND TEACHER PREPARATION

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Looking to the future is an exciting but dangerous undertaking, in education as in any other sphere of life, and history is replete with examples of predicted trends that never materialised or did so in completely unanticipated ways. It is wise then to be cautious but, given the ongoing pace of social change, important nonetheless to identify major socio-political trends and attempt to anticipate what the consequences might be for education in general and teacher education in particular. The first requirement is to acknowledge the nature of social change itself and it is clear that, at least in so-called advanced industrial countries and those that have experienced major political change, competitive market forces, increasingly complex economic structures and pressure on public services are driving increased de-centralisation, a stronger role for the private sector and a more critical clientele, be that parents or young people.

At present countries are engaged with large scale building reforms in education, for example England and Wales and Portugal, which has prompted interesting discussions about a suitable framework for how the future might look, how schools will function, what building designs are appropriate and what parents will require and pupils engage with. However, the extent to which those discussions have been radical enough is open to question. The Teaching 2020 project in the UK (www.teachernet.gov.uk) highlighted such things as the need for more flexible curricula for increasingly ‘disorganised environments’, greater emphasis on the learning process than factual knowledge and the growth of learning as a community enterprise; the teacher functioning at the core of a learning network involving the local community, business and parents. Indeed, with the future power of home technology, ever more selective parents and substantial growth in the private offer in education there are questions about whether all pupils need to attend school all the time anyway where would that leave physical education? In fact the physical education curriculum in many schools persistently remains a fairly traditional offering that often fails to acknowledge such things as young people’s lifestyle interests, so the subject has some interesting challenges.

Teacher education is challenged no less by these possible future scenarios. As the state increasingly disengages with the public sector, provision of a national framework and base-line provision only for initial qualifications with the rest, including continuing professional development, being employer driven, learner directed and locally provided gathers pace. Universities will come under greater challenge from the private sector and institutions in other countries to remain major players in this field, are they ready for it?
RESEARCH ON TEACHING IN PHYSICAL EDUCATION: PRESENT SITUATION

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As for the concept of “research on teaching in physical education” there is not in the literature a consensus about what is its object and problematic. As a consequence, when we talk about research on teaching in physical education first of all it is important to clarify its meaning. We share the perspective that research on teaching is the process that investigates educational facts and educational interactions, specifically the teachers and students’ beliefs, attitudes and their cognitive and thinking processes, the teachers and students’ actions and interactions within the pedagogical relationship, and the effects of the pedagogical activity on the social dynamics of the class, and on the students’ learning process and development. Research on teaching also analyses the values, goals and curriculum ideology underlying a physical educational programme, and how PE teachers’ adapt curriculum and transform subject matter for teaching. Furthermore, research on teaching PE investigates the influence of the organizational, social, and cultural contexts on the dynamics of educational situations. Taking into account that research on teaching is not a free value activity, firstly we will make reference to the conceptual and methodological references which have framed and guided research on teaching in physical education. Secondly, we will analyse the following research programs: (a) the study of teaching effectiveness; (b) the study of the teachers’ thinking processes and actions; and (c) the study of the cognitive, socio-affective, and motor mediating processes of the PE students’ participation. We will make a brief reference to the main purposes, themes, and methodologies used by each of those research programs. Thirdly, we will make reference to the study of ecology in teaching physical education, an emerging conceptual approach that has shaped a growing number of studies. We will end up the intervention talking about the main trends of the current research on teaching in physical education. In asserting that no single paradigm can capture the complexity of educational events, we will mention the paradigm eclecticism and the problems that have received more recent attention from researchers. To better illustrate these concerns, we will present some examples of studies that have been carried out.

CURRENT TRENDS IN THE RESEARCH ON PHYSICAL EDUCATION TEACHER EDUCATION (PETE)

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In several countries, teacher education programmes have integrated a competency centered approach based on official recommendations aiming to prepare more professional teachers. The latter are defined as (Brau-Anthony & Grosstephan, 2006, p.93):
- having a knowledge basis;
- assuming a mission of knowledge transmitter;
- being able to act in emergency and to decide in uncertainty;
- being able to think about one’s teaching and to analyse it;
- showing autonomy and responsibility;
- having a professional ethics compatible to the values of the public educational service.

The first part of the paper will compare the guidelines proposed by educational authorities in some countries or regions in order to identify the main similarities. Moreover, it is well accepted that teacher preparation is a long term process during which this large array of competencies should be progressively developed (Calderhead, 2000; O’Sullivan, 1998). In their process of development from the beginner level to the expertise, educators draw experience from a diversity of learning contexts allowing them to acquire personal and professional competencies that will help them to succeed in their classes. The second part of the paper will be focused on that process. After a description of the long life model of development, opinions of teachers about the importance of the competencies and where they are developed will be analysed. Despite the emphasis to develop inductive approach aiming to help student teachers to acquire analysis skills and to build their own intervention models, it appears that teacher education remains dominated by deductive approach using a “traditional” model. Following this, specific teaching behaviours are selected and presented in teacher training courses before being experimented during teaching practice.

The third part of the paper will present some selected studies illustrating strategies tested all around the world in order to innovate and getting closer to the learning society characteristics (Jarvis, 2007).

References

Oral presentations (OP)

OP-BN01 Biomechanics 1

THE ANALYSIS OF PRESSURE DRAG AND SKIN FRICTION DRAG DURING THE GLIDING IN SWIMMING

1: UBI (Covilhã, Portugal), 2: UTAD (Vila Real, Portugal), 3: CIDESD (Portugal), 4: FMH-UTL (Lisbon, Portugal), 5: FADEUP (Porto, Portugal).

Introduction
In human swimming, the total drag is composed of the skin friction drag, pressure drag and wave drag. The relative importance of each component to the overall hydrodynamic drag is a controversy issue. Therefore, the aim of this study was to analyse the relative contributions of the skin friction drag and the pressure drag for the total drag during the gliding, using numerical simulation techniques.

**Methods**

The numerical simulation analysis consisted of the use of a three-dimensional mesh of cells that simulates the flow around the considered domain. We used the k-epsilon turbulent model (Moreira et al., 2006) implemented in the commercial code Fluent® and applied to the flow around a three-dimensional model of a male adult swimmer in a gliding situation, in ventral position with the arms extended at the front. The simulations were applied to different flow velocities, between 1.6 m/s and 2.0 m/s and the coefficient of drag (CD) was computed to each one of the applied velocities. Moreover, the CD was decomposed into pressure and skin friction drag by Fluent® software.

**Results**

Velocities of 1.6, 1.7, 1.8, 1.9 and 2.0 m/s produced, respectively, CD values of 0.48, 0.475, 0.432, 0.431 and 0.428. The pressure drag was the main responsible for the total drag, with a percentage of about 87%, while skin friction drag contributed to about 13% for the total drag during the underwater gliding.

**Discussion**

In both gliding positions the swimmer CD decreased with the velocity. The inverse relationship between the CD and the velocity found in the present study seems to correspond to what happens in experimental situations in the human body totally submersed (Jiskoot and Clarys, 1975; Lyttle et al., 2000). Our research was limited to the influence of the pressure drag and the skin friction drag in the total drag coefficient since the swimmer model was placed 0.90 m under the water surface (Lyttle et al., 2000).

The computed drag forces components showed that the pressure drag was dominant. Nevertheless, skin friction drag was by no means negligible. However, these values are based on the swimmer model’s surface having a zero roughness. Another different situation could happen if the swimmer were at the water’s surface. The contribution of the skin friction drag would be reduced due to the reduction in the wetted area and the generation of wave drag (Bixler et al., 2007).

**References**


Acknowledgments

This work was supported by the Portuguese Government by a grant of the Science and Technology Foundation (SFRH/BD/2524/2005, POCI/DEI/58872/2004).

**LOCOMOTOR ADAPTATION RELATED TO PREDICTIVE AND FEEDBACK STABILITY CONTROL STRATEGIES WHILE PERTURBATIONS IN YOUNGER AND OLDER ADULTS**

Bierbaum, S., Karamanidis, K., Peper, A., Arampatzis, A.

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Postural corrections after unexpected perturbations involve reactive sensorimotor strategies to maintain the dynamic stability of the human system. However, posture is not a static state but can be modified on the basis of feedforward (predictive) as well as feedback adaptive improvements of postural behaviour when perturbations occur. Especially for the elderly, successful postural corrections based on both predictive and feedback stability control strategies during perturbations may be vitally important because falls are the major cause of injury among the elderly population. Although some studies have previously demonstrated an age-related decrease in recovery performance after unexpected perturbations, there is no information about the age-related adaptive responses in the components of dynamic stability during the incidence of repetitive perturbations. Therefore, the purpose of this study was to examine the age-related predictive and feedback adaptive locomotor improvements of dynamic stability control during disturbed walking. Older (62-74yr) and younger (23-30yr) subjects performed walking in a given speed. The gangway included one exchangeable element which was not visible for the subjects. This allowed the replacement of the element to change the surface stiffness (hard/soft). The gait-protocol comprised 23 trials with soft and hard surface, arranged to detect predictive as well as feedback strategies over the repetitions.

Motion capturing system was used to determine the subject’s 3D-kinematics and ground reaction forces, respectively. Components of dynamic stability while walking were calculated according to Hof et al. (2005). Compared to base line walking both age groups increased the margin of stability at touchdown (TD) at the disturbed leg within the gait repetitions (old: -7.3±3.8 to -4.4±4.2cm, young: -11.8±4.7 to -8.2±3.3cm) by increasing the base of support at the step before the perturbation. Even though these anticipatory adjustments were performed by both age groups in a similar manner in order to reduce the consequences of the perturbation, the older participants needed more repetitions to increase the base of support. In the step after the perturbation the margin of stability at TD decreased in both groups (old: -8.4±3.9cm to -19.6±7.5cm, young: -12.8±5.2cm to -16.2±8.3cm) but stabilised after 2 to 4 repetitions to the base line values. In the first disturbed trial the older adults showed a higher decrease in margin of stability at TD after the perturbation due to a lower increase in the base of support compared to the younger ones. Concluding, both age groups showed similar predictive as well as feedback adaptive improvements during the adaptive changes, however, happened in younger adults faster compared to the older ones.

**References**


MUSCLE FASCICLE STRETCH VELOCITY IN RELATION TO STRETCH REFLEX ACTIVATION AT DIFFERENT CONTRACTION LEVELS IN HUMAN TRICEPS SURAE

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Stretch distribution between muscle and tendinous tissues depends on their relative stiffnesses. At low forces, most of the stretch occurs in the more compliant muscle fibres. However, muscle and tendinous tissues both become stiffer with increasing force, with a greater relative increase in the muscle fibres. As muscle spindles only ‘see’ the movement of the muscle fibres in which they are situated, their view of a stretch depends on its distribution between muscle fibres and tendon. The aim of this study was to examine changes in stretch distribution to muscle fascicles with changes in contraction intensity in the human triceps surae. This information was related to EMG reflex responses.

Thirteen healthy subjects aged 21-30 participated. Subjects sat in an ankle ergometer with the ankle (90°), knee (180°) and hip (120°) angles fixed. Dorsiflexion stretches of 8° were applied at a velocity of 250°/s to the ankle at different contraction levels: 0, 20, 40, 60, 80 and 100% of MVC. Surface EMG was recorded in the medial gastrocnemius (MG), soleus (SOL) and tibialis anterior (TA) muscles. Fascicle lengths of MG and SOL were determined using ultrasound.

In both muscles, reflex amplitudes peaked between 40-60% and declined thereafter. Between 0 and 100%, pre-stretch fascicle length decreased by 1.80cm and 0.86cm in MG and SOL, respectively. In addition, fascicle stretch amplitude decreased by 57% and 53% and fascicle stretch velocity decreased by 61 and 56% in MG and SOL, respectively.

Stretch distribution was modulated with variations in contraction level, and the velocity at which muscle fascicles stretched dramatically decreased at high forces. As stretch velocity is more potent to muscle spindles than stretch amplitude, and assuming constant sensitivity of the muscle spindles to stretch velocity, this decline would decrease afferent activity, contributing to the decreased reflex response. Short latency reflexes play an important role in force3 and stiffness production4, so the decrease in reflex stiffness we have observed previously at high contraction levels5 can at least partly be explained by this observation.

References.

THE EFFECT OF SHOE DESIGN ON REARFOOT KINEMATICS, KINETICS AND PLANTAR FORCES

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Motion control components incorporated in the upper vamp and midsole design of shoes have been based on biomechanical reasoning which assumes excessive motion can be controlled via mechanisms of restraint. However, multiple studies have failed to provide unequivocal evidence to support this theory. Evidence of compensatory changes to kinematic gait parameters associated with alterations to density of the shoe sole suggests cutaneous afferents from the plantar surface of the foot may have an important role in the control of foot motion (Zhang et al., 2000). Several studies indicate altering cutaneous input may instigate a feed forward mechanism demonstrated by an alteration to kinematic function and muscle activity prior to heel strike (Wakeling et al., 2003). This study investigates the effect of five different styles of shoe on walking and running gait and examines possible relationships between footwear design factors, plantar force distribution and rearfoot kinematics and kinetics. Three dimensional lower limb kinematics including in-shoe rearfoot motion, ground reaction forces (GRF) and plantar forces were collected for 16 subjects in each condition.

Increased stiffness of the shoe and dual density midsoles were found to increase inversion angle at heel strike compared with a barefoot condition and neutral and flexible shoes (p<0.004). Significant increases in mean force (p=0.001) and the force-time integral (p<0.001) under the lateral aspect of the calcaneus in the dual density condition supports the finding of a more inverted heel strike angle. This is further substantiated by increases in medial calcaneal mean force and force-time integral in the most flexible shoe condition which demonstrated the most everted heel strike angle. The dual density condition also demonstrated an increase in peak ankle joint inversion moment compared to other conditions suggesting that the more inverted position at heel strike induced a centre of pressure (COP) pathway closer to the long axis of the foot, reducing the evertor lever arm of the GRF. Running gait also produced an abduction moment in the dual density shoe which did not occur in other conditions and supports the medial location of the COP.

These finding indicate changes to terminal swing phase mechanics, suggesting footwear design has a significant non-mechanical effect on foot function. Changes to heel strike angle with specific shoe designs implies a feed forward mechanism is instigated by alteration to the foot-ground interface. This strongly supports a possible neuromuscular component to controlling foot function with footwear.

References.

CAN HUMAN ACHILLES TENDON BE FATIGUED AFTER STRETCH-SHORTENING CYCLE EXERCISE?

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When placed under continuous stress, tendons behave like elastic materials and can be fatigued. That is under deformation their ultimate strength (US) decreases. This fatiguing behavior of a tendon was first shown with wallaby tail tendons by Wang and colleagues (1995). Now question this study aims to answer is: Do human tendons fatigue after voluntary exercise?
Schechtman & Bader (2002/3) showed in a cadaver study that if US is decreased in human tendons after cyclic stretching, also linear relationship between stress and strain is decreased. This slope of the linear part of stress-strain curve is called Young's modulus of tendon. If Young's modulus of tendon is decreased after exercise, tendon is said to be more compliant. Evidence for increased compliance after voluntary exercise in humans has been previously presented by Kubo et al. (2001).

In this study, subjects (N=9, mean age, weight and height: 26y, 67kg and 172cm) underwent a hopping exercise using their ankle plantar flexor muscles. Exercise consisted on average 2000 (range: 1200-3000) jumps at preferred frequency until exhaustion. Before and after exercise, subjects performed a tendon stiffness test. In tendon stiffness test, subjects sat in ankle dynamometer (knee in full extension) and produced six isometric contractions with ankle plantar flexors: 100%, 80%, 60%, 40%, 20% and 100% of maximum voluntary contraction torque. Tendon displacement of Achilles tendon that is anchored to m. Gastrocnemius medialis and torque over ankle joint was recorded for each isometric contraction.

Data from axial and coronal magnetic resonance images was combined with tendon stiffness test data to calculate tendon stress and strain individually. Straight line, using least-squares method, was fitted to six pairs of values (stress vs. strain). Change in the slope of the line (Young's modulus) was a measure of tendon fatigue in this study. Tendon stress during maximum voluntary contraction decreased from 140±30MPa to 100±40MPa (P<0.01). Young's modulus, however, didn't change significantly. It reduced from 2.7±1GPa to 2.4±0.9GPa.

It's concluded that despite the fact that exercise was performed until exhaustion and induced reduction in maximum voluntary stress, there was no decrease in tendon stiffness and therefore no tendon fatigue. This is in agreement with previous studies that haven't found any changes in tendon stiffness after voluntary exercise (Maderni et al., 2006).

**References.**


**CARDIOVASCULAR AND NEUROMUSCULAR RESPONSES DURING INTERMITTENT CYCLING EXERCISE PERFORMED WITH ELECTRICAL ASSISTED VERSUS CLASSICAL BICYCLE**

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**Introduction.**

In the current social and environmental context, electrical assisted bikes (EB) could become an interesting urban mode of travel. For example, EB has been recently used by postal agents during their delivery route. EB is supposed to reduce muscular and cardiovascular strains during postal work, in comparison with classical bike (CB). The objective of the present study was to compare the energetic and muscular responses during intermittent cycling exercise performed with EB versus CB.

**Methods.**

Ten subjects (age: 34±14 years) performed two intermittent cycling exercises, in a random order. Experiments were conducted either with EB or CB, which were adjustable to replicate identical positioning of subjects. Each exercise was performed with alternating cycling starts (10±60m) and rest period (20 s) for 30 min (i.e. 60 starts). Oxygen uptake (O2) and heart rate (HR) were continuously recorded, by gas exchange analyzer (K4b2, Cosmed, Rome, Italy), during exercise and averaged every 30 s. For each cycling start (S1 to S60), EMG was recorded and root mean square (RMS) was calculated for vastus lateralis (VL), rectus femoris (RF) and gastrocnemius medialis (GM) muscles of the right leg. Subject used a scale of rating perceived exertion (RPE) to judge their global effort (from 6 to 20) after 5, 10, 20 and 30 min of exercise.

**Results:**

Mean O2 was 30±20 % greater during CB than during EB session. O2 was greater with CB than with EB from the second start (29±3 vs. 24±6 ml-1.min-1.kg1) to the end of exercise (respectively 42±5 vs. 31±3 ml-1.min-1.kg1). Averaged HR was 20±17 % greater during EB than during CB session. HR was similar for both conditions after the first start (EB: 107±19 bpm vs. CB: 113±16 bpm), but differ significantly (p<0.01) from 2 min to the end of exercise (CB: 173±13 bpm > EB: 144±27 bpm). EMG RMS was constant from the beginning to the end of exercise for both cycling conditions and the three muscles. However, EMG RMS was respectively 44±30 %, 50±47 % and 40±38 % greater for VL, RF and GM muscles respectively, during CB than during EB sessions. Mean RPE was higher during CB than during EB session (15±2 vs. 11±2), reaching 17±2 at the end of EB session versus 11±2 at the end of EB session.

Discussion. The present data evidenced that EB cycling reduced energetic and muscular demand in comparison with CB cycling during intermittent exercise. Considering that cyclist distribution of postal mail is similar to an intermittent cycling exercise (Theurel et al. in press), these findings suggested that EB is an interesting tools to reduce physical strains of postal agents during their delivery route.

**References.**

to have minor or no effects on HRV. This study examined the effects of combining endurance and strength training on HR measures and physical fitness. 94 men aged 40 to 67 years completed the 21-week progressive training period consisting of either 2 endurance (E), 2 strength (S), both 2 endurance and 2 strength (ES) training sessions per week or no systematic training (control group). Maximal oxygen uptake (VO2max) was measured during a graded cycling test until voluntary exhaustion. R-R intervals were recorded during a 5-min supine rest and a 5-min low intensity exercise (50 W) and analyzed by the spectral method from high (0.15-0.4 Hz) and low (0.04-0.15 Hz) frequency bands (HF and LF). Furthermore, fractal scaling properties of heart rate dynamics were analysed by the DFA method and expressed as a short-term fractal scaling exponent (alpha-1). Maximal bilateral leg extension strength (1RM) was measured using a dynamometer.

Endurance training showed different changes in resting HR and fractal scaling properties compared to strength training. However, when strength training was combined with endurance training the positive effects of endurance training on the cardiac autonomic function remained. These effects may be more evident with the DFA method than the frequency domain method of HRV in the present short term recordings. These results suggest that combined endurance and strength training improves both endurance and strength performance to the same extent compared to endurance or strength training alone without compromising the improvements in cardiac autonomic function.

References.


EFFECTS OF STRENGTH AND ENDURANCE TRAINING ON METABOLIC HEALTH IN OLDER MEN

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Physical exercise is a cornerstone in the prevention of the metabolic syndrome and type 2 diabetes. However, the optimal type and intensity of physical exercise that should be used to maximize health benefits of exercise in decreasing metabolic risk factors is unclear (Johnson et al., 2007, Lakka & Laaksonen 2007). This study compared the effects of 21 weeks of combined high-intensity strength and endurance training with endurance or strength training only on metabolic risk factors in 40-65 years old men. 63 healthy men were randomized into the endurance (E), strength (S), combined strength and endurance training (SE) or control group (C). S and E trained 2 times a week and SE 2 times a week for strength and 2 times for endurance for 21 weeks. Heart rate monitored endurance training by cycling and total body strength training consisting of exercises for lower and upper extremities and trunk were utilized. Metabolic risk factors investigated were resting blood pressure, glucose and insulin metabolism by oral glucose tolerance test (OGTT) and blood lipids and lipoproteins. Body composition was measured by percentage of fat (skin folds) and waist circumference and physical fitness by maximal oxygen uptake (VO2max) during cycling and by isometric bilateral leg extension strength. After training both E (10%, p<0.001) and SE (11%, p<0.01) had increased VO2max significantly, but not S or C. Leg extension strength increased markedly in S (15%, p<0.01) and SE (17%, p<0.001), but less in E (8%, p<0.01) and not at all in C. Waist circumference decreased by 1.7-2.2cm in all three training groups and fat percent in all groups, especially in SE (from 24±5 to 22±4%). Systolic blood pressure (SBP) decreased significantly both in E (-6±8, p<0.01) and S (-9±8, p<0.001) and also diastolic blood pressure in E and S (-4±6mmHg and -5±7mmHg, both p<0.05), respectively. There were no changes in blood pressure in SE or C. A significant difference in the changes of SBP served in blood lipids and lipoproteins in all groups.

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Both progressive endurance and heavy resistance strength training can modestly improve metabolic health even in relatively lean older men with normal glucose tolerance. Combined strength and endurance training did not produce complementary benefits on metabolic risk factors, but it is effective in improving both cardiorespiratory and muscular fitness as well as body composition, especially during prolonged training.

References.


GENDER, AGE AND COGNITIVE SCORE EFFECTS ON STRENGTH IN SPANISH INSTITUTIONALIZED ELDERLY

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Introduction: Physical strength is one of the most important physical capacities in old people since maintaining optimal strength values will allow autonomous lifestyles during longer time. Little information is available about functional fitness parameters in institutionalized elderly.

Aim: To analyze muscle strength of hands, arm and legs in Spanish institutionalized elderly according to gender, age groups and cognitive score.

Material and methods: One hundred and twenty six elderly, 47 men and 79 women, participated in a cross-sectional study. Mean age was 81±8 and 84±6, respectively. All subjects were institutionalized living in Madrid (Spain). Hand grip strength (kg) was measured with a Takei TKK 5101 digital dynamometer (range 5-100 kg, precision 0.1 kg). Arm strength (rep/30s) and chair stands (rep/30s) were used according to the Rikli and Jones test. Cognitive status was determined using the Mini Mental State Examination (MMSE) test by Folstein. Descriptive statistics, t-test, Mann-Whitney-U, Kruskal-Wallis-H test and One-Way-Anova with post hoc Bonferroni were used in order to determine gender, age and cognitive score effects on strength. Significance was set at p<0.05. All elderly people were compared according to age and MMSE groups.
AGE-RELATED DIFFERENCES IN VO2MAX ESTIMATE AND COGNITIVE PERFORMANCES IN ATHLETES AND ACTIVE NON-ATHLETES BETWEEN 49 AND 73 YEARS OLD

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An increasing number of studies suggest that physical activities might protect against age-related cognitive decline. In fact, aerobic training leads to a significant improvement in VO2max that correlates with increased cognitive performances in sedentary older adults (Kramer et al. 1999), with larger benefits in attentional control functions, required to share attention between multiple tasks. The effect of physical fitness on brain structures and functions in humans remains to be elucidated, but proposed hypotheses suggest an increased vascularization of brain tissue. However, most studies published so far include moderately active healthy individuals and no study has assessed whether the positive impact of cardiorespiratory fitness on cognition holds for athletes or highly active individuals who engage in intense fitness training programs.

In this study, we assessed fitness condition and cognitive performances in athletes and moderately active non-athlete individuals of two age strata, to further explore if fitness training has a protective effect against age-related declines in highly active and trained individuals. Twenty-three adults aged between 49-59 years old (mean age of 54.5) and 20 adults aged 60-73 (mean age of 65) completed the Rockport 1-mile test (VO2max estimate) and clinical neuropsychological tests of attention and psychomotor speed. They also completed a computerized dual-task paradigm to assess attentional control, required to divide attention between two concurrent tasks. A median-split on VO2max estimation allowed forming high and low fit groups in each age strata. The results indicated a significant age by fitness level interaction (F=5.6, p<0.05), due to a significantly larger loss (p<.001) in fitness level after 60 years old in the high fit group (VO2max estimate in ml/min/kg was 54 for younger and 52 for older high-fit individuals) compared to the age-related difference observed (p=0.001) in the low-fit group (VO2max estimate was 37 and 32 for younger and older respectively). The results also showed a significant age-related difference in dual-task performances (p<0.001), with no age-difference in the single task condition, in the high fit group only. This suggests a specific cognitive decrease in the condition tapping attentional control functions. A significant decline with age in attentional control functions and fitness condition in the high fit group supports the relationship between fitness and cognition in older adults reported in previous studies. However, results of this study also suggest that very high fit individuals are more likely to experience a reduction in fitness level from the fifth to the seventh decade accompanied with reduced performances in cognitive tasks requiring attentional control.

References.
walk (p<0.001). 7.3% of the 1,897 patients without a walking aid had experienced a fall, whereas 16.4% of the 214 patients who were not able to walk without an aid had experienced a fall. Conclusion The incidence of self-reported falls and the prevalence of impairment measured by the inability to walk without an aid are high in elderly people. As expected, the ability to walk independently was associated to the level of physical activity. Furthermore, the frequency of falls seems to be reduced when the person is able to walk without an aid. There seems to be no relevant association between the fall status and the activity level. Considering the relevance of regular physical activity for health, the preservation of walking ability should be a major aim in elderly health care.

The study has been conducted within the research cooperation PRISCUS (Prerequisites for a new health care model for elderly people with multimorbidity) which is funded by the German Federal Ministry of Educa

LEISURE-TIME PHYSICAL ACTIVITY REDUCES SELF-REPORTED GASTROINTESTINAL PROBLEMS OF SHIFT-WORKERS

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A large proportion of shift-workers suffer some type of gastrointestinal (GI) discomfort that impairs their quality of life [Atkinson et al., 2008]. Leisure-time physical activity (LTPA) has been demonstrated to decrease GI problems reported by people living a diurnal lifestyle (Brown et al., 2000). A LTPA mediated change in dietary habits is a possible explanation for this observation, but such a change might not be feasible for shift-workers, whose dietary habits are already disrupted by their work schedules. Thus, we examined whether LTPA reduces shift-worker’s GI discomfort by altering their dietary habits.

Male (n=111) and female (n=50) shift-workers, with mean (SD) age of 39 (9) y, body mass of 83 (14) kg, height of 1.75 (0.1) m and body mass index of 27 (4) kg m-2, completed the Standard Shift-work Index, together with a food frequency and LTPA questionnaire. Participants were allocated to low, moderate and high LTPA tertiles and the incidence of self-reported GI problems was compared between groups using 1-way ANOVA. Differences in LTPA between shifts (morning, evening and night) were examined using linear mixed modelling. Data were logarithmically transformed prior to analysis to control for skewed distributions, and are presented as geometric mean and 95% confidence intervals (CI).

Gastrointestinal discomfort was significantly (P=0.02) more prevalent in the low LTPA group (16 units, CI = 15 to 16 units) compared to the high LTPA cohort (13 units, CI = 12 to 15 units). There was no significant (P=0.05) difference between the moderate LTPA group and the two other groups in prevalence of GI discomfort. Average daily energy intake from fat, carbohydrate (CHO), protein and total energy consumption did not differ between the LTPA groups (P>0.05). Energy intake from fat (2.9 MJ, CI = 5.6 to 6.2 MJ), CHO (5.6 MJ, CI = 8.1 to 22 MJ), protein (2.4 MJ, CI = 5.2 to 5.6 MJ) and overall energy consumption (10.4 MJ, CI = 12.4 to 14.38 MJ) were significantly higher on rest days compared to days working morning, afternoon and night shifts (P<0.001). There were no interactive effects of shift and amount of LTPA on the average daily energy intake from these sources (P>0.05).

These data suggest that LTPA can reduce the occurrence of self-reported GI problems in shift-workers. However, this effect does not appear to be mediated through altered dietary content. Thus, biological or other behavioral factors (e.g. the timing of eating habits) may be involved in the positive effect of LTPA on perceived GI problems. In conclusion, shift-workers should expend 8805.9.6 MJ per week during LTPA in order to decrease the prevalence of subjective GI problems and improve their quality of life.

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Oral presentations (OP)
OP-ML01 Motor Learning 1

MOTOR COMPETENCE IN CHILDREN WITH MILD MENTAL RETARDATION AND CONTROLS

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Motor and cognitive development are believed to occur in close interaction with each other, although the literature on this issue is somewhat equivocal. The aim of this study was to compare motor competence of children with mental retardation with a reference sample of normal children in Flanders. Therefore, anthropometrical and physical measurements as well as motor skill evaluation by means of standardized motor skill test batteries were performed in subjects attending schools for children with mental retardation (N = 138) and subjects attending regular schools (N = 2538; boys and girls, 6-11 years of age). These tests included grip strength, explosive power, trunk and shoulder flexibility, strength of trunk muscles, endurance and arm strength. Additionally, the BOT2-SFI and KTK2 test batteries were performed.

Mild mentally retarded children tended to be smaller and heavier, which accumulated in a significantly higher BMI (17.5 +/- 3.7 versus 16.9 +/- 2.6 for the control group). When compared to the control group, children from special schools showed lower muscle strength (grip force), explosive power (counter movement jump), less flexibility in hips and shoulders, lower sprint speed and endurance. In addition, they scored worse in every single item of the BOT2-SFI and their KTK scores were significantly lower than those of the controls. These findings indicate that the lower general motor competence of children with mental retardation seems to result from a lower physiological competence (e.g. strength, endurance) as well as from a lower motor skill level, i.e., problems in coordinating and controlling movements.

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With financial support of the Flemish Government
MODULATIONS OF LEG AND JOINT STIFFNESS DURING DROP JUMPING BY OBSERVING THE JUMP MOVEMENTS OF A MODEL AND THE LEARNERS

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The utilization of impact shock and motor skills that allow the shortening of contact time are required for better performance in drop jumping (DJ). The parameter to identify the acquisition of skills is leg and joint stiffness. A study showed that leg stiffness during DJ is influenced by the provision of verbal instruction about foot contact duration (11), thus, indicating that stiffness is a self-controlled motor skill. Meanwhile, the conventional method of improving the motor skills depends on the somatosensory information during a motor task. However, in an arm-reaching task with manipulandum, an improvement is noticed in the learner’s skills by observing a movie of a model performing the same task (2). On the sports field, since the demonstrated motor skills the learner observed are generally acquired skills, the learner cannot observe the process of the demonstrator’s skill improvement. However, an observation of the movies of both the model’s and the learner’s own movements may help the learner to notice the differences between the two movements; the observation plays an important role in improving the learner’s skills. Moreover, the procedure may change the learner’s stiffness during DJ. We aimed to test the hypothesis.

We selected one student as a model and 24 students with no experience in DJ as subjects for an action observation. The model performed six DJ trials. The subjects performed four trials before the observation (pretest). For both the model and the subjects, the observations were recorded (30 fps) for the last trial and for analysis in the other trials. The subjects were divided into three groups (GP) according to the observation type GP1: observation of both the model’s and their own DJ, GP2: observation of only the model’s DJ, GP3: no observation. During the observation, the subjects observed the video projected on a face-mounted display. After the observation, the subjects performed three more DJ trials (posttest). Kinematics (240 fps) and ground reaction force (2000 Hz) were recorded during each trial. Leg stiffness and ankle and knee joint stiffness were calculated using the collected data; the data pre- and post-tests were compared. During the pretest, leg stiffness was observed to be greater for the model than for the subjects (727.72 vs. 157.41 N/m/kg); therefore, the model’s DJ skill was considered to be ideal. Only GP1 showed significant changes in leg and knee joint stiffness between the pre- and post-tests (1.19 vs. 2.65 N/m/degree; 101.64 vs 222.87 N/m/kg).

The fact that the stiffness increased only in GP1 indicates that observing both the model’s and learner’s movements is an effective method to enhance motor skills when the learner understands the task that requires to use external force. The difference in DJ motion found during the observation may contribute to rectifying motor commands for stiffness modulation.

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CYCLING IMPAIRS NEUROMUSCULAR COORDINATION DURING RUNNING IN TRIATHLETES: THIS IMPAIRMENT REDUCES PERFORMANCE, IS ASSOCIATED WITH INCREASED RISK OF INJURY BUT CAN BE IMPROVED BY A TAPING INTERVENTION

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Triathletes report incoordination when running after cycling. Fatigue is likely to contribute to this perceived incoordination but impaired coordination of running may also be due to interference with neuromuscular control independent of fatigue. Interference with neuromuscular control may result from repeated prior performance of the movement pattern of cycling. However, the direct effects of cycling on neuromuscular control of running are unknown, as are the implications of any interference with neuromuscular control for performance and injury, and b) our ability to address any interference. PURPOSE To investigate a) the influence of the bike-run transition on neuromuscular coordination of running (i.e. does cycling have a direct effect on running?); b) the effect of altered neuromuscular coordination on run economy (ER, steady-state VO2); c) the association between a history of exercise-related leg pain (ERLP) and neuromuscular coordination of running; d) the role of fatigue in coordination changes, and e) the effectiveness of taping as an intervention for impaired neuromuscular coordination of running. METHOD 27 highly-trained triathletes participated. D Kinematics and muscle recruitment of the lower limb were compared between a control-run (no prior exercise) and a 30 min transition-run (preceded by 20 min of cycling, i.e. run vs. cycle-run). RE was measured using established procedures. Fatigue indicators from EMG and force data were evaluated using an established isometric fatigue protocol. Neuromuscular coordination was compared between transition runs with and without augmented low-Dye anti-pronation taping applied to both feet. RESULTS Kinematics were not different between control- and transition-runs. Muscle recruitment was different in 5 of 17 triathletes without injury history (65.6 ± 11.4% change in mean EMG amplitude); altered muscle recruitment during the transition-run was more similar to recruitment used during cycling (39.2 ± 5.86% increase in corollation for similarity of running and cycling muscle recruitment). Altered muscle recruitment was associated with a 3.7 ± 0.9% increase in VO2. Muscle recruitment was altered in 7 of 10 triathletes with a history of ERLP. Altered muscle recruitment was not associated with indicators of fatigue from myoelectric and force data, but was less when taping was used (70.5 ± 18.6% reversal of altered muscle recruitment). CONCLUSION Short periods of cycling have no direct effect on running kinematics or muscle activity in most (~70%) highly-trained triathletes. However, running muscle activity is influenced by cycling in a proportion (~30%) of highly-trained triathletes. This influence is not related to altered kinematics or fatigue, but instead is a direct effect of cycling on motor commands for running. This altered muscle recruitment is associated with reduced RE and 2.5 times greater likelihood of a history of ERLP, but can be improved by the use of an established taping technique.

BILATERAL TRANSFER OF LEARNING DEPENDS ON INHERENT TASK DEMANDS

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Introduction

Transfer of learning describes the influence of a previously practiced or performed skill on the acquisition of a new skill or the same skill in a new context. If transfer of learning occurs be-tween two limbs, it is called bilateral transfer of learning (Magill, 2001). The most important question for coaches and athletes about the bilateral transfer effect concerns its direction. There is little evidence, that bilateral transfer is asymmetric, what means that one limb bene-fits more from practice of the other limb. But it is controversy discussed, whether bilateral...
transfer occurs in higher amounts from preferred to non-preferred limb, or vice versa. In our study we expected, that the direction of bilateral transfer of learning depends on inherent task demands. Therefore, two experiments have been carried out, which required school children to learn a complex motor skill with (1) high demand on spatial accuracy or (2) high demand on force production and control.

Method
A total of 66 subjects were involved in two experiments to the acquisition of (1) a slalom-dribbling task in basketball (n = 30) and (2) a throwing task in handball (n = 36). In a counterbalanced crossed transfer paradigm participants practiced one of the tasks over four weeks in one of two training regimes: (P-NP) Subjects initially practiced four sessions only with their preferred limb and changed to the non-preferred side for another four session, (NP-P) Subjects initially practiced four sessions only with their non-preferred limb and changed for another four session to the preferred side. All subject were tested before practice, after the first four sessions, at the end of the training sessions and after one week without practice on both limbs separately. Bilateral transfer was assessed directly through the improvement on the nonpracticed limb (1st test repetition) and indirectly through the influence of the practiced limb on the learning of the skill on the second limb (2nd test repetition). The persistence of the bilateral transfer of learning was examined in the 3rd test repetition.

Results and Discussion
Bilateral transfer of learning occurred in both experiments, but differently in its direction (asymmetric transfer) and manner. While in the acquisition of the dribbling-task direct transfer and indirect influences on the nonpracticed limb only appeared from non-preferred to pre-furred, for the acquisition of the throwing-task only indirect influences from preferred to non-preferred limb could be shown. These results are in line with previous findings on simple motor tasks and support the suggestion, that bilateral transfer of learning is task-specific. As a practical implication these findings indicate, that in early stages of motor learning tasks de-manding high spatial accuracy should be taught differently from tasks with high demand on force control and production.

References

FREELY CHOSEN PEDAL RATE IS UNAFFECTED BY SEPARATE INCREASES IN CARDIOPULMONARY AND MECHANICAL LOADS THAT CONTRIBUTES TO THE DESIGNATION AS A ROBUST INNATE VOLUNTARY MOTOR RHYTHM

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INTRODUCTION
Freely chosen pedalling during submaximal cycling represents a voluntary rhythmic movement. Suggestively, such a rhythmic movement could be largely influenced by central pattern generators that are rhythmically active neural networks located in the spinal cord (Zehr 2005). While it is assumed that the output from the central pattern generators is affected by e.g. sensory feedback, it is unknown to what extent the freely chosen pedal rate is affected by cardiopulmonary and mechanical loads. This was, therefore, investigated.

METHODS
Recreationally active individuals (4 males and 4 females, 32±5 years, 175±8 cm, 74±15 kg) who were accustomed to cycling, without being competitive cyclists, participated. On an electromagnetically braked cycle ergometer, placed in a hypobaric chamber, each participant's freely chosen pedal rate was found during three different 10-min cycling bouts: (i) work rate corresponding to 65% of maximal oxygen uptake (VO2max), at 200 m altitude (laboratory location); (ii) work rate as in (i) but at 3,000 m simulated altitude resulting in ~80% of VO2max, and, (iii) work rate corresponding to ~80% of VO2max, at 200 m altitude. A 7% reduction of VO2max and 2 beats/min reduction of maximal heart rate per 1,000 m increase of simulated altitude was assumed (Wehrlin, Hallén 2006) for estimations of relative values of oxygen uptake and heart rate. Condition (i) and (ii) allowed comparison of freely chosen pedal rate under constant mechanical load on the legs while varied cardiopulmonary load. Condition (iii) and (iii) allowed comparison of freely chosen pedal rate under constant cardiopulmonary load while varied mechanical load.

RESULTS
Relative oxygen uptake was 65±3%, 82±5%, and 82±4% of VO2max for condition I, II, and III, respectively. Heart rate was 78±4%, 89±5%, and 91±3% of the maximal heart rate, respectively. For these physiological responses, taken to reflect cardiopulmonary load, differences occurred between condition I and II while not between II and III. Work rate, reflecting mechanical load, was 173±32, 173±32, and 224±37 W in condition I, II, and III, respectively (p<0.05 for condition II vs. III). Freely chosen pedal rate was 86±13, 88±11, and 85±11 rpm for condition I, II, and III, respectively (p>0.05).

DISCUSSION AND CONCLUSION
Freely chosen pedal rate was unaffected by increased cardiopulmonary load at a constant mechanical load - and vice versa. From this, and other results showing the freely chosen pedal rate to be steady and at the same time largely individual over 3 months (Hansen 2008), the freely chosen pedal rate is suggested to be a robust innate voluntary motor rhythm, likely under primary influence of central pattern generators that again are minimally affected by cardiopulmonary and mechanical load.

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BRAIN ACTIVITY: HOW EXPERTS DIFFER FROM NOVICES IN GOAL-DIRECTED SPORTS PERFORMANCE

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Purpose: Skilled performance in a goal-directed motor task is dependent on the ability to process internal and external information in an effective manner and decide which pieces of information are important and which are irrelevant. On a cortical level focused attention and somatosensory information processing in the concept of working memory play a crucial role in this process. The electroencephalography (EEG) is able to monitor these changes in frontal and parietal brain areas (Theta and Alpha-2 spectral power) during cognitive and sensorimotor tasks. Less is known about these parameters in a complex goal-directed sports performance. Therefore EEG recordings were examined during a goal-directed golf putting to examine electro-cortical changes related to information processing and focused attention in an expert-novice paradigm.

Methods: Nine male, right-handed experienced golfers (26.4±4.1 years, 86.7±4.8 kg, 189.4±21 cm, 7±6 ± 4.2 years golf experience, playing golf 3.0±7.0 hours/week) with golf handicap of 8.3±7.5 were compared to nine male, right-handed novice volunteers (24.6±3.4 years, 82.6±31 kg, 184.3±7.1 cm, no golf experience). Participants were required to putt balls as accurate as possible at their own
pace during a 5 x 4 min putting series. During the performances the EEG was measured in accordance with standards of the international 10:20 system from 13 scalp locations (Fz, F3, F4, Cz, C3, C4, P3, P4, T3, T4, T5, T6) and divided into different frequencies: Theta (4.75-7.5 Hz), Alpha-1 (7.9-9.5 Hz), Alpha-2 (9.75-12.5 Hz) and Beta-1 (12.75-18.5 Hz). Performance-related power values were calculated and log-transformed.

Results: Statistical analysis showed significantly better performance in the expert golfers (F1,16=114.328, p<.001; part r2=.864). This was associated with higher frontal Theta power (F1,16=5.275, p=.05; df=248) and increased parietal Alpha-2 power values (F1,16=8.482, p=.01; part r2=.346) compared to the novices in golf putting.

Conclusion: In summary, the results of this study demonstrate that performance-related power values measured by EEG were associated with skill level in a goal-directed golf putting series. The findings suggest that with increasing skill level, expert golfers have developed task solving strategies which came along with focused attention (increased frontal Theta power) and an economy in neural activity during sensory information processing in the somatosensory cortex (increased parietal Alpha-2 power). With the theoretical framework of the working memory it seemed to develop a model for goal directed sports performance like golf.

SHORT-TERM CHANGES IN MUSCLE ACTIVITY TO AN ELASTIC CORD TECHNIQUE TRAINING DEVICE DURING TREADMILL RUNNING

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Modern motor learning theories, such as differential learning approach (Schöllhorn 2006) and the coordination dynamics theory (Kelso 2006), consider noise or movement variability as an essential, inherent factor for technique stabilization and improved learning. According to Bernstein (1967) movement results from forces generated directly by muscle contraction and reactive phenomena (gravitation, inertia, forces stored in muscle-tendon unit). Neuromuscular impulses must adjust to produce constant movement outcome due to changing forces of non-muscular genesis. In order to achieve the ability to adapt to such changes, reactive phenomena should be increased in the training process but not exceed the solution space. The aim of our study was to compare short-term changes in variability of muscle activity during treadmill running when using a technique training device and controlled running.

Six males ran 2 x 30 min intervals at 2.9 m/s separated by a 30 min rest period. After the first 5 min of either the first or the second 30 min-interval, elastic cords were attached at iliosacral joint and both heels. The cords act to increase the degrees of freedom. They then ran for 20 min followed by 5 min free running. The cord length was standardized at 40% of the leg length (producing ~48 N at 100% leg length). Muscle activity of the rectus femoris (RF), tibialis anterior (TA), lateral gastrocnemius (LG) and stride duration (ST) were measured. IEMG for each stride was measured. Standard deviations (SD) between strides in 2-min-blocks were calculated to assess movement variability.

Average IEMG increased between 21.1 and 68.0% for the three muscles after the switch from free to cord running, whereas ST changed by 1.4%. A 2 X 2 ANOVA revealed a strong interaction between cords and free running by p2 between .63 and .70 (p<.06) for IEMG. Readaptation from cord to free running showed a prolonged muscle activity and variability only for TA illustrated by an increase of 11.1% and 14.5% to the first 5 min free running (p<.001). The increase in average IEMG and stride-to-stride variability is potentially a result of increased forces generated by cords or the inability to profit from occurring forces for generating the movement pattern as described by Bernstein potentially assigned to their first time experience. The basic idea to induce higher movement variability within solution space by applying cords is confirmed by the higher EMG variability compared to ST.

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Oral presentations (OP)

OP-NU01 Nutrition 1

THE EFFECT OF DEHYDRATION ON COGNITIVE PERFORMANCE IN ELITE FEMALE FIELD HOCKEY PLAYERS FOLLOWING INTERMITTENT EXERCISE IN THE HEAT

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Background: Little is known about the combined effects of dehydration and heat stress on cognitive performance in elite female athletes. In the case of team sports, it is crucial players execute a high degree of mental functioning for skill execution, reading play and processing tactical changes. Baker and colleagues (2007) showed that fluid ingestion during exercise was essential in maintaining vigilance-related attention in male basketball players. The aim of this study was to investigate the combined effect of fluid ingestion and field hockey specific exercise in the heat on cognitive performance in elite female players.

Methods: Seven elite female field hockey players (mean ± SD, 22 ± 4 yrs; body mass 61.9 ± 5.4 kg, height 166.6 ± 5.1 cm; VO2 max 52.9 ± 2.9 ml/kg/min) performed 30 min of a field hockey-specific intermittent treadmill protocol (FHITP) in the heat (33oC, 60% RH) on two occasions, separated by at least 7 days. The FHITP was individualised based on work rate and consisted of different exercise intensities observed in match play (total distance = 6967 ± 266 m). On one occasion subjects were restricted from consuming any fluid (NF); in the other it was ad libitum (FL). An exercise intensity corresponding to ~92% HRmax was subjectively assessed using rate of perceived exertion (RPE) and perceived thirst were measured at regular intervals during exercise.

Results: Body mass loss was significantly greater (P<0.001) in the NF trial, equating to mean percentage body mass losses of 0.5 ± 0.5% and 2.5 ± 0.5% for the F and NF trials, respectively. HR and Trec were similar between trials, however, RPE and perceived thirst were significantly higher in the NF trial (P<0.001). Fluid ingestion significantly improved (P=0.023) reaction time for the executive function and log-transformed.
Conclusion. Volume = 3.3% ± 5.2% vs 5.1% ± 7.9% in B+W and W, respectively, all p < 0.001) and thirst score decreased at pre-exercise levels. Plasma volume increased significantly after the rehydration period in both trials (fat free mass = 0.09% ± 1.5% vs 1.3% ± 1.2%; plasma.

Financial support: Centro de Información Cerveza y Salud.

References:


NEUTROPHIL DEGRANULATION RESPONSE TO CARBOHYDRATE AND PROTEIN FEEDING AFTER PROLONGED EXERCISE

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Objective: To determine the effects of immediate and delayed carbohydrate (CHO) and protein (PRO) feeding on neutrophil degranulation responses after prolonged exercise.

Methods: Nine trained male runners completed three feeding interventions in randomised order after 2 h running at 75% VO2max. On the control trial (CON) participants received water immediately post-exercise and 1 h post-exercise. On the immediate feeding trial (IF) participants received a CHO-PRO solution equal to 1.2 g CHO/kg/BM and 0.4 g PRO/kg/BM immediately post-exercise and water 1 h post-exercise. On the delayed feeding trial (DF) participants received water immediately post-exercise and CHO-PRO solution 1 h post-exercise. All fluid boluses were prepared with water equal to 12 ml/kg/BM. Venous blood samples were collected pre-exercise, post-exercise, and at 20 min intervals until 140 min post-exercise. Neutrophil counts were determined using an automated cell counter. Elastase release from bacterial-stimulated neutrophils (degranulation) was determined using ELISA. Data were analysed using a trial x time repeated measures ANOVA with post hoc Tukey's HSD.

Results. The post-exercise circulating neutrophilia was similar throughout the recovery period measured (main effect of time: P< 0.001) on CON (8.2 ± 0.9 x10 9/L), IF (8.8 ± 1.1 x10 9/L) and DF (8.4 ± 0.8 x10 9/L). Neutrophil degranulation (% change in elastase release per neutrophil significantly decreased during recovery on CON and DF (24% and 31% at 140 min vs. pre-exercise, respectively; P< 0.01), but remained unchanged on IF. Neutrophil degranulation was significantly lower on CON at 100 and 140 min post-exercise (P< 0.05) and DF at 80 min to 140 min post-exercise (P< 0.01) compared with IF. Conclusion: These results indicate that consuming a CHO-PRO solution equal to 1.2g CHO/kg/BM and 0.4g PRO/kg/BM immediately after, but not 1 h after, prolonged strenuous exercise prevents the decrease in neutrophil degranulation.

REHYDRATION AFTER EXERCISE UNDER HOT ENVIRONMENT: EFFECTS OF BEER VS WATER

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Introduction. Beer is characterized for its low alcoholic content and notable amount of low molecular weight maltodextrins, amino-acids, minerals, B group vitamins, anti-oxidants, and carbohydrates. Hence, moderate intake of beer could be an alternative in the restoration of fluid balance after exercise-induced dehydration.

Aim. To determine the effectiveness of beer intake (660 ml) in restoring fluid balance after exercise-induced dehydration compared with the effect of water intake.

Material and methods. In a cross-over study design, sixteen healthy male volunteers (age: 21.1 ± 1.4 years, VO2max: 55.9 ± 3.6 ml.min.kg⁻¹) performed two randomized trials separated by a 3 weeks interval. In each trial the subjects exercised at 60% of maximum aerobic speed in hot environment during 60 minutes (35 ± 1 ºC, 60 ± 1 % relative humidity). After the exercise bouts, the subjects rest for 2 h in a separate chamber at the same environmental conditions and were asked to drink 660 ml of beer plus water ad libitum (trial B+W), whereas in the other trial the participants were allowed to drink only water (trial W). The subjects were weighted before exercise, after exercise and after 2 h of rehydration. Additional measured variables included fat free mass (measured by dual-energy x-ray absorptiometry), percentage of change in plasma volume and thirst scale. Urine volume and fluid intake were collected during the rehydration period.

Results. A decrease of 2.4 ± 0.3% of their body weight was observed. A decrease in fat free mass and plasma volume occurred after exercise in the heat (all p < 0.001), whereas thirst score increased significantly after exercise in both trials (all p < 0.001). During the rehydration period, there were no differences in the amount of fluid intake between trials (6260 ± 587 vs 1644 ± 620 ml in B+W and W, respectively, p = 0.91). The urine volume was also similar in both trials (281 ± 374 vs 223 ±245 ml, in B+W and W, respectively, p = 0.70). After two hours of rehydration, the subjects recovered 1.3% and 1.6% of body weight in the B+W and W trials, respectively (p = 0.29). Fat free mass and plasma volume increased significantly after the rehydration period in both trials (fat free mass = 0.09% ± 1.5% vs 1.3% ± 1.2%, plasma volume = 3.3% ± 5.2% vs 5.1% ± 7.9% in B+W and W, respectively, all p < 0.001) and thirst score decreased at pre-exercise levels.

Conclusion. The results of the present study suggest that beer could be an alternative effective post-exercise rehydration drink in healthy moderately trained young adults, even under hot environment. Thirst was not enough for stimulating voluntary drinking and recovering full body weight loss. In addition, it is important to highlight that the messages related to the benefits of moderate consumption of alcohol have always been addressed to adult populations.

Financial support: Centro de Información Cerveza y Salud.
ENERGY INTAKES AND BODY COMPOSITION IN COMPETITION ATHLETES

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Female athletes participating in sports that require gracefulness and technique, like gymnastics, ballet, diving are under a great pressure of keeping a lean body. The very short gymnasts' career embraces very young athletes, who are undergoing the very important processes of growth and development for their future life. Although gymnasts seem to be at a low level of energy intake, few investigations have examined this concern, especially in female athletes.

The primary aim of this investigation was to study and to compare energy intake and body composition in seventy competition female gymnasts (12.3 (2.6) (years); 142.3 (11.1) (cm); 36.7 (8.4) Kg) of Federação de Ginástica de Portugal (Portuguese Gymnastic Federation) in preparatory and transitory period to 9,6 (2,5)% in the end of season.

Energy intake in most sports was lower than recommended for moderately exercising athletes, as average practice time was 96.4 +- 58.2 minutes per day. Independent of exercise-related aspects, risk groups for low nutrient intakes were identifiable among the junior athletes. For example, iron intake was strongly correlated with energy intake (r-squared = 0.74, p < 0.001). Consequently, relative iron intake was significantly lower in female athletes (93 +- 32 % RDA vs. 145 +- 51 % RDA (males), p < 0.001).

RESULTS & DISCUSSION: Within the monitoring period, the average activity level (EE/resting EE) of the monitored athletes was 1.71 +- 0.22. Consequently, carbohydrate intake in most sports was lower than recommended for moderately exercising athletes, as average practice time was 96.4 +- 58.2 minutes per day.

The present report includes data from 72 male and 85 female athletes (16.7 +- 3.3 y, 65.7 +- 13.5 kg, 174. 7 +- 10.7 cm) from 17 different sports, who visited the Centre between January and December 2007.

VALIDATION OF THE COLOGNE NUTRITION AND ACTIVITY PROTOCOL USING DOUBLY-LABELLED WATER, INDIRECT CALORIMETRY AND 24H UREA EXCRETION

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INTRODUCTION: Assessment of the nutrition status of elite athletes depends on valid methods for determination of both nutrient intake as well as physical activity. Prospective methods such as dietary protocols seem well suited for routine assessment of nutrient intake. Physical activity can be assessed with activity protocols (API), thus enabling the simultaneous approximation of energy expenditure (EE).

Validation of energy intake (EI) and physical activity can be obtained by using doubly labelled water (DLW) as an independent biomarker, which is considered to be the gold standard in field situations. During exercise in laboratory conditions, indirect calorimetry (IC) can be used to determine EE. As an additional tool, 24h urea excretion has been established as a marker of protein intake. The aim of the present study was to validate the Cologne nutrition and activity protocol by using DLW, IC and 24h urea excretion as reference methods. The highly standardized nutrition protocol consists of predefined food items and portion sizes. Nutrient intake is calculated with EBIS nutrition software (version 7.0). The activity protocol contains predefined activities, with strong emphasis on sport-related activities. EE is calculated from AP data on the basis of reference data.
The primary goal of games teaching is enhancing pupil’s game playing ability. Small-sided games are considered to provide more learning opportunities compared to the full game (Capel, 2000). This study was conducted to examine if there is a differential amount of learning opportunities in basketball 3 on 3 versus 5 on 5 game play situations. Additionally, players’ heart rates in both conditions were measured with IC in all subjects (mean r-squared: 0.86 +- 0.07 (running), 0.94 +- 0.02 (cycling)). Dietary protein intake was significantly correlated with 24h urea excretion (r-squared = 0.51, p < 0.001). These preliminary data indicate that the Cologne nutrition and activity protocol is a valid tool for assessing the nutrition status in athletes.


THE SELF-EFFICACY OF PRE-SERVICE PHYSICAL EDUCATION TEACHERS' AND IT SOURCES

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Introduction
Teachers’ self-efficacy has been detached as having a determinant influence on teaching quality (Onofre; 2000; Henson, 2002, Woolfolk Hoy & Spero, 2005), namely because it affects the quality of teachers pedagogical knowledge (Onofre, 2000), and teachers’ commitment, effort and motivation to teaching (Bandura, 1997). Some studies underline that teachers’ self-efficacy can be reinforced through different kinds of experiences (sources of self-efficacy) (Tschannen-Morgan, Hoy & Hoy, 1998), mainly during the teacher first year of teaching (Woolfolk Hoy & Spero, 2005). Research have indicated that verbal persuasion (Hoy & Tschannen-Moran, 2006) and mastery experiences (Tschannen-Morgan, Hoy & Hoy, 1998) are the main teaching self-efficacy sources for pre-services teachers. This study aimed to analyse the variation of the self-efficacy beliefs of the pre-service physical education teachers during their practicum, and to identify the its sources.

Methodology
This study was carried out in two phases. During the extensive phase, two questionnaires were applied to 88 PE pre-service teachers, to estimate the variation of their personal teacher efficacy and specific classroom teaching self-efficacy (Onofre, 2000). A comparative statistical analysis was used. An intensive phase consisted of a multi-case study. Eight pre-service teachers representing two clusters of the teacher self-efficacy variation (under percentile 25 and upper percentile 75) were interviewed to identify the sources of their teaching self-efficacy. Their answers were submitted to an inductive content analysis.

Results
Results had shown a moderate but significant correlation between general and specific teachers self-efficacy. The specific self-efficacy beliefs of pre-service teachers had a significant increment in classroom instruction, management and climate. No significant changes were found in classroom discipline. The sources of self-efficacy that teachers argued as most influential were the verbal persuasion and the mastery experience.

References.

TEACHERS' PERCEPTIONS OF GENDER RELATIONS IN SCHOOLYARDS

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Introduction
Children and youth do gender differently according to which place they are at (Arnesen & Laegren 2004). Also schools and school yards are places where activities are very stereotype and traditional gender roles are re-/produced (Boyle 2003; Pellegrini 1995, Shilling 1991, Thorne 1993). Diketmüller & Studer (2007) examined physical activities concerning gender play in school yards and identified different factors which influence the gender play at school recess. In the following paper the focus of the study lies on teachers’ and educators’ perceptions of gender relations in school yards and physical activity and their influence in the process of gendering institutions.

Methods
To examine the influence of the teachers and their attitudes on physical activities concerning gender play in school yards, the data of participant observation in 20 Austrian school yards (60 recesses) were applied and compared with the data of structured interviews with directors (n=20) and teachers (n=29). The data were analysed by content analysis technique.

Results
The findings of the interview data lead to the assumption that teachers have diverse estimations about how boys and girls use the school yards and playground via physical activities. Teachers assume both gender stereotyped activities and no differences between girls and boys. Those teachers, whose ratings differ conspicuously from the observed activities of girls and boys in the school yards, had also more traditional explanation approaches on gender and gender differences in physical activities. The results also showed that the gender awareness of the teachers contributes girls’ and boys’ activities in school yards: if and how disadvantages by gender are seen, how gender issues are dealt with, how activities of boys and girls are appraised and supported or how usages are negotiated and which rules are rearranged.

Discussion
This study shows the need of a higher gender awareness of teachers because the uncritical current use of school yards often still contribute to the production of (unequally) gender relations. That teachers are sensitised to their contribution to the process of gender-reproduction in school seems to be a condition precedent for changing gender relations. Based on the study, different approaches are discussed, how to enable less gender-stereotyped activities at school.

References.
A SOCIO-CULTURAL PERSPECTIVE ON HUNGARIAN STUDENT TEACHERS’ EXPERIENCE WITH PLAY
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The soul of the child needs to have play” articulated Plato on the role of childhood games in Laws (793. B.C.E.). Fröbel added ‘A child’s play is his work, the highest expression of human development in childhood.’ Teachers and psychologists agree that the intellectual and physical stimulation of both spontaneous and organized games are required for the personality development of children. According to some, (Lancy, 1976; Schwartzman, 1983; Rigler, 2004) traditional games are significantly influenced by social and socio-cultural circumstances.

In Hungary the theoretical and practical teaching of games in teacher education draws on significant traditions. Despite this, students’ experience and knowledge of games is relatively poor in higher education, and when learning games a significant portion of students tend to be reluctant and passive rather than active participants.

For this reason we attempted to map the knowledge of games among 1st year students studying to educate children in the future with the following questions:

- Does the population size of a community influence playing habits?
- Is play more frequent in families with several children?
- Do regular sports activities influence the willingness to play?

In addition to registering demographic data, the questionnaire consisted of 25 close-ended and 4 open-ended questions.

Students completed the questionnaire at the first session of the school games course in the autumn semester of the 2007/2008 academic year (N=224).

In our study we inquired about both intellectual and physical games. Contrary to our expectations, neither settlement population size nor the number of siblings influenced the frequency of play in either case. The number of siblings did not statistically influence play habits; however it is important to mention that almost all the students coming from big families (3 or more children) said that they had played games within the last month.

Most surprising was that the number of years spent actively participating in sports also did not have a significant influence on the students’ willingness or motivation to play or the amount of spare time spent playing games. There were no significant differences between girls and boys in the study.

The results of the students’ group reveal that enjoyment, the improvement of physical capacities and being physically healthy are the main reasons or motives that justify schools sports practice with over 90% of the answers. However, teachers consider that socialising with friends was the most significant factor.

Conversely, the factor that less influence has for the practice of sports seems to be the same for both groups, namely I like to be popular (approximately 50%), although about half of the students consider that they would like to become stars or sports champions.

The timetables of transportation of students to competitions is one of the critical aspects relating to the quality of the service, although this is more evident in teachers (almost 40% and dissatisfied or very dissatisfied) than in students (20%).

In general, students and teachers are satisfied with the running and the pertinence of school sports competitions. However, while students tend to value the respect for sport competition rules, teachers indicate the commitment of students as the most chosen factor (more than 80%).

From a negative point of view, both groups refer the number of competitions during the school year and the quality of refereeing as the main factors for their dissatisfaction, although results are much more evident in the group of teachers.

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INTANGIBLE ATTRIBUTES OF THE QUALITY OF THE SCHOOL SPORTS SERVICE: A COMPARATIVE STUDY BETWEEN ATHLETES AND TEACHERS
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This study is based on the presupposition that physical education students and teachers involved in school sports are the organisational actors that have the greatest responsibility for the success of training and competitions. Thus, and in accordance with the Portuguese Republic’s Physical Activity and Sports Act (Law n. 5, 2007), school sports should value the participation of young athletes and that of members of the organisation in the assessment and improvement of the service.

This study aims at comparing the perception of athletes with that of the school sports teachers with regard to: the reasons that motivate students to take part in school sports; the easiness in participating and the level of satisfaction in relation to how competitions take place.

For the collection of data two questionnaires were used, put together departing from a study carried out in mainland Portugal (Correia & Rosado, 2006) and adapted to Madeira in accordance with its activity programme (GCDE, 2006). Data processing was done via SPSS version 15 using non-parametric Qui-square and Kruskal - Wallis (p = 0,05) techniques.

The results of the students’ group reveal that enjoyment, the improvement of physical capacities and being physically healthy are the main reasons or motives that justify schools sports practice with over 90% of the answers. However, teachers consider that socialising with friends was the most significant factor.

Conversely, the factor that less influence has for the practice of sports seems to be the same for both groups, namely I like to be popular (approximately 50%), although about half of the students consider that they would like to become stars or sports champions.

The timetables of transportation of students to competitions is one of the critical aspects relating to the quality of the service, although this is more evident in teachers (almost 40% and dissatisfied or very dissatisfied) than in students (20%).

In general, students and teachers are satisfied with the running and the pertinence of school sports competitions. However, while students tend to value the respect for sport competition rules, teachers indicate the commitment of students as the most chosen factor (more than 80%).

From a negative point of view, both groups refer the number of competitions during the school year and the quality of refereeing as the main factors for their dissatisfaction, although results are much more evident in the group of teachers.
Introduction.
A surprisingly large reduction in blood lactate concentration ([lac-B]) is commonly observed during whole body exercise following inspiratory muscle training (IMT). However, Wetter and Dempsey (2000) argue that the size of the respiratory muscles precludes them from affecting systemic [lac-B]. We recently showed Johnson et al (2006) that voluntary hyperpnoea during exercise at maximal lactate steady state (MLSS) increased [lac-B] by 25%.

The aims of this study were to explore whether IMT attenuates such a response and to reveal further the potential of the respiratory muscles to influence systemic lactate kinetics.

Methods.
22 healthy males were divided equally into an IMT group and a control group. Prior to and following a 6-wk intervention period, subjects completed 20 experimental trials at MLSS. Arterialised venous blood was sampled every 2 min to determine [lac-B] and acid-base balance. Respiratory variables were measured breath by breath. The second experimental trial was identical to the first except from min 10 to 20 volitional hyperpnoea was performed. During this period IR was controlled using a metronome and a target VE (95% maximal exercise VE) and VT were maintained via visual feedback. IMT was performed using a pressure-threshold loading device comprising 30 inspiratory efforts twice daily, 7 d/wk, at an intensity of 50% maximal inspiratory mouth pressure (MIP). The control group performed no IMT.

Results. Brachial and popliteal artery FMD or CADC did not change in control subjects at any time points. Exercise training induced changes in brachial artery FMD [ANOVA, P<0.05]. FMD increased from baseline (5.9±0.5%) at weeks 2 and 4 (9±0.6, 8.4±0.6, respectively, P<0.01), but not between baseline and week 8 (6.9±0.7%). Brachial artery CADC analysis revealed a gradual increase throughout training [ANOVA, P<0.01], with an increase from baseline (8.1±0.4%) at weeks 2, 4, 6 and 8 (9.2±0.6, 9.9±0.6, 10±0.5, 10.5±0.8, respectively, P<0.05). In keeping with these results, popliteal artery FMD showed a change during training [ANOVA, P<0.001], with increased FMD between baseline (8.2±0.7%) and weeks 2, 4 and 6 (9.1±0.6, 9.5±0.6, 7.8±0.5, respectively, P<0.05), but not between baseline and week 8 (6.5±0.6%). Popliteal CADC demonstrated a gradual increase in response to exercise training [ANOVA, P<0.05] with significant increase from baseline (8.9±0.4%) at weeks 4 and 8 (10±0.7, 12±0.6, respectively, P<0.05).

Conclusions. This study is the first demonstration in humans of the rapidity and complimentary adaptations in arterial structure and function. Functional changes precede structural adaptations, suggesting that structural change may normalise shear, returning artery function to baseline. These findings may therefore explain why previous pre-and post-exercise training measures have failed to demonstrate any change in functional adaptations.

References.

INSPIRATORY MUSCLE TRAINING REDUCES BLOOD LACTATE CONCENTRATION DURING STEADY STATE EXERCISE AND VOLITIONAL HYPERPNOEA

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Aims.
To investigate the effect of inspiratory muscle training on lactate kinetics during exercise following voluntary moderate hyperpnoea.

Methods.
23 healthy males were divided equally into an IMT group and a control group. Prior to and following a 4-wk intervention period, subjects completed 20 experimental trials at MLSS. Arterialised venous blood was sampled every 2 min to determine [lac-B] and acid-base balance. Respiratory variables were measured breath by breath. The second experimental trial was identical to the first except from min 10 to 20 volitional hyperpnoea was performed. During this period IR was controlled using a metronome and a target VE (95% maximal exercise VE) and VT were maintained via visual feedback. IMT was performed using a pressure-threshold loading device comprising 30 inspiratory efforts twice daily, 7 d/wk, at an intensity of 50% maximal inspiratory mouth pressure (MIP). The control group performed no IMT.

Results. Brachial and popliteal artery FMD or CADC did not change in control subjects at any time points. Exercise training induced changes in brachial artery FMD [ANOVA, P<0.05]. FMD increased from baseline (5.9±0.5%) at weeks 2 and 4 (9±0.6, 8.4±0.6, respectively, P<0.01), but not between baseline and week 8 (6.9±0.7%). Brachial artery CADC analysis revealed a gradual increase throughout training [ANOVA, P<0.01], with an increase from baseline (8.1±0.4%) at weeks 2, 4, 6 and 8 (9.2±0.6, 9.9±0.6, 10±0.5, 10.5±0.8, respectively, P<0.05). In keeping with these results, popliteal artery FMD showed a change during training [ANOVA, P<0.001], with increased FMD between baseline (8.2±0.7%) and weeks 2, 4 and 6 (9.1±0.6, 9.5±0.6, 7.8±0.5, respectively, P<0.05), but not between baseline and week 8 (6.5±0.6%). Popliteal CADC demonstrated a gradual increase in response to exercise training [ANOVA, P<0.05] with significant increase from baseline (8.9±0.4%) at weeks 4 and 8 (10±0.7, 12±0.6, respectively, P<0.05).

Conclusions. This study is the first demonstration in humans of the rapidity and complimentary adaptations in arterial structure and function. Functional changes precede structural adaptations, suggesting that structural change may normalise shear, returning artery function to baseline. These findings may therefore explain why previous pre-and post-exercise training measures have failed to demonstrate any change in functional adaptations.

References.
RELATIONSHIP BETWEEN THE CATECHOLAMINES AND HEART RATE VARIABILITY (HRV) RESPONSE DURING CYCLING AT MAXIMAL LACTATE STEADY STATE (MLSS)

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INTRODUCTION
During submaximal steady-state (SS) exercise the adrenaline and noradrenaline concentration are supposed to increase continuously 1, 2, being an indicator of the sympathetic activation 6. Differents studies have shown relations between sympathetic and parasympathetic activity and the different spectral components of HRV 6. The aim of this study was to compare the catecholamines and HRV response at the MLSS in cycling, to differentiate the nervous activity during exercise.

MATERIAL AND METHODS
Twelve amateur cyclists participated in the study [21 ± 2.6 years, 179.8 ± 7.5 cm, 72.2 ± 9 Kg]. Each subject performed an incremental test (25 W o min⁻¹) until exhaustion on a cicloergometer, and two 30 minutes constant load tests to determine the MLSS 3, 4 at an intensity around the mean point of ventilatory thresholds (VT). Expired air was analyzed with a Jaeger Oxycon Pro. Arterialized venous blood samples were obtained at 0, 10, 20 and 30 minutes during the SS tests. Lactate concentration [L-] and catecholamines concentration were determined. The heart rate (HR) was obtained from a Polar HR monitor and HRV was measured using HRV analysis software. A one way ANOVA was used to compare the response of the variables in 0, 10, 20 and 30 minutes and Pearson correlation analysis was used to set the relationships between variables. The significant level was set at 0.05.<ref>RESULTS</ref>

The VO₂ during MLSS was 4225.17±414.39 mL/min (58.82±4.67 mL/min/kg) and 81.84±7.02 %VO₂max. The workload was 279±28 W. The main significant correlations were obtained between [L-] and noradrenaline concentration [Nor] and HR (r=0.855 and r=0.835 respectively), [Nor] and HR (r=0.852), high frequency (HF) and low frequency (LF) and very high-frequency (VHF) (r=0.894 and r=0.839 respectively). There were not significant correlations between hormones concentration and HRV variables. Significant differences were found between 0 minute and 10, 20 and 30 minutes in almost all variables along the MLSS (p<0.05). Hydrogen ion concentration [H⁺], [L-] and adrenaline concentration were stable (10, 20 and 30 minutes), while HR and [Nor] increased from 10 minute to 30 minute (p<0.05). LF, HF and VHF decreased from 10 minute to 30 minute (p<0.05).

DISCUSSION
HR and [Nor] did not stay stable during the MLSS test, due to the “cardiovascular drift” and the increase in sympathetic nervous system activity 2, 5. However, our results sugest there is no relation between catecholamines and HRV during the MLSS. Thus, the use of HRV is not clear to differentiate the nervous activity during MLSS6.

References.

BOTOX INDUCED MUSCLE PARALYSIS LEADS TO SLOWER MYOSIN HEAVY CHAIN ISOFORMS AND REDUCES TITIN CONTENT

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Introduction
Botox and exercise are both applied in the therapy of spastic muscle in children with cerebral palsy. However, little is known about the biological changes in muscle composition following Botox injections and how the combination of Botox and exercise affects the growing muscle. Muscle function is determined in large part by the contractile protein myosin and the structural protein titin. The purpose of this study was therefore, to determine the effect of Botox and 3 weeks of exercise on the myosin heavy chain isoform and titin.

Methods
Male Sprague-Dawley rats (29 d, 74 ± 4 g) were randomly assigned to four groups (n=6) that received either saline or Botox (Btx) injections in the right gastrocnemius muscle: 1) sedentary control group (Con), 2) wheel-running group (Ex), 3) Btx-paralyzed sedentary group (Btx), 4) Btx-paralyzed wheel running group (Btx-Ex). The animals of the exercise groups had free access to running wheels and the frequency, velocity and distance of all voluntary running bouts were recorded continuously. After 3 weeks, the animals were sacrificed. The gastrocnemius muscle was dissected, frozen in liquid nitrogen and stored at -80°C. Frozen muscles were homogenized in low salt lysis buffer and total protein was isolated. Protein concentration was determined by optical densitometry and equal amounts of protein were buffer and total protein was isolated. Protein concentration was determined by optical densitometry and equal amounts of protein were

RESULTS
The mean daily running distance in Ex (776 ± 538 m) did not differ significantly from Btx-Ex (636 ± 37 m). Botox decreased gastrocnemius mass (Btx-Ex -43%, Btx -46%), while exercise increased gastrocnemius mass, expressed relative to body mass, only in Ex (+6%) and the contralateral leg of Btx-Ex (+8%) compared to Con. Botox had an effect on muscle composition, since the percentage of MHC type IIB decreased, while the slower MHC type IIX increased. This effect was slightly enhanced by exercise. The titin content, represented by the band volume, decreased with Botox (-25%). Furthermore, there was a tendency for exercise to enhance the effect of Botox, since the lowest titin content was found in exercised muscle that received Botox injections.

Discussion
Our results add to the limited knowledge that Botox affects MHC expression different than other forms of paralysis, since in contrast to our findings changes towards a faster muscle phenotype have been observed in spinal cord injury patients. This is the first evidence to sug-
gest a Botox-exercise effect on MHC and titin, indicative that exercise of Botox paralysed muscle, as done in therapy, might induce adaptations different from that in non-Botox muscle. Thus, caution may be warranted in the use of physiotherapeutic therapy in Botox paralysed muscle.

REPETITION FAILURE IS NOT REQUIRED FOR MAXIMAL STRENGTH ADAPTATION

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Resistance training protocols targeting maximum strength adaptation commonly encourage exercise to repetition failure. Loads greater than 85% of one repetition maximum (1RM) promote maximal strength adaptation, whilst explosive exercise against relatively lighter loads increases the rate of force development. We hypothesised resistance exercise to repetition failure is unnecessary when heavy loads (85% 1RM) are attempted as an explosive resistance exercise. Therefore, we investigated neuromuscular adaptation of the biceps brachii in untrained males (N=28) using three elbow flexion (60°-160°) treatments: (EC) attempted explosive concentric and eccentric; (SSC) attempted explosive concentric and eccentric; and (C) controlled 2-s concentric and eccentric training. All subjects completed a 4-wk progressive resistance training (control) period prior to the experiment. Subjects then exercised a further 3 days per wk for 12 wks at 85% 1RM. Group (C) performed four sets to repetition failure, completing 6.1 ±0.1 repetitions per set. The two explosive exercise groups performed four sets: (EC) 4.2 ±0.1 and (SSC) 4.2 ±0.0 repetitions. Strength was assessed isometrically (7 angles: 80°-140°) and via a 1RM elbow flexion, and muscle cross-sectional area using magnetic resonance imaging. Filtered electromyographic (EMG) data were sampled at 2 kHz (Digitimer, Neurolog). Peak and average root mean square (RMS) and mean frequency (Wf, Spike 2 Ver5.13) were calculated over scroling 250 ms windows with a 50% overlap. All data are means ±SE with alpha set at 0.05. Despite a 31% reduction in total work, no significant differences were observed in 1RM strength gain among groups: (EC) 28.17% (6.28±0.46kg), (SSC) 34.22% (6.28±0.32kg) and (C) 29.43% (5.85 ±0.63kg). Significant training-induced increases in peak RMS (EC: 8.34 ±5.06%, SSC: 20.42 ±12.2%, C: 21.79 ±13.31%) and mean RMS (EC: 7.66 ±5.1%, SSC: 46.97 ±21.8%, C: 16.71 ±11.2%) were observed during 1RM, but significant differences among groups were not detected. Significant increases in MVC were observed at joint angles between 80-120° in all groups. Our results demonstrate that it is not necessary to achieve repetition failure for maximal strength adaptation when high attempted velocity movements are coupled with higher loads. This may result from an optimal neuromuscular adaptation associated with altered motor unit recruitment thresholds and increased motor unit firing during explosive muscle contractions (Van Custem et al. 1998), or possibly differences in the rate of muscle hypertrophy.

References


THE EFFECT OF PLYOMETRIC EXERCISE ON PERCEIVED EXERTION AND CYCLING ENDURANCE PERFORMANCE

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The effects of exercise-induced muscle damage on endurance performance have been studied infrequently. The purpose of this study was to evaluate the effects of exercise-induced muscle damage on the cardiovascular, metabolic and perceived exertion responses to fixed-load exercise and 5-minute time-trial performance. Following ethical approval, seven recreational athlete volunteers (age 22.1 +/- 3.9 y, stature 1.76 +/- 0.08 m, body mass 76.0 +/- 4.2 kg) performed an incremental test to exhaustion on a cycle ergometer to determine VO2peak and the power output corresponding to VO2peak (Pmax). After a minimum of 96 h, participants performed two fixed-load exercise bouts, exercising at 60%Pmax and 80%Pmax followed by a 5-minute time-trial. Cardio-respiratory, metabolic and perceived exertion responses were recorded during all tests. Performance measures were accompanied by measurement of perceived muscle soreness and peak isokinetic torque of the knee extensors at 60 deg/s. Following a further 48 h, participants performed muscle-damaging exercise consisting of 10 x 10 plyometric jumps, after which all measurements were repeated at 48 h and 168 h. Indirect evidence of muscle-damage following plyometric exercise was confirmed by a significant increase in perceived muscle soreness and concomitant reduction in peak isokinetic torque at 48 h (P<0.05). There were no significant main effects for time (P>0.05) or time by exercise intensity interactions (P>0.05) on VO2peak, heart rate, RER, and blood lactate concentration during the 60% and 80%Pmax fixed load bouts. However, Ve and Ve/VO2 were significantly increased at 48 h (P<0.05) at 48 h. RPE values were also increased following plyometric exercise (60%Pmax: 13.7 +/- 0.4, 15.4 +/- 0.7 and 12.9 +/- 0.4, 80%Pmax: 17.7 +/- 0.5, 18.3 +/- 0.5 and 16.7 +/- 0.3 at baseline, 48 and 168 h, respectively, P<0.05). The ratio of RPE-HR and RPE-VO2 were also higher at both exercise intensities at 48 h (P<0.05). With regard to the 5-min time trial performance, peak VO2, mean VO2, peak power output, mean power output, distance covered and post exercise blood lactate were significantly lower at 48 h after the muscle-damaging plyometric exercise bout (P<0.05). However, the absolute RPE values remained the same between trials (P>0.05). These findings indicate that the ventilatory equivalent for oxygen and the rating of perceived exertion at submaximal work rates are increased 48 h after performing a single session of plyometric exercise. We also conclude that exercise-induced muscle damage impairs time-trial performance, increases perceived exertion and decreases the amount of work that can be completed in a 5 minute all-out effort.

Oral presentations (OP)

OP-<I>TT01 Training and Testing 1</I>

ASSESSMENT OF THE EFFECTS OF AN 8-WEEKS CONDITIONING PROGRAMME ON MUSCULAR STRENGTH: COMPARISON BETWEEN WHOLE BODY VIBRATIONS, CONVENTIONAL STRENGTH TRAINING

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Introduction

Whole body vibration (WBV) may represent an alternative exercise intervention for enhancing strength and power in humans. Many authors have studied the effects of WBV on the neuromuscular and neuroendocrine system [1]. However, it is still not clear if and how they may be beneficial for elite athletes.
Therefore, the aim of this work was to compare the effectiveness of similar training programmes, carried out through WBV, traditional weights or their combination. Their influence on muscular strength was assessed in a population of male athletes.

Methods

18 healthy competitive female athletes (23.8±4.6 y; 1.6±0.05 m; 58.8±7.8 kg) were randomly assigned to 3 training groups (V, B and VB). They carried out a periodised 8-weeks training programme, 2 cycles of 3 weeks with 2 training session a week, followed by a week of tapering. During each training session, subjects performed 6 sets of 6 repetitions of dynamic training: on a vibrating platform (Nemes LX-B, SAIR, Italy) [V], with a weight loaded barbell (B); with a weight loaded barbell on a vibrating platform (VB). Vibration frequency was initially set at 25 Hz and was increased by 5 Hz every 2 weeks for both V and VB. Bar loads were set at 60% and 30% of each subject's body mass (BM) for B and VB, respectively, and was increased of about 3% (for VB) and 6% BM (for B) every 2 weeks. Isometric and dynamic muscular strength was measured before and after the training period. Maximal voluntary contraction (MVC isometric) was measured by force platforms (Twin Plates, Globus, Italy), fixed onto the footplate of a leg press. The seat was locked so that the subject's knees were flexed at 90 deg. Dynamic variables (force, velocity and power) were calculated from force platforms and linear encoder measurements. Muscle's laws (Real Power, Globus, Italy). The external loads used for dynamic measurements corresponded to 100-120-140-160-180-200% BM. Non-parametric within groups tests (Wilcoxon) and repeated measure ANOVA were applied (P=0.05) where appropriate, after applying normal distribution tests.

Results

Isometric tests manifested statistically significant changes only in group V, for which T30 and T50 (respectively, time to 30 and 50% of MVC) increased from 64 (17) ms and 92 (16) ms, to 72 (16) ms and 100 (31) ms [median (IQR)]. No main effect for treatment was identified in all other measurements.

Discussion

WBV did not seem to induce enhancements in either static or dynamic muscular force, either alone or in combination with low intensity resistance exercise with the protocols used in our study.

References.


EFFECTS OF COMPRESSION GARMENTS ON EXERCISE PERFORMANCE AND RECOVERY FOLLOWING INTERMITTENT, HIGH-INTENSITY EXERCISE

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Compression garments are commonly used as both a performance and recovery aid despite inconclusive evidence to support their effectiveness to perform either function. The aim of this study was to determine the effects of wearing compression garments (CG) (Slazenger) on performance and physiological responses during and following intermittent, high-intensity cycling exercise. Eight male and seven female team-sport athletes performed an initial familiarisation session followed by two testing sessions either with or without CG i.e. during a 30-min exercise protocol and for a 60min post-exercise recovery phase, participants were required to wear either full-body CG or normal athletic clothing. Each testing session consisted of a 30min high-intensity, intermittent-sprint cycling protocol involving a 20s maximal sprint every 5min, separated by a constant-intensity of 100W. Peak power (Watts) and time to peak power (sec) were recorded for each sprint effort, with the % decrement in power calculated as an indicator of maintenance of sprint performance over the seven sprints. A measure of maximal voluntary contraction (MVC) and evoked twitch properties (Pf), and a capillary blood sample (for lactate, pH and HCO3) were obtained pre and immediately, 15-, 30- and 60-min post-exercise. Further, during and following exercise VO2, core temperature (Tc), heart rate (HR) and rating of perceived exertion (RPE) measures were obtained. Results for exercise performance indicated no significant differences (p=0.40-0.90) between conditions for peak power, time to peak power or % decrement in peak power. Further, the reduction and subsequent recovery of MVC and Pf was not changed with CG (p=0.05). Whilst not significant, moderate to large effect sizes (d=0.5-0.8) for a reduced VO2 in the CG condition compared to the control condition were evident. There were no significant differences between the conditions for HR, Tc, change in nude body mass or blood measures. Finally, immediately and 60-min post-exercise, a moderate effect (d=0.50, P=0.20) for a reduced self-reported RPE was observed when wearing the CG. In conclusion, minimal differences between conditions for exercise performance, recovery of evoked or voluntary muscle performance or physiological responses were present. However, VO2 at a sub-maximal, constant-intensity of 100W was reduced in the CG condition indicating an improved economy of effort when cycling in the garments. Given the lack of differences in HR, this may indicate the elastic recoil of wearing the garments, improved economy of effort when cycling in the garments highlighting the possible perceptual benefits of wearing the garments, despite no differences in anaerobic metabolic markers. Overall, these results may indicate the effectiveness of the garments to improve economy and subjective accounts of recovery when worn during or following exercise.

RELATIONSHIP BETWEEN TACTICAL SKILLS AND PERFORMANCE LEVEL OF EXPERT YOUTH SOCCER PLAYERS

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In invasion games, such as soccer, athletes need well-developed tactical skills. Studies with novice and expert athletes show that expert athletes outscore novice athletes on aspects of tactical skills. Unknown is whether this relation also holds when all athletes are experts. Therefore, the aim of this study is to determine if there is a relationship between tactical skills and level of performance in a population of all expert youth soccer players.

The tactical skills inventory for sports (TACSIS, Efferink-Gemser et al., 2004) with questions related to declarative (‘knowing what to do’) and procedural knowledge (‘doing it’) was used to measure tactical skills of 37 soccer players of the Dutch (n=18, age: 19.5±2.0 16-18 years) and Indonesian (n=19, age: 20.6±2.16 years) national youth team. Participants were all expert players although the Dutch team has a higher performance level than the Indonesian team. Players were also divided per team on the basis of playing minutes at an international soccer tournament.

Analyses of variances showed that the Dutch players outscored the Indonesian players on ‘knowing about ball actions,’ ‘knowing about others’ (declarative knowledge), and ‘positioning and deciding’ (procedural knowledge) (p<.05). Within the Dutch national team there was no relation between playing minutes and tactical skills. Within the Indonesian national team there was a positive relation between playing minutes and positioning and deciding (p<.05).
The explanation of the Dutch players outscoring the Indonesian players on several aspects of tactical skills might be that they are playing for a longer period of time at a higher performance level (Dutch starting age: 5.24±1.09 years; Indonesian starting age: 9.12±2.58 years). As performance level increases, the necessity of performing the right action at the right moment also increases. In soccer, when time is constrained knowing what to do and doing it is essential for a successful outcome. The explanation of the lack of relation within the Dutch national team between playing minutes and tactical skills might be that on a high performance level other aspects than tactical skills are important for a trainer to decide which players are lined up. As performance level decreases, tactical skills also decrease. It could be that the Indonesian players with the minimum playing minutes know what to do, but lacking the skills for doing it (French et al., 1987, Thomas et al., 1994, McPherson, 1994). In conclusion, this study shows that there is a positive relationship between tactical skills and level of performance also within a population of all expert players.

References.

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VALIDITY OF A RESPIRATORY SNORKEL FOR DETERMINATION OF OXYGEN UPTAKE KINETICS IN SWIMMING

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In pursuit of direct measurement of cardio-respiratory parameters in swimming Toussaint et al. (1987) developed a respiratory and valve system that was shown to be valid and to only slightly increase the hydrodynamic drag. The more recent version of this respiratory snorkel (RS) (Aquatrainer, Cosmed, Roma, Italy) connected to a breath-by-breath (BxB) gas analyser (K4b2, Cosmed, Roma, Italy) was evaluated by Rodriguez et al. (2008). It was reported that although the FiO2 was significantly larger when measured with the RS, there were no significant differences in VO2 and VCO2 between the RS and a mechanical gas exchange simulation system. However, in what concerns oxygen uptake kinetics, the use of the RS has not yet been evaluated.

The purpose of this study was to compare the parameters of the VO2 kinetics in constant-power exercise, using a conventional face mask (CM) or a respiratory snorkel (RS) designed for breath-by-breath analysis in swimming. Ten trained triathletes (29.3±8.3 yrs; 67.5±7.3 kg, 177.2±6.9 cm) performed two testing sessions involving a incremental test to exhaustion for determination of VO2max and Ventilatory Threshold (VT1) and two 8-min constant load exercise at 25% = VT1 + 0.25 x (VO2max - VT1) in each condition. The VO2 kinetics parameters (td1, tau1, A1, td2, tau2, A2, i.e. time delay, time constant and amplitude of the primary phase and slow component, respectively) were modelled with two exponential functions (Borrani 2001), which also incorporated the determination of an individual snorel delay (ISD) in the case of the RS tests. This time was calculated as the difference between the start of the exercise and the time when the following breaths summed a tidal volume superior to the outlet tube volume, therefore making the VO2 data to be exercise representative. Only td1 was significantly different between RS and CM (13.8±s.1,77 and 8.95±s.2,99 s, respectively) due to the delay introduced by the tubing. Otherwise the parameters variability of the primary phase parameters wasability not different between RS and CM.

In conclusion, direct measurement of VO2 in swimming for estimating VO2 kinetics is appropriate and comparable to terrestrial activities (i.e. running, cycling), as long as a suitable numerical method is used to model the data, since the use of a respiratory snorkel does not interfere with the kinetic parameters obtained in heavy intensity constant load exercise.

References.


DRIBBLING AS PREDICTOR OF FUTURE SOCCER PERFORMANCE

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To reach the top in soccer, technical skills are of extreme importance. The current study focuses on the development of dribbling with quick changes of direction, since this is recognized as a central component in the development of young players (Malina et al. 2005,Reilly et al. 2000). To predict long-term success within a group of talented youth soccer players, longitudinal tracking is needed. The goal of the present study is to reveal whether the technical performance characteristics of dribbling and the factors underlying this technical skill are predictive for future playing level.

A total of 134 talented soccer players from soccer schools in the Netherlands age 14-18 were tested, 237 measurements were performed. The players tested are currently 20 years or older and are classified into their current playing level: professional (N=31), semi- (N=49) or non-professional (N=54) players. The Shuttle Dribble Test was used to measure the development of dribbling performance in a longitudinal study over 5 years. The test consisted of a maximal sprint of 30 m while dribbling a soccer ball (Lemmink et al. 2004). The 30 m sprint has three 180° turns, measuring the acceleration of soccer players. Anthropometrics (height, weight, and body fat percentage), and training characteristics were assessed. Longitudinal changes in dribbling were investigated using the linear mixed model procedure in SPSS.

The fixed part of the multilevel model contains a different intercept term for the current playing level (semi-professionals + 0.07 seconds and non-professionals + 0.17 seconds compared to professionals). The multilevel age-model showed better performance of the current professional players compared to the current lower level players at age 15, 16 and 17 on the Shuttle Dribble test (p < 0.05). The age-model was significantly improved by including lean body mass and total practice hours per week, both having a positive effect on dribbling performance.

Although soccer performance can be divided into many multidimensional performance characteristics (Ellerink-Gemser et al., 2004), the current results showed that dribbling performance in youth can be an useful tool for identifying the best players for the future. Current professional players outscored current semi- and non-professional players in dribbling during adolescence, especially from age 15-17. More lean body mass and extra practice hours positively influence dribbling performance. The Shuttle Dribble test illustrated to be a good predictor for future playing level.
CONTRIBUTIONS OF SELECTED FUNDAMENTAL FACTORS TO ATHLETICS PERFORMANCE IN ADULT INDIVIDUALS WITH MENTAL RETARDATION

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Regular physical activity is encouraged as being important for preventing diseases and promoting physical and emotional well-being for individuals with Mental Retardation (MR) [Fragala-Pinkham et al, 2005; Carmeli et al, 2005], but it is well known that people with MR exhibit poor fitness performance on standard fitness tests (Graham and Reid, 2000). The aim of this study was to determine the contributions of selected fundamental factors to athletic performance in adult individuals with MR.

Thirty-two trained athletes with MR (20 males and 12 females, age range 20-45 years, MR levels: 7 Mild, 3 Moderate-Mild, 8 Moderate, 4 Moderate-Severe, 8 Severe and 2 Profound) were recruited. The athletes’ performance was assessed using the official results in an Individual Athletics Championships. The athletes could take part in one or two competitions selected within one of the two ability levels: Level I (60m, 300m, 400m in walking, Standing Long Jump, and Vortex Throw) or Level II (100m, Shot Put, and Long Jump). The fundamental factors included anthropometric measurements (height, weight and %body fat), flexibility assessed by Sit and Reach test, standing balance assessed by Flamingo test, muscular endurance assessed by Push-ups and Sit-ups tests, leg muscular strength assessed by Standing Long Jump test, cardiovascular endurance (VO2max) assessed by Step test and coordination assessed by Timed Get-Up and Go test. Stepwise regression analysis was used to identify the contribution of these selected fundamental factors to performance. This study showed that in Level I the leg muscular strength and height had significant contributions to 60m (81%), the leg muscular strength and lower %body fat had significant contributions in vortex throw (70%). The coordination, lower %body fat and flexibility had high significant contributions in Standing Long Jump performance (90%). Within Level II, the leg muscular strength and a lower MR level had significant contributions in 100m (85%). Lower weight had high significant correlation in Long Jump scores (P<0.01). Lower age and cardiovascular endurance had high significant contributions in Shot put (98%).

It was possible to predict the efficiency of athletics performance in Level I by leg muscular strength, flexibility and coordination. In Level II, cardiovascular endurance and anthropometric measurements were especially important to improve athletes’ performance. All these selected fundamental physical factors should be addressed in athletics training for adult individuals with MR.

References.

17:15 – 18:45

Plenary sessions (PS)

PS-1 Genetics: The impact of molecular technology on the future of sports

CATCHING UP WITH WINNERS IN THE GENETIC LOTTERY? FAIR OPPORTUNITY IN SPORT

Loland, S.
The Norwegian School of Sport Sciences, Norway

The structural goal of sport competition is to measure, compare and rank participants according to athletic performance. In this sense, sport deals with inequalities between persons. The critical question is whether all kinds of inequalities are of relevance to sport. Should some inequalities be eliminated or compensated for, and if so, which ones and why?

Athletic performances are complex products of a high number of genetic and extra-genetic factors with impact from the moment of conception to the moment of performance.

Genetic factors can be understood as genetic predispositions for developing relevant abilities and skills to athletic performance. A person with good predispositions is usually characterized as ‘talented’. Genetic talent is distributed in the so-called natural lottery and based on chance.

Athletes develop talent through gene-gene-environment interaction. Impact from environmental factors ranges from the more indirect influence on performance from the material, economic and socio-cultural contexts of which athletes are parts, to specific training and learning of technical and tactical skills of particular sports. Impact from environmental factors is in part outside of and in part within athlete control.

The fair opportunity principle (FOP) is introduced as a regulative principle in this respect. In its general form, FOP prescribes eliminating or compensating for inequalities in essential qualities which individuals can not influence or control in any significant way and for which they therefore can not be held responsible (Rawls 1971). In its sport-specific version, FOP(S) prescribes the elimination of or compensation for inequalities with significant and systematic impact on athletic performance that individuals can not influence or control in any significant way and for which they therefore can not be held responsible (Loland 2002).

It is argued that FOP(S) has radical consequences for competitive sport both in terms of eliminating or compensating for inequalities in talent (genetic predispositions), and inequalities in environmental factors. A series of proposals are made on how to raise the level of fair opportunity in current sport. Among the proposals are a revision of existing classification systems, and rules to reduce the impact of inequalities in athletes’ supporting systems. Particular emphasis is put on discussing inequalities in genetic talent, and inequalities due to the use of doping and bio-technical means.
INVESTIGATING THE GENETIC BASIS OF PHYSICAL ACTIVITY RELATED TRAITS

Wareham, N.
MRC Epidemiology Unit, United Kingdom

The epidemiology of many emerging chronic diseases suggests that interactions between genetic predisposition and lifestyle behaviours such as physical activity are central to disease causation. Such a proposition is easy to make, but the task of identifying the molecular basis of such interactions is much harder. Progress in discovering main effects for various chronic metabolic disorders including obesity and type 2 diabetes is accelerating thanks to the output of whole genome association studies, demonstrating the limitations of previous candidate gene approaches. A range of possible study designs is available for investigating gene-physical activity interaction, each with different strengths and weaknesses. However, given the likely small main effect of common genetic variants, an analytical approach based on the clear specification of prior probabilities to reduce the chance of false discovery is likely to be preferable. Mixed approaches combining data from large-scale observational studies with smaller intervention trials may be ideal. In designing new studies to investigate these issues, a key choice is how to quantify physical activity as it is clear from power calculations that the precision of measurement of this key exposure is critical to the ability to detect interaction.
Thursday, July 10th, 2008

08:30 - 10:00

Invited symposia (IS)

IS-BN02 Neuromechanics in aging

AGING-INDUCED NEURAL ADAPTATIONS IN HUMAN GAIT

Hortobágyi, T., Solnik, S., Rider, P., Moscicki, B., Lin, P., Bai, O., Hallett, M., DeVita, P.

East Carolina University, United States

Advancing age brings about profound changes in human locomotion due to modifications in the properties of bone, muscle, and tendon. There is also increasing evidence to suggest that age-related changes occur in the central nervous system, including a loss of motor units, cortical and spinal motor neurons, and muscle spindles accompanied by a diminishment of corticospinal and spinal reflexes, factors that can affect the neural control of gait. Here we examine the possibility that advancing age affects the shared synaptic input to pairs of muscles during gait. The pairs of muscles that are examined are the tibialis anterior and gastrocnemius lateralis during ascending and descending gaits and gaits at slow and fast speeds. The differences were statistically larger at frequencies up to 22.5 Hz (or alpha band), coherence thought to be of spinal origin (3) and smaller at higher frequencies (beta and gamma). These data agree with reduced coherence between single motor units (4) and the concept that advancing age may affect the coordination between excitatory and inhibitory activity of neural oscillators (5). Future research will determine if such impairments have functional consequences such as reduced adaptive walking skills in old vs young adults.

References.


Supported by NIH AG024161 and NS049783

AGING-RELATED ISSUES IN MOTOR UNIT DISCHARGE BEHAVIOR

Kamen, G.

University of Massachusetts - Amherst, United States

There are numerous morphological changes in the aging motor system and these are accompanied by alterations in the manner in which motor units are activated. With advancing age, muscle fibers decrease in size. The numbers of motor units decreases as a result of motor unit atrophy. Surviving muscle fibers may be re-recruited by other motor neurons producing very large motor units composed predominantly of slow-twitch muscle fibers. Although individual muscle fiber twitch forces are smaller, the resultant increase in motor unit size can produce very large motor unit twitch forces. The increase in motor unit size can be documented using macro EMG techniques. Surviving motor units exhibit smaller maximal firing rates, and this is true in both small muscles as well as large muscles. Mechanisms producing the reduction in maximal firing rate might include reduced motor neuron excitability caused by a reduction in tonic activity at spinal levels or impaired activation at cortical levels. There are also changes in motoneuron action potentials such as the afterhyperpolarization that may be implicated in the attenuated firing rate. Motor unit firing variability has also been assessed, though the results appear somewhat equivocal. A potential strategy for augmenting force, doublet firing, is reduced in frequency in older adults. Motor unit synchronization, the tendency for pairs of motor units to fire simultaneously, appears to occur with similar frequency in both young and older adults. These and other characteristics of age-related motor unit discharge behavior will be discussed in the presentation.

AGING-INDUCED NEUROMUSCULAR INTERACTION AND TRAINING ADAPTATION DURING NORMAL HOPPING

Ishikawa, M., Hoffrén, M., Komi, P., Masaki, V.

Osaka University of Health and Sport Sciences, University of Jyväskylä, Japan

It is well known that aging influences neuromuscular function. Literature is quite abundant regarding the deterioration of muscle strength, which is most evident after 50 years of age. This is usually associated with reduction in number of skeletal muscle fibers and motor units. The resulting sarcopenia will in turn be responsible for reduction in optimal bone loading and the situation may then lead to deterioration of the bone structure. All these events are partially responsible for age related problems in body control during movement including risks for falls and accompanied bone fractures. Recent ultrasonographic studies give convincing evidence that on the muscular level the fascicle length and pennation angle decrease in aging (4,5). This suggests the loss of sarcomeres both in series and in parallel in aging muscle, which can influence the maximum force as well as shortening velocity of the muscle.
In addition to muscle mechanical properties, the neural activation strategy also plays important role in aging. The measurements of antagonist coactivation have shown increased level of coactivation in elderly individuals during human movements [1,2,3]. Especially, this increased coactivation may affect the joint stiffness in the braking phase of dynamic movements and the movement efficacy. Thus there is considerable need to explore whether there is age-specific activation strategy during dynamic movements together with the regulation of fascicle-tendon interaction.

The basic comparison between YOUNG and OLD subjects showed that the activation strategies in hopping were dramatically different in OLD as compared to YOUNG. OLD demonstrated lower agonist muscle activation in braking phase and higher agonist muscle activation in push-off phase than YOUNG (p<0.05), indicating less utilization of elastic energy. However, when OLD performed repetitive hopping training, they showed already after two weeks modification of the activation strategy to resemble that of YOUNG. Tendon stiffness, as evaluated by high speed ultrasonography, showed also the training induced mechanical adaptations in fascicle-tendon interaction.

References.

Invited symposia (IS)

IS-PM01 Angiogenesis and exercise

HAEMODYNAMIC FORCES AND SKELETAL MUSCLE ANGIOGENESIS IN EXERCISE

Brown, M., Milkiewicz, M., Hudlicka, O.
University of Birmingham, United Kingdom

The growth of new capillaries occurs in skeletal muscle trained by exercise around the fibre types that have been activated, linking angiogenesis with haemodynamic forces associated with exercise hyperaemia, such as shear stress, and/or metabolic factors relating to contraction e.g. hypoxia and VEGF. The growth takes place by two modes, proliferative sprouting angiogenesis and non-proliferative longitudinal splitting of vessels by formation of intra-luminal endothelial projections. The role of blood flow per se in initiating capillary growth in rodent skeletal muscle is shown by chronic application of a vasodilator (prazosin), which increases capillary shear stress 4-fold and induces capillary growth within days [1] around all fibre types [2]. Growth occurs by longitudinal splitting only [3], and is dependent on nitric oxide (NO) [4] and shear-related up-regulation of VEGF in capillaries [1], in the absence of metabolic stimuli. In exercise, fibre types are recruited in order, with increases in blood flow matching intensity. Studies localising endothelial cell proliferation and VEGF immunostaining to capillaries and fibre types have helped to identify how sprouting and splitting types of angiogenesis might co-exist in exercised muscle. If all motor units are activated by intensive exercise or chronic muscle stimulation, capillary proliferation associated with sprouting is initiated first around fast glycolytic fibres [5]. This is likely due to hypoxia [6] and up-regulation of VEGF in both fast fibres [7] and proliferating capillaries [5]. However, VEGF also increases in non-proliferating capillaries without relationship to fibre type. This could represent shear-induced up-regulation because the microvascular unit, comprising arteriole and capillaries, supplies a group of adjacent muscle fibres, not the spatially dispersed fibres of individual motor units. Hence flow will be directed not only to active muscle fibres but will ‘over-perfuse’ neighbouring non-active fibres [8], and could provoke splitting capillary growth. This flow-related component of angiogenesis does not conform to the concept of physiological vessel growth to meet metabolic needs, but no doubt helps the efficiency of oxygen to tissue transport during muscle contractions [9].

References.

ANGIOGENESIS IN SKELETAL MUSCLE IN RESPONSE TO EXERCISE

Bouch, O., Hoppeler, H.
University of Bern, Switzerland

Mammalian skeletal muscle is composed of a specific mosaic of muscle fibers surrounded by capillaries that provide the tissue with oxygen and nutrition. However the interaction between muscle fibers and capillaries is not static but might undergo changes in response to different stimuli (mechanical, hemodynamic, environmental). In particular, simultaneous increases in the capillary-to-fiber ratio and the capillary density indicate that the capillary system has expanded (a process designated angiogenesis). Over the last 30 years our group has collected about 700 needle biopsies derived from vastus lateralis muscle of human subjects belonging to different study groups. Applying a standardized morphometric protocol on EM level, we were able to quantify the impact of exercise on the capillary supply in skeletal muscle. Because the capillary-to-fiber ratio and capillary density were found to be higher in trained than untrained men, a study was designed in which groups of male and female individuals were subjected to different training protocols over periods of typically six weeks. Angiogenesis in skeletal muscle occurred only in protocols that induced similar rates of mitochondrial growth. It was concluded that the microvasculature density and the metabolic phenotype of muscle fibers are correlated to ensure maximal rates of skeletal muscle oxidation. Further studies showed that the angiogenic response can be further increased if the high-intensity training is performed under hypoxic conditions and that eccentric rather than concentric exercise influences the microvasculature density. Some of the studies
were accompanied by gene array analyses of the mRNA gene expression patterns. The data obtained allow pinpointing molecules that might underlie the angiogenic plasticity of the microvasculature in skeletal muscle in response to exercise.

**HUMAN STUDIES - EXERCISE INDUCED CAPILLARY GROWTH AND GROWTH FACTORS**

Gustafsson, T.
Karolinska Institute, Stockholm, Sweden

Human skeletal muscle is an optimal tissue to study the molecular mechanisms in angiogenesis (neoangiogenesis from existing vessel) as well as other mechanisms underlying adaptive processes and signalling pathways in humans because it is accessible in amounts needed for analysis at the mRNA and protein levels. Newer methods, such as laser dissection of tissue sections provide ways to analyse the role of different types of cells. Physical exercise is also an ideal model for studying angiogenesis because it is one of the few conditions in which angiogenesis occurs in healthy humans and because it can be applied in a controlled manner (e.g., by varying intensity, duration and frequency) which makes it possible to study the effects of different metabolic and environmental conditions (e.g., oxygen, substrate and metabolic availability) on angiogenesis.

Recent studies have revealed that the suggested major angiogenic growth factors VEGF-A and angiopoietins systems are regulated in human skeletal exposed to exercise and numerous stimuli have been demonstrated to participate in these processes. In addition to angiogenesis, where vessels form through sprouting of resident endothelial cells neovascularization has recently been established to occur from circulating bone marrow-derived endothelial progenitor cells (EPCs), which differentiate into ECs EPC number in plasma increases in response to physical activity, but it is largely unknown whether they contribute to vessel formation in the remodelling skeletal muscle in human.

Future studies in humans are needed to integrate the growing basic knowledge from animal studies regarding various factors in the neovascularization processes and their interaction in human exercising muscle.

**Invited symposia (IS)**

**IS-PM02 GSK Symposium: Nutrition for running**

**ENERGY BALANCE AND BODY COMPOSITION OF ELITE ENDURANCE RUNNERS: A HUNTER-GATHERER PHENOTYPe**

Pitsiladis, Y.
University of Glasgow, United Kingdom

Given the fact that east African endurance athletes dominate global competition, it is reasonable to consider their training habits and lifestyle as being close to optimal for athletic performance. An ad libitum and rather low intake of water (Fudge et al., 2008), low body mass (Mukeshi and Thairu, 1993; Christensen et al., 2002) and body-mass-cycling with a negative energy balance prior to competition (Onywera et al., 2004; Fudge et al., 2006) are typically found in these athletes. Although it is unclear what constitutes an optimal hydration strategy and/or loss in body mass prior to competition, the performance implications for the modern athlete of a low fluid intake and reduced body mass were very evident when Homa was chasing its prey on the savannah grasslands in central Africa. However, athletes and coaches should be cautious in deliberately trying to lose excess body mass; rather a sensible diet/hydration strategy and training that aims to optimise an adequate mix of metabolic fuel stores for racing and a body weight that enables a reduced oxygen cost of movement is paramount.

References.

**GASTROINTESTINAL SYMPTOMS IN RUNNERS**

Jeukendrup, A.
University of Birmingham, United Kingdom

Gastrointestinal (GI) complaints are very common amongst endurance athletes, in particular runners. An estimated 30 to 50% of distance runners experience intestinal problems related to exercise. The most common complaints include eructation (belching), abdominal pain, nausea, gastroesophageal reflex (or heartburn), abdominal pains, abdominal cramping, increased flatulence, loose stool, diarrhea or even bloody diarrhea, and vomiting. The complaints are normally divided into two categories: symptoms of the upper intestinal tract or symptoms of the lower intestinal tract. Lower gastrointestinal symptoms are more often observed in women than in men. Individuals with pre-existing GI issues such as reflux, lactose intolerance or irritable bowel syndrome are more likely to get GI-symptoms during competition. At present, the causes of gastrointestinal symptoms are not completely understood. A limited number of laboratory studies has been performed and field studies have correlated the symptoms with nutritional intake and other factors. From these studies a number of potential causes and contributors have been identified and they can be divided into 3 categories: (1) physiological, (2) mechanical and (3) nutritional.

Physiological causes of GI-symptoms include reduced blood flow and increased anxiety. With exercise, blood flow is preferentially redirected to the working muscles and blood flow to the gut can be reduced by as much as 80%. This can compromise gut function and result in GI symptoms ranging from cramping to ischemic colitis. Anxiety has an effect on hormone secretion which in turn can affect gut motility, resulting in incomplete absorption and loose stool.
The mechanical causes of GI-problems are either impact-related or are related to posture. GI bleeding is common amongst runners. This is thought to be a result of the repetitive high-impact mechanics of running and subsequent damage to the intestinal lining. This repetitive gastric jostling is also thought to contribute to lower GI symptoms such as flatulence, diarrhea and urgency. Estimates of the incidence of occult blood after a race range from 8% to 85% mostly because of the wide range of race distances in various studies. Finally nutrition can have a strong influence on GI distress. Fiber, fat, protein, and fructose have all been associated with a greater risk to develop GI-symptoms. Dehydration, possibly as a result of inadequate fluid intake, may also exacerbate the symptoms. Beverages with high carbohydrate concentrations and high osmolalities (greater than 500 mOsm/L) were also associated with more complaints. Although some risk factors have been identified it is still unclear why some individuals seem to be more prone to develop GI-problems than others. To minimize GI symptoms, all known risk factors must be taken into account, in preparation for competition.

NUTRITION AND THE FEMALE RUNNER
Wallis, G.
GlaxoSmithKline, United Kingdom
Considerable research has been directed towards developing nutritional strategies to optimise athletic performance. Traditionally, this is performed using athletic men as the study participants with findings and implications simply extrapolated to women athletes. An increasing number of studies are investigating the metabolic and ergogenic responses to nutritional interventions in athletic women. Although still in a state of relative infancy, these studies provide provisional insight into aspects of sports nutrition that could require tailoring based on the sex of the athlete.

Invited symposia (IS)
IS-SH03 Technology and performance in sport: historical perspectives

THE CHANGING TECHNIQUES, BODIES, AND IMAGES IN SKI JUMPING
Pfister, G.
University of Copenhagen, Denmark
Ski jumping spread as a modern sport at the turn of the 19th to the 20th century from Scandinavia to whole Europe. The development of the equipment, technique but also of the jump resulted in increasing performances and large and larger jumping ranges. The ski jumpers were glorified as heroes and as men who presented and enacted strength, competence and daredevily. Ski jumping was and is one of the few sports where not only the quantitative performance but also the right posture is evaluated. This gave the experts the power of definition about the proper style of jumping.

In the 1990s, the technique of jumping changed to the so called V-style where the tips of the skis are spread and form a V. This style was at first punished by the judges but was adopted soon by all jumpers. This new style advantages light athletes and in the following time the ski jumpers became thin and thinner. On the one hand, the skinny men in their wide overalls and their tendency to get anorexic and depressed caused doubts about their masculinity. On the other hand, this new boyish image of the athletes met the taste of young girls. Thousands of girls streamed to the ski jumping events, wrote love letters to their favourites, founded fan clubs and opened web pages with stories and images, also erotic pictures of the successful German athletes Sven Hannawald or Martin Schmitt.

Based on the concept of sportification and a constructivist approach to gender, I will analyse the changes and the re-productions of bodies, images and masculinities in and through ski jumping. As examples I will use tow of the most successfull ski jumpers in the last decades: Martin Schmitt and Sven Hannawald.

My sources are skiing journals, popular literature and web pages. In addition I analysed all articles about the two athletes mentioned above in the magazine Der Spiegel and in two German news papers BILD and Welt.

POLE LEAPING THROUGH THE AGES: HOW HIGH, FAR OR LOW CAN YOU GO?
Renson, R.
Faculty of Kinesiology & Rehabilitation Sciences, K.U.Leuven, Belgium
Throughout time there have been three kinds of pole leaping. In Ancient Greece and Etruria pole vaulting was used to mount bareback horses. Pole vaulters sometimes appeared in Roman arenas and used their skills to escape from wild animals. Goya still observed a bullfighter leaping over a bull in the ring of Madrid around 1815-16. Medieval and later paintings and etchings, a.o. by Pieter Bruegel and Adriaen van de Venne, depict pole vaulters, who use their lenn poles to leap over ditches or other obstacles. When Johann J.F. Guttmuths ‘reinvented’ school gymnastics in Germany at the end of the 18th century, pole vaulting for height and for distance figured on his physical education curriculum. Pole vaulting for height has been on the Olympic program since the first Games of Athens 1896. In the 1930ies Olympic pole vaulting was contested by the gymnasts, who claimed it as one of their disciplines. Pole vaulting made a big leap upwards when fibre glass poles were introduced from 1964 onwards at the Rome Olympics.

Pole vaulting for distance (over a river) is still a popular traditional sport in the Dutch province of Friesia, where it called ‘fierljeppen’. The third variant is pole leaping in the depth, which is today still practised on the Canary Islands, where it known as ‘salto del pastor’. The question why only pole vaulting for heigt became a global sport and not the two other forms, will be discussed in the context of the modernisation concept.

THE EXPLORATION AND CONQUEST OF EVEREST: SCIENCE, TECHNOLOGY AND PERFORMANCE
Vanreusel, B.
K.U.Leuven, Belgium
The first ascent of Mount Everest in 1953 is considered as a benchmark in human performance. This paper addresses the impact of science and technology on this performance. The original report ‘The ascent of Everest’ by John Hunt (1953) is analysed as the primary
source. It is argued that the first successful ascent of Everest was the result of knowledge from geography, physiology, kinesantropometry and military technology. Later similar performances rather capitalized on exercise science and nutrition as dominant factors of success. The report of the first ascent of Everest will be interpreted by the opposing concepts of militarism versus modern sport and of technological determinism versus technological constructivism. It is argued that the first ascent of Everest has lost its technoscientific meaning and was transformed into an icon of modern sport.

Oral presentations (OP)

OP-HF02 Health and Fitness 2

THE RELATIONSHIP BETWEEN FUNDAMENTAL MOVEMENT SKILLS AND PERCENT TOTAL BODY FAT IN 9-10 YEAR OLD CHILDREN

Foweather, L., McWhannell, N., Henaghan, J., Graves, L., Stratton, G.
Liverpool John Moores University, United Kingdom

OBJECTIVE: Overweight and obese children participate in less physical activity than non-overweight children (Trost et al., 2001), and this may be partly explained by differences in fundamental movement skill (FMS) proficiency. This study sought to examine whether percent body fat was associated with such skills.

METHODS: 158 children (Age Mean: 9.66, SD 0.32) were recruited from local primary schools. Eight skills were assessed using video analysis and process-orientated measures. Percent total body fat was determined by means of dual-energy x-ray absorptiometry (DEXA). The number of skill components successfully demonstrated for each skill was summed to create an overall FMS index score. Multiple linear regression and partial correlations were used to determine how much of the variance in FMS was explained by percent body fat, controlling for gender differences.

RESULTS: Percent body fat explained 6.5% of the variance in the FMS index score (p < 0.01). Specifically, a 1 unit (%) increase in body fat is associated with a 0.291 unit decrease in FMS index (95% CI: -0.43 to -0.147). When the skills were divided into locomotor and object-control subscales, percent body fat was only associated with locomotor skills (p < 0.01), accounting for 23.4% of the total variance. Explicitly, a 1 unit (%) increase in body fat is associated with a 0.257 unit decrease in locomotor score (95% CI: -0.33 to -0.18).

DISCUSSION: Using DEXA to calculate percent body fat, this study confirms the findings of previous studies that have used less robust methods of determining overweight and obesity (Okely et al., 2004, Southall et al., 2005). Proficiency in these 8 fundamental movement skills is associated with percent body fat. However, increased body fat is negatively associated with the performance of locomotor skills, rather than object-control skills.

CONCLUSION: Interventions seeking to increase fundamental movement skill proficiency in overweight or obese children should target locomotor skills. Such improvements may also positively impact on perceived competence, weight management and physical activity participation.

References.
Okely et al. (2004) Research Quarterly for Exercise and Sport 75, 238-247

TARGET GROUP SPECIFIC APPLICABILITY OF CARDIORESPIRATORY FITNESS PREDICTION BY BIO-IMPEDANCE ANALYSIS

Thiel, C., Vogt, L., Banzer, W.
J.W. Goethe University of Frankfurt, Germany

PURPOSE
Determination of aerobic fitness status is crucial for the evaluation of health-enhancing physical activity (HEPA) interventions in different target groups. However, especially in elderly, inactive or chronically ill, the applicability of direct tests to full exertion seems questionable. Besides health, motivational and economic reasons, adverse attitudes towards physical activity might be fostered. The current cross-sectional study evaluated the feasibility of an established test-free aerobic capacity prediction method based on bio-impedance data collection in three characteristic cohorts who are in special need of HEPA.

METHODS
In 18 overweight (BMI>25kg/m²) and 18 inactive (<1h vigorous PA/week) healthy adults, as well as 18 patients with histologically confirmed cancer diagnosis, bio impedance analysis (IBIA 101/S, Data input, Germany, 50 Khz sinusoidal current) was performed using adhesive electrodes at hands and feet after 10 minutes of supine rest. Based on this measurement, aerobic capacity was indirectly estimated using the regression equation involving impedance index, physical activity rating and gender by Stahn et al. 2006. For comparison in all subjects, VO2peak (Viasys Oxyon mobile spirometer) was additionally determined directly during a performance-adjusted standardised graded exercise protocol.

RESULTS
VO2peak [ml*kg-1*min-1] measured by spiroergometry was 40.7±7.7 in overweight, 40.3±9.0 in inactive subjects and 24.6±7.1 in cancer patients. The IBIA based regression algorithm underestimated VO2 in these groups by an average 47±14%, 45±19% and 13±34%, respectively.

CONCLUSION
When applying the IBIA-based Stahn regression equation in overweight, inactive and chronically ill subjects, there is a potential VO2 underestimation on a group level as well as an individual misclassification in accordance to cohort characteristics. Prediction accuracy was lower with increasing VO2. However, impedance data by itself accounted for 65, 69 and 51% variance in VO2peak in these groups. Therefore, further studies for refinement of the IBIA approach by establishment of target group- specific regression equations and their cross-validation seem warranted.

References
EFFECTS OF AN ACCUMULATED BRISK WALKING INTERVENTION ON BODY COMPOSITION IN CHILDREN AGED 5-11 YEARS OLD

University of East London, United Kingdom

It seems that increased physical activity in childhood can affect an individual’s energy balance, and thus storage of excess adipose tissue. Surprisingly though there are a limited number of interventions performed within schools, especially using brisk walking, as well as the nation of accumulated physical activity. The purpose of this study was to identify whether an accumulated brisk walking programme within a primary school setting is effective in increasing energy expenditure and reducing body fat in 5-11 year old children.

152 participants took part in this intervention study, using both a walking (W) and control (C) group. W took part in the accumulated brisk walking programme during school time, which involved walking at a brisk intensity around the school grounds for 15 minutes in the morning and afternoon, at least 3 times a week. This represented an additional 90 minutes of walking week-1, during the 15-week intervention period. The distance and heart rate recorded during each brisk walk by a sample of W participants was 1437 ± 7.6m and 135.2 ± 9.6 beat min⁻¹, respectively (mean ± SD). C took part in normal school lessons during the walking sessions. Pre- and post-intervention measures of all the physiological variables were taken immediately prior to, and at the end of the 15-week period in both groups. Body fatness was measured using the BodPod Self-Test Life Measurements Inc, Concord, CAL. Additionally, skinfold thickness measures (Harpenden Skinfold Calipers, British Indicators Ltd, Luton, England) were recorded. Data was analysed using SPSS v13.0, with both parametric and non-parametric differences tests. Significance accepted at p<0.05.

EFFECTS OF AN ACCUMULATED BRISK WALKING INTERVENTION ON BODY COMPOSITION IN CHILDREN AGED 5-11 YEARS OLD

The principal finding of this study was that regular accumulated bouts of walking reduced body fatness (%) and fat mass (kg) in 5-11 year old children, whereas such changes were not observed in controls. The additional brisk walking increased the estimated energy expenditure by >240 kcal. It seems that this type of short-bout regular brisk walking, within the school day, has the potential to create a mild negative energy balance in primary school children, and thereby, could help to prevent obesity in young children.

THE RATING OF PERCEIVED EXERTION DURING COMPETITIVE RUNNING SCALES WITH TIME

Faulkner, J., Parfitt, G., Eston, R.
University of Exeter, United Kingdom

Recent research suggests that a scalar linear relationship exists between the ratings of perceived exertion and the duration of exercise during constant load exercise tasks on a cycle ergometer (Noakes, 2004, Eston et al., 2007). This was first suggested by Noakes (2004) during carbohydrate-depleted and carbohydrate-replete conditions, and by Eston et al. (2007) who observed the response following an antecedent fatiguing activity. It has also been suggested that the perception of exertion has scalar properties during closed loop cycling time-trials of either 2.5, 5 or 10 km (Joseph et al., 2008).

The purpose of this study was to assess whether the scalar internal timing mechanism of perceived exertion was evident during competitive running, and whether the distance, course elevation and the participants’ pacing strategy (running velocity) altered the perceptual response. After completing a graded exercise test to exhaustion on a motorised treadmill, nine men and women competed in a 7 mile road race (7-MR) and a half marathon (GWR, 13.1 miles), approximately one and two weeks later, respectively. The RPE, heart rate and split mile time were recorded throughout the duration of the races. The RPE was regressed against time and a ‘time’ to complete the 7-MR and GWR. As expected, the rate of increase in RPE was greatest in the 7-MR [F (1, 7) = 556.83, P < 0.001] although there were no differences when expressed against %time [F (1, 7) = 4.43, P > .05]. Although the RPE at the completion of the first mile of the GWR (10.8 ± 0.7) was significantly lower than the 7-MR [11.9 ± 0.6] (P < .01), similar RPE values were reported at the completion of the races [18.4 ± 0.5 & 18.9 ± 0.6, respectively, P > .05], despite significant differences in the course elevation, heart rate response, running velocity and pacing strategy adopted by participants during the races (P < .05). The study provides further evidence that the ratings of perceived exertion have scalar linear time-based properties. The study has also demonstrated that during competitive distance running the perceptual response may be dissociated from the underlying physiological or physical mechanisms associated with performance.

References


PHYSICAL ACTIVITY OR FITNESS: WHAT'S THE BEST PREDICTOR OF BONE MINERALIZATION AND WIDTH?

Faculty of Human Movement, Technical University of Lisbon, Portugal

The purpose of this study was to analyse the impact of physical activity (PA) and fitness on bone mineralization and width in prepubertal children. Methods: Participants were 53 girls (chronological age, 8.5±0.4 yrs; bone age 8.5±1.2 yrs; height,132.0±0.05 cm; weight, 29.2±5.9 kg) and 64 boys (chronological age, 8.6±0.4 yrs; bone age, 8.9±1.1 yrs; height,133.0±0.06 cm; weight, 32.3±7.4 kg). Evaluation of body weight, total lean and fat mass, bone mineral content (BMC) and area of total body, lumbar spine (L1-L4), femoral neck, and 33% radius were performed with DXA. PA was assessed with a uni-axial accelerometer. Aerobic capacity was evaluated by the PACER test according the manual of Fitnessgram 6.0. Muscle capacity was measured in lower limbs by a long stretch-shortening cycle with a counter movement jump and in upper limbs by a handgrip strength test. Maturation level was determined by the TW3 method (Tanner et al., 2001). Calcium intake was calculated from a semi-quantitative food frequency questionnaire assessing regular intake of a wide set of nutrients.
LACTATE RESPONSE TO CIRCUIT WEIGHT TRAINING: COULD IT BE RELATED WITH THE ACE I/D POLYMORPHISM?

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INTRODUCTION
Lactate response to resistance training has only been studied in isolated exercises without comparing same protocols at different intensities. Individual variation in the cardiovascular response to the exercise due to genetic factors, such as the angiotensin-converting enzyme (ACE) gene polymorphism, are determinant with several fitness parameters and physical performance. However, only several studies without conclusive results have investigate the role of the ACE insertion/deletion (I/D) polymorphisms with lactate metabolism. OBJECTIVE: To describe lactate response to a circuit weight training on different intensities in relation with the ACE insertion/deletion (I/D) polymorphisms.

METHODS
10 male volunteers (mean ± standard deviation, age 24±1.8 years, height 178.2±5.4 cm, weight 78.2±7.1 kg) performed a circuit of 8 exercises at 6 different intensities (from 30% to 80% of 15RM) in 6 non-consecutive days. Capillary blood samples were analyzed at the end of each circuit, using the YSI 1500 STARK Lactate Analyzer. The I/D polymorphism of ACE gene was determined by polymerase chain reaction. Subjects were divided in 2 groups: I (II homozygotes and ID heterozygotes) and D (DD homozygotes).

RESULTS
Lactate concentration was significantly correlated with the circuit intensity (Spearman correlation=0.815, p=0.01). Mann-Whitney test showed significant differences between I group and D group (p=0.041) in maximal blood lactate during the strength circuit training, having lower concentration the I group. Percentage of genotypes: DD=70%, ID=20% and II=10%.

DISCUSSION AND CONCLUSIONS
Our results show that the increased energy requirement due to the increased intensity induces an elevated lactacid metabolism. Thus, the needed energy to increase resistance training intensity is not only due, as previously described, to a higher oxygen consumption, but also to an increased anaerobic metabolism. Furthermore, we found that individuals in I group reached lower lactate levels in strength training. These low levels might be caused by a worse oxygen delivery due to an impaired vasodilation in the ACE DD homozygotes. We conclude that lactate response to circuit weight training is very correlated with the intensity of this training, and that individuals in I group reached lower lactate levels in strength training.

TWO-STAGE FINE-MAPPING OF A LINKAGE PEAK FOR KNEE STRENGTH ON CHROMOSOME 12

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Myostatin (Growth and differentiation factor 8, GDF8) is known to be a key negative regulator of skeletal muscle mass. Despite its remarkable influence on skeletal muscle mass in animals, studies of human genetic variation in the myostatin gene have shown little association with muscle phenotypes, except for a rare missplicing change in IVS1:G378A. To clarify the inconclusive role of myostatin and other key proteins of the myostatin pathway, our research group conducted linkage analyses on young male Caucasian siblings from the Leuven Genes for Muscular Strength study (LGfMS). Microsatellite marker-based linkage analyses revealed that the region harbouring cyclin-dependent kinase (CDK2; 12q12-14; LOD 3.4; P = 0.0004) showed significant linkage to knee muscle strength. However, it is not possible to exclude that genes other than the original myostatin pathway candidate genes cause the linkage findings. Therefore a two-stage fine-mapping approach was conducted on the 1-LOD confidence interval of the linkage peak.
In stage 1, 209 polymorphisms were selected using an empirical two-step gene-centred fine-mapping strategy in which candidate genes are prioritized using a bioinformatics approach and the top genes are chosen for further SNP selection with a linkage disequilibrium based method. These SNPs were genotyped in 500 male Caucasian siblings from the LGMS study using an Illumina Bead Array platform. Combined linkage and association analyses and family based association tests identified 6 genes including activin receptor 1 beta (ACVR1B) and inhibin beta C (INHBC). Inhibins and activins belong to the TGF beta superfamily - as does myostatin - and signal through a combination of type II and type I receptors, of which ACVR1B is one. Therefore ACVR1B and INHBC make strong candidates for follow-up. In stage 2, an additional 27 SNPs, likely to have functional consequences (i.e. exonic SNPs, SNPs located on intron/exon boundaries and SNPs in [putative] transcription factor binding sites or in highly conserved regions) were successfully genotyped using Sequenom iPLEX Gold technology in 510 individuals, partially overlapping stage 1 individuals. Family based association analyses for SNPs in ACVR1B on isometric knee strength and concentric torque of the knee extensors and flexors at 60°/s revealed empirical p-values ranging from 0.003 to 0.04 for a polymorphism located in a miRNA binding site and from 0.003 to 0.07 for a SNP located in a conserved region. For INHBC none of the additional SNPs was significantly associated with muscle strength.

Further research will be necessary to evaluate whether the associated genotypic variations in these candidate genes with muscle strength can be explained by an associated variation in mRNA expression or protein level and whether these associations can be replicated in independent samples.

PROTEOMIC IDENTIFICATION OF SEX-SPECIFIC DIFFERENCES IN MUSCLE HEAT SHOCK PROTEIN EXPRESSION IN RESPONSE TO INTERVAL TRAINING

Holloway, K., Goldspink, D., Cable, N., Burniston, J.
Liverpool John Moores University, United Kingdom

Background
Sex-specific differences in muscle metabolism have been reported (Tarnopolsky et al., 1990), but the potentially different responses of muscle to interval training have not been investigated. To question this, we used proteomics techniques that provide a broad assessment of muscle proteins. This approach has not previously been used to study the adaptation of muscle to exercise training and can provide novel molecular information.

Methods
Five health-screened recreationally active men (mean±SE; age 21±3 years, body mass 71±9 kg) and 5 women (age 20±2 years, body mass 55±6 kg) completed the training programme after giving their informed consent to the ethically approved procedures. Maximum oxygen uptake was measured and each subject completed a 6 weeks treadmill running programme, involving 3 sessions per week, utilising six 1-minute bouts at 100% maximal oxygen uptake interspersed with 4 minutes of 50% maximal oxygen uptake. The vastus lateralis was biopsied at standardised times before, and after, the training intervention and proteins resolved using isoelectric focusing (pH 3-10) and gel electrophoresis. Gels were stained with colloidal Coomassie blue and analysed using proteome profiling software. Spots of interest were digested with trypsin and analysed using mass spectrometry. Gene products were identified by searching peptide ion and fragment ion mass spectra against the Swiss-Prot database using Mascot (www.matrixscience.com).

Results
Six weeks of interval training increased average maximum oxygen uptake by 8% in men and 7% in women (P=0.001), with corresponding increases in arterio-venous difference (4% in men, 10% in women; P=0.005). In males, the expression of 7 gene products was significantly different after interval training. Expression of muscle creatine kinase increased 50% (P=0.022), fast troponin T by 60% (P=0.032) and myosin regulatory light chain 2v by 24% (P=0.015). In contrast, slow troponin T decreased 115% (P=0.008) and myosin essential light chain 1s by 40% (P=0.049), suggesting a shift toward a faster contracting phenotype in men. In women, only the expression of heat shock protein 27 was significantly (P=0.032) increased (33%) after interval training, whereas in men significant increases in the expression of heat shock proteins 70 (8%, P=0.012) and 20 (31%, P=0.009) were detected.

Conclusions
Proteomic analysis can provide mechanistic evidence of sex-specific responses to exercise. Skeletal muscle adaptation to a standardised regimen of interval training was greater in men than in women. Consistent with previous findings in rats (Paroo et al., 2002), this training intervention elevated the expression of heat shock protein 70 in vastus lateralis of males, but not females. Sex-specific differences in the response of the small heat shock proteins 20 and 27 were also discovered.

References

FAK TRANSMITS MECHANICAL STRESS TOWARDS INCREASED PROTEIN SYNTHESIS IN SKELETAL MUSCLE

Klossner, S., Durieux, AC., Freyssenet, D., Hoppeler, H., Flueck, M.
University of Bern, Switzerland

Mechanical load leads to increased muscle mass and a gain in muscle strength. Classical cell biology experiments led to the identification of kinases that activate protein synthesis and thus trigger muscle growth. However, the molecular link between the mechanical (extracellular) stress and the chemical (intracellular) signaling towards protein synthesis has not been identified so far. We examined the possible functional coupling between the activation of a key player of protein synthesis in striated muscle, the 70kDa ribosomal protein S6 (extracellular) stress and the chemical (intracellular) signaling towards protein synthesis has not been identified so far. We examined the

RESPONSE TO INTERVAL TRAINING

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In stage 1, 209 polymorphisms were selected using an empirical two-step gene-centred fine-mapping strategy in which candidate genes are prioritized using a bioinformatics approach and the top genes are chosen for further SNP selection with a linkage disequilibrium based method. These SNPs were genotyped in 500 male Caucasian siblings from the LGMS study using an Illumina Bead Array platform. Combined linkage and association analyses and family based association tests identified 6 genes including activin receptor 1 beta (ACVR1B) and inhibit beta C (INHBC). Inhibins and activins belong to the TGF beta superfamily - as does myostatin - and signal through a combination of type II and type I receptors, of which ACVR1B is one. Therefore ACVR1B and INHBC make strong candidates for follow-up. In stage 2, an additional 27 SNPs, likely to have functional consequences (i.e. exonic SNPs, SNPs located on intron/exon boundaries and SNPs in [putative] transcription factor binding sites or in highly conserved regions) were successfully genotyped using Sequenom iPLEX Gold technology in 510 individuals, partially overlapping stage 1 individuals. Family based association analyses for SNPs in ACVR1B on isometric knee strength and concentric torque of the knee extensors and flexors at 60°/s revealed empirical p-values ranging from 0.003 to 0.04 for a polymorphism located in a miRNA binding site and from 0.003 to 0.07 for a SNP located in a conserved region. For INHBC none of the additional SNPs was significantly associated with muscle strength.

Further research will be necessary to evaluate whether the associated genotypic variations in these candidate genes with muscle strength can be explained by an associated variation in mRNA expression or protein level and whether these associations can be replicated in independent samples.

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reloading [1.59-fold]. This FAK activation preceded the phosphorylation of p70S6K at activation sites Ser411 and Thr421/Ser424 after 6 hours of reloading and the subsequent 3.8-fold (p<0.05) enhancement of p70S6K phosphotransfer activity 24 hours after reloading. In ongoing experiments we aim to verify these results in the tenotomy-model, in which we expose a much higher mechanical stress to the muscle. Taken together, our data provide evidence for the involvement of the mechano-sensory FAK in transmitting the mechanical signal and promoting protein synthesis.

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THE ROLE OF SIRTUINS IN AGED EXERCISE TRAINED AND IGF-1 TREATED RAT SKELETAL MUSCLE

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Sir2, an NAD+-dependent protein deacetylase, extends the lifespan in diverse species from yeast to flies. Sir2 has seven mammalian homologs; SIRT1-7, which affect aging and metabolism. Conservation of sirtuin regulation of the insulin-like growth factor 1 (IGF-1) signaling pathway has been observed for Caenorhabditis elegans and mammals, indicating an ancient role for sirtuins in the modulation of organism adaptations to nutritional intake and metabolism.

We conducted a study in which, Wistar male rats (3 mo and 26 mo) were divided into six groups. The training protocol lasted for 6 weeks (5times/wk, 1h/day, reaching the intensity of 22m/min for young and 13m/min for old groups at the incline of 10% for both groups). In the last two weeks of the training program Alzet pump was inserted into the animals with and without IGF-1. The concentration of adminis-
tered IGF-1 was 5 µg/body weight kg/day. Gastrocnemius muscle was used in the present study.

The Western blot data revealed that SIRT1 content did not change as a result of aging. On the other hand, exercise appears to decrease the protein level while IGF-1 administration increases the content of SIRT1. H3K9 histone acetylation changed with different pattern in young and old animals for exercise training and IGF-1 supplementation. SIRT1 acts as suppressor for UCP3 gene, UCP3 is a mitochondrial membrane transporter which also significantly effects the production of free radicals. Accordingly to this, we have found that increased SIRT1 content was associated with decreased UCP3 level especially in exercise trained rats. SIRT1 believed to influence the DNA repair, and interestingly enough, the activity of 8-oxoguanine glycosylase in the nucleus changed with similar pattern as SIRT1. Although, the concentration of nuclear 8-hydroxy-2-deoxyguanosine was not significantly altered by aging or exercise. The level of carbonyl groups of the protein level while IGF-1 administration increases the content of SIRT1. H3K9 histone acetylation changed with different pattern in young and old animals for exercise training and IGF-1 supplementation. SIRT1 acts as suppressor for UCP3 gene, UCP3 is a mitochondrial membrane transporter which also significantly effects the production of free radicals.

In the present study we have some novel observations: Exercise and aging alter the SIRT concentration in the skeletal muscle and this concentration of nuclear 8-hydroxy-2-deoxyguanosine was not significantly altered by aging or exercise. The level of carbonyl groups of the protein level while IGF-1 administration increases the content of SIRT1. H3K9 histone acetylation changed with different pattern in young and old animals for exercise training and IGF-1 supplementation. SIRT1 acts as suppressor for UCP3 gene, UCP3 is a mitochondrial membrane transporter which also significantly effects the production of free radicals.

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SEASONAL EVALUATION OF CHANGES IN MUCOSAL IMMUNITY AND UPPER RESPIRATORY ILLNESS AMONGST ELITE RUGBY UNION PLAYERS

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Previous studies have shown that intense exercise results in suppression of host immunity. This may predispose athletes to an increased risk of developing upper respiratory illnesses (URI's). Few studies have investigated changes in mucosal immunity and URI development within multi-stressor team environments over prolonged periods (Fahlman and Engels, 2005). OBJECTIVES: To assess the effects of exercise stress on markers of mucosal immunity and URI incidence in elite rugby union players.

METHODS: Thirty players [mean ± SD: age 26.4 ± 2.5 yr, height 186.5 ± 8.7 cm, weight 101.1 ± 15.2 kg, VO2peak 52.1 ± 6.2 ml kg⁻¹ min⁻¹] agreed to participate in the study passed by the ethical committee of the University of Glamorgan. Timed, unstimulated morning saliva samples were taken from players (lasted) at pre-selected time points over the course of a competitive playing season (11 months). Samples were taken after a minimum of 48-h rest from the previous game or intense exercise and analysed via ELISA for possible changes in salivary cortisol, immunoglobulin A (s-IgA) and lysozyme (s-Lys) concentration and secretion rate. Weekly self-reported player illness data was obtained using an 'internet' based data logging system. Additional data recorded by affiliated medical staff. Daily records of training load, type, duration and perceived intensity were obtained using the same system.

RESULTS: Players reported on average, 4 URI episodes (min = 0; max = 8) over the 46 wk study period. Average duration of reported URI's lasted 4.5 days (min = 2; max = 33). Peaks in URI's occurred during the months December and March were preceded by increases in training intensity. Values for s-Lys and salivary cortisol concentration were lowest and highest during this time period. The increase in URI incidence during December was also associated with a significant (P < 0.05) decrease in s-IgA concentration and secretion rate. Recorded number of URI episodes differed for player position (mean ± SD): 3.4 ± 2.1 vs 4.3 ± 2.03 for forwards and backs respectively. Backs also displayed lower mean resting s-IgA and s-Lys concentrations and secretion rates when compared to forwards across the study period.

CONCLUSIONS: Regular monitoring of s-IgA and s-Lys may be useful in the assessment of both exercise stress and URI risk status within elite rugby union. A combination of alterations in training intensity and seasonal influence are likely contributors to observed peaks in URI incidence. Possible stress induced changes in cortisol release may contribute to reductions in resting s-IgA and s-Lys concentrations over prolonged periods. A critical threshold for s-IgA may exist in predisposing elite rugby union players to increased URI incidence.


EXERCISE INDUCES APOPTOSIS OF LYMPHOCYTE SUBPOPULATIONS IN LYMPHOID ORGANS

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Intensive exercise affects lymphocyte counts in lymphoid and non-lymphoid organs via different mechanisms like redistribution as well as proliferation and apoptosis. The role of apoptosis is currently under focus of research since intensive exercise is well known to increase several apoptosis-inducing factors including reactive oxygen species, Fas receptor, TNF-α, glucocorticoids, and intracellular calcium. Purpose: To investigate the effect of intensive exercise on apoptosis of lymphocyte subpopulations in several lymphoid organs and to study the kinetics of these alterations.

Methods: Eight week old male CD1-mice were assigned either to an exercise group or to a control group. In the exercise group mice performed an acute treadmill exercise at 80% VO2max until exhaustion, while controls were exposed to treadmill noise without running. Mice were sacrificed immediately, 3h, 24h or 48h after exercise. Spleen, lung, Peyer’s patches, inguinal lymph nodes and bone marrow were excised and blood samples were taken. Lymphocytes were isolated and stained using PE-conjugated monoclonal antibodies against CD3, CD4 and CD8. Detection of apoptotic cells was performed by flow cytometry using FITC-conjugated annexin V.

Results: In the spleen we observed an increased percentage of apoptotic CD3+, CD4+ and CD8+ cells immediately and 3h after exercise. Rate of apoptotic CD3+ and CD4+ cells were still increased 24h after exercise and decreased 48h after exercise. In blood, apoptosis of CD3+ and CD4+ cells increased immediately and 3h after exercise and reached baseline values 24h after exercise. In Peyer’s patches, apoptosis of CD3+ increased immediately and 3h after exercise and was still enhanced 24h after exercise. In contrast, in lung, lymph nodes and bone marrow we observed a delayed increase in apoptosis. In lung and bone marrow apoptosis of CD3+, CD4+ and CD8+ increased 24h after exercise and reached baseline levels 48h after exercise. Furthermore, in lymph nodes percentage of CD3+ and CD4+ increased 24h after exercise and reached baseline levels 48h after exercise.

Conclusion: An acute bout of intensive treadmill running increased lymphocyte apoptosis in several lymphoid organs, but with different kinetics. We speculate that exercise induced apoptosis in different organs might have a regulatory function to remove activated cells mobilized during exercise. It remains to be shown whether different rates of apoptosis in the lymphoid compartments are related to different concentrations of apoptosis-inducing factors.

IDENTIFICATION OF LEUKOCYTES IN HUMAN SKELETAL MUSCLE

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Accumulation of neutrophils in muscles after exercise-induced muscle damage has not been convincingly demonstrated. Results from immunohistochemistry indicate that infiltration is more evident in animal than human studies. The discrepancy may be due to the antibodies used to detect neutrophils [1]. The aim of this study was to identify different leukocyte antigens with a panel of frequently used antibodies in muscle exposed to unaccustomed eccentric exercise in humans. Secondly, we evaluated the specificity of these antibodies to identify neutrophils and macrophages.
Thirty-three subjects (26 ± 5 yr, mean ±SD) performed a bout of maximal eccentric exercise. Biopsies were taken 0.5, 1, 3.5, 8, 24, 48, 96 and 168 hrs after exercise (3-4 biopsies per subject). Anti-CD11b, CD16, CD66b, CD68, MPO and elastase, were used to detect leukocytes on cross-sections from both exercised and control muscle. A positive cell was defined as overlap of antibody and DAPI staining. Double labelling and labelling on adjacent cross-sections with different antibodies were performed to examine the reactivity of the different antibodies to neutrophils and monocytes/macrophages in muscle samples and on blood smears. Eccentric exercise resulted in reduced force-generating capacity after exercise (~50%) and prolonged recovery (> one week). The CD11b, CD66b and elastase antibodies stained a low number of cells at all time points. CD66b stained fewer cells than the CD11b antibody. The CD11b+, CD66b+ and elastase+ cells were found primarily in the perimysium and near blood vessels. Both the CD11b+, CD66b+ and elastase+ cells had typically polymorphic nuclei, but the CD11b antibody showed also weak affinity for mononuclear cells, which appeared to be monocytes. CD68+ cells were more frequently observed in exercised muscle compared to control (p<0.05). Within 24 hrs CD68+ cells were distributed throughout the sections, especially within perimysium. At 48 hrs CD68+ cells where more often observed in the epimysium. Later, necrotic fibres contained large numbers of CD68+ cells. CD68+ cells appeared to be mononuclear cells. Staining with CD16 followed the same pattern as with CD66b, but stained 17% fewer cells. Double-staining confirmed that these antibodies recognized many of the same cells. Sections double labelled with both CD66b and MPO showed larger number of MPO+ cells compared to CD66b+ cells. Blood smears showed that CD66b+ cells were positive for MPO. Anti-MPO also stained cells that appeared to be monocytes. Double-staining with MPO and CD66b on blood smears showed that many of the CD66b+ cells were positive for MPO. The main leukocyte subtype that accumulated in muscle after damaging exercise was monocytes/macrophages (CD68+ cells). It seems like CD66b and elastase are good markers for neutrophils, whereas CD11b and especially CD16 and MPO are not specific to neutrophils in human skeletal muscle.

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IMMUNOLOGICAL RESPONSES TO INCREASED DIETARY PROTEIN INTAKE DURING INTENSIFIED TRAINING IN CYCLISTS

Witard, O., Jackman, S., Kies, A., Bosch, J., Jeukendrup, A., Tipton, K.
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The present study investigated the impact of additional dietary protein intake on immune responses during overreaching. In a single-blinded, counter-balanced experimental design, eight trained cyclists (Wmax: 354±28W) completed two identical, three-wk trials, consisting of a normal (NOR) intensified (INT) and recovery (REC) training week. In the experimental trial, cyclists consumed a high protein (PRO) (3g protein/kgBM/d) diet during INT and REC. In the control (CON) trial, a eucaloric normal protein diet (1.5g protein/kgBM/d) was consumed. Exercise performance was assessed using a pre-loaded (120-min @ 50%Wmax 45-min time trial ITT) on the final day of each training week. Immunological and hormonal measurements were collected at baseline, following submaximal exercise (IT120), at immediate cessation of TT (T+45) and following one-h recovery (R+60). Total lymphocyte counts were determined using a couler haematology analyser. Extensive leukocyte and lymphocyte sub-population phenotyping was performed using multicolour flow cytometry. Conjugated monoclonal antibody combinations were used to stain peripheral blood for surface antigens common to cytotoxic T lymphocytes (CTLI), helper T lymphocytes (ITH), B lymphocytes and Natural Killer (NK) cells. A highly cytotoxic and tissue-infiltrating CTL subset, denoted terminally differentiated effector-memory cell (TDEM), was identified on the basis of differential expression of the surface markers CD27 and CD45RA. A Daily Analysis of Life Demands of Athletes questionnaire monitored psychological symptoms of overreaching. Following INT, a significant decrease (12±4% vs. NOR) in TT performance (P=.02) and increase in mood disturbance (P=.05) was observed, indicating a state of overreaching was induced. During NOR, a robust mobilisation of CTL was observed at T+45 +110±13% from baseline, but this response was blunted during INT (+80±15% from baseline) (P=.02). PRO normalised this blunted response following INT (+112±17% from baseline). During INT, mobilisation of highly cytotoxic TDEM cells were upregulated in PRO (16±1.72 cells/µl blood) compared to CON (109±37 cells/µl blood) at T+45 (P=.02). A delayed attenuation in mobilisation of NK cell number was observed at R+60 during REC (79±13 cells/µl blood) compared to NOR (114±6 cells/µl blood) (P=.05). Diet did not impact NK cell number. INT did not perturb circulating Th or B lymphocyte subsets. Absolute increases in plasma cortisol concentrations at T+45 observed during NOR (116±18ng/ml from baseline) were attenuated following INT (70±27ng/ml from baseline) (P=.04), however no effect of dietary protein was observed. In conclusion, these findings indicate that overreaching induced decrements in endurance performance and mood state may be accompanied by an imposited mobilisation of tissue-infiltrating cytotoxic T lymphocyte and NK cells. Increasing dietary protein intake may help normalise these blunted exercise-induced immune responses.

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EFFECTS OF AGED AND YOUNG SERUM ON PRIMARARY HUMAN MUSCLE CELLS STUDIED IN CULTURE

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Introduction:
Ageing is characterised by a loss of muscle mass (sarcopenia). The mechanisms contributing to this loss are not known. One theory is that sarcopenia results from an impaired response to contraction-induced injury. In rodent muscle, evidence suggests that changes in circulatory factors contribute to the regenerative decline by affecting satellite cells [1].

Aim:
The aim of this study was to assess the myogenicity of human satellite cells cultured in serum from young or old subjects. Myogenicity was defined as the % of cells expressing desmin (a muscle cell marker) in proliferating cultures, and was further assessed by determining the ability of cells to express myosin heavy chain (MHC) when cultured in conditions that promote cell differentiation and fusion.

Methods:
Needle biopsies were taken from the vastus lateralis muscle of women aged 23 and 65 years. Serum was obtained from 4 young (ages 23-36) and 4 elderly (ages 65-81) subjects. The tissue was digested with trypsin and the resulting cell supernatant was cultured in a humidified incubator at 37°C and 6% CO2 in skeletal muscle cell growth medium (Promocell, Germany) supplemented with 10% foetal calf serum (PSF). For desmin experiments, cells were plated at a density of 1250/well in 96 well dishes. After 24 hours medium was replaced with basal skeletal muscle medium supplemented with 15% human serum (H5) and fixed after 92 hours in 4% paraformaldehyde + 0.4% Triton. For MHC experiments cells were plated at a density of 5000 cells/well. The PSF was replaced with basal medium containing 2% H5 and fixed after 11 days. Immunocytochemistry was performed using mouse monoclonal

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antibodies against desmin (D33, Santa Cruz) or MHC (MF20, DSHB University of Iowa) and a rabbit anti-mouse secondary antibody conjugated to Alexa Fluor 488 (Invitrogen). The nuclei were counterstained with Hoechst 33258. Analysis was performed using a Zeiss Axiovert fluorescence microscope.

Results:

Cells from the elderly subject showed a tendency towards a higher % of desmin +ve cells when cultured in the young serum (YS, 31.2 +/- 3.4%, mean +/- sem) as compared to old serum (OS, 24.2 +/- 2.9%, p=0.063). In contrast, the age of serum had no effect on the cells from the young subject (61.6 +/- 1.4% in YS v 62.3 +/- 1.9% in OS). The age of serum also did not affect the differentiation of the cells derived from either the elderly [25.5 +/- 3.7 in YS v 25.8 +/- 5.3% in OS] or young subject [43.6 +/- 2.2 in YS v 41.5 +/- 1.8% in OS].

Conclusion:

The data suggest that cells derived from elderly but not young individuals may be sensitive to factors in the aged human circulation that affect myogenicity. These factors do not affect differentiation. This contrasts with data on mice (1) in which satellite cells from young animals showed reduced expression of muscle markers when cultured in old serum.

Reference


PERFORMANCE, IMMUNE STATUS AND MUSCLE DAMAGE DURING AN INTERNATIONAL FIELD HOCKEY TOURNAMENT

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PURPOSE In major events such as the Olympics, elite field hockey players are required to compete in a series of matches, which sometimes occur on consecutive days, but are rarely separated by more than 1-2 days. However, little is known about performance during, and the physiological implications of, such demanding match schedules. Thus, the aim of the present study was to assess the impact of tournament play on performance and markers of immune status and muscle damage.

METHODS Sixteen male international field hockey players gave their informed consent to participate in the study. The mean (SD) age and mass of the players was 25.6 (2.5) years and 78.9 (7.2) kg, respectively. Data was collected during a 13 day period comprising: Days 1-4, training and match preparation; Days 5-13, 6 tournament (world ranking) matches. Fasted venepuncture blood samples were collected on days 1 and 13, with fasted capillary blood samples taken daily on all other days, except day 2. Plasma was analysed for creatine kinase (CK). Unstimulated saliva samples were collected, from day 2 through to 13 and analysed for IgA. A global positioning satellite system (GPS) was used during matches to assess heart rate, and the distances run at particular speeds ('walk', 0-4; 'slow jog', 4-7; 'jog', 7-11.0; 'run', 11-15.5; 'fast run', 15.5-20; 'sprint', >20 km/h) and intensities ('low', 0-7; 'moderate', 7-15.5; 'high', >15.5 km/h). GPS data is presented for 9 players who played in all matches and blood data for 15 players. Data were analysed using 1- and 2-way ANOVA with repeated measures. Statistical significance was accepted as P<0.05.

RESULTS Mean distance covered during the 6 matches increased during the tournament and was 6397 (1764), 6345 (1397), 6620 (1628), 6777 (1449), 7103 (1788) and 7051 (1255) m for matches 1 to 6, respectively (P<0.05). Despite covering over 7 km in match 6, the mean distance sprinted was lower than in matches 1, 3, 4 and 5 (match 1 to 6: 411 (131), 363 (211), 477 (132), 499 (158), 515 (271) and 394 (187) m; P<0.05). As the tournament progressed it appeared that the intermittent activity patterns during matches became less extreme as players spent more time 'jogging' and 'running' (both P<0.01) and less time sprinting and walking (P<0.05 and P<0.01 respectively). Players achieved lower mean speed and heart rate and spent less time in the 'high intensity' exercise zone in the second half of all matches (all P<0.01, 2nd vs 1st half, indicating fatigue over the course of each match. Salivary IgA was lowest on day 2 (174 (89) ug/ml; P=0.05) and CK increased the day after each match (P<0.01) reaching a peak of 513 (291) U/l following matches on 2 consecutive days (P<0.01).

CONCLUSION With repeated match exposure during tournament play, elite field hockey players exhibit altered intermittent activity patterns. Further work is required to determine whether these altered activity patterns are a consequence of fatigue during later matches.

Oral presentations (OP)

OP-PM03 Physiology 3 - Neuromuscular

ELECTRICAL AND MECHANICAL CHARACTERISTICS OF FINGER FLEXOR MUSCLES DURING ISOMETRIC CONTRACTIONS IN ELITE ROCK CLIMBERS

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The typical rock climbing effort involves mainly isometric contractions of high or maximal intensity. Therefore, maximal isometric strength of the upper limb muscles is a critical factor in climbers’ performance. The aim of the present study was to determine, by means of surface EMG and mechanomyogram (MMG) combined approach, the differences between climbers and sedentary controls in finger flexors motor unit (MU) activation strategy. Our hypothesis is that several years of rock climbing induced structural and neural changes that can be detectable by EMG-MMG compared analysis. Eleven elite climbers and ten healthy controls volunteered for the study. Anthropometric characteristics and maximal voluntary contractions (MVC) for each subject were measured. Five levels of short isometric contractions at 20, 40, 60, 80 and 100% MVC were performed in a randomized order. During each contraction, EMG, MMG and force signals were recorded. EMG and MMG were analyzed in time and frequency domain, and the root mean square (RMS) and mean frequency (MF) were then calculated. Climbers showed significantly higher values of MVC and MMG per unit of muscle area. EMG RMS was statistically higher in climbers with respect to controls for the range of effort from 60% to 100% MVC. In climbers MMG RMS increased up to 80% MVC, while in controls it increased only up to 60% MVC. MMG MF was higher in climbers than in controls at all exercise intensities (p<0.05). EMG-MMG combined analysis revealed significant differences in MU activation strategy between the two investigated groups. In particular, climbers had a significantly higher maximum force, electrical activity and average firing rate, as revealed by MMG MF values. These results are compatible with a shift of climbers’ muscles toward faster MUs, namely type II MUs. Thus, the hypothesis that many years of sustained isometric contractions during climbing activities induced changes in climbers skeletal muscle at a morphological and neural level, is confirmed.
EFFECTS OF ISOMETRIC EXERCISE TRAINING INTENSITY UPON REDUCTIONS IN RESTING SYSTOLIC BLOOD PRESSURE

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The purpose of this study was to compare the effects of two intensities of double-leg isometric exercise training upon resting blood pressure. 33 subjects with a mean age of 20.2 ± 3.6 yrs, body mass 75.6 ± 12.2 kg and stature 179.4 ± 7.6 cm (mean ± s), gave informed consent and were randomly allocated to either control (CON), high-intensity (HI) or low-intensity (LO) isometric exercise training for 8-weeks. The isometric training intensities were set at the proportion of peak EMG (%EMGpeak), which corresponded with either 95% (HI) or 75% (LO) of the peak heart rate (HRpeak) achieved during an incremental isometric exercise test to exhaustion. Each subject performed 4 bouts of exercise, with 2 minutes rest in between, on 3 occasions per week, by maintaining a target EMG value. Resting blood pressure was measured at the brachial artery, seated, using an automated oscillometric device, at baseline, 4-weeks and post-training (8-weeks). ANOVA revealed that resting systolic blood pressure fell significantly in both groups after 8 weeks of training (from 121.5 ± 4.6 to 116.3 ± 6.9 mmHg for HI; and from 118.0 ± 10.1 to 114.3 ± 8.6 mmHg for LO). However, the reduction was also evident at 4 weeks in the HI group, findings we would suggest that the mechanism for adaptations in resting blood pressure after isometric exercise training is dependent upon exercise intensity.

THE PRECISION WITH WHICH ISOMETRIC EXERCISE TRAINING CAN BE PERFORMED ACCORDING TO A GIVEN HEART RATE

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Previously, it has been suggested that the relationship between heart rate (HR) and electromyography (EMG) during an incremental isometric exercise test can be used to achieve precise intensities of isometric exercise training. The purpose of this study was to assess the precision with which this could be done. 22 subjects with mean Age 20.5 ± 4.3 y, Statute 1.79 ± 0.08 m, Body Mass 77.4 ± 13.2 kg, performed a double-leg incremental isometric exercise test to exhaustion, and the linear relationship between HR and EMG was established. From this, isometric training was set at an intensity (EMG) which was predicted to elicit a group mean HR of either 89 or 101 b.min-1 (resting group mean HR of 66 b.min-1). Subsequently, HR was recorded during an 8-week double-leg isometric exercise training programme. The training sessions involved 4 × 2 minute bouts of double-leg isometric exercise, with 2 minutes rest in between, and they were performed, using an isokinetic dynamometer, on three occasions per week (totaling 192 minutes of exercise). Subjects attempted to maintain a 'target' EMG value which was selected so as to elicit a given HR (either 89 or 101 b.min-1). The isometric training resulted in a mean HR which differed from the predicted 89 b.min-1 by only 1.39 ± 1.96 b.min-1, and which did not differ at all from the predicted 101 b.min-1 (1.00 ± 2.55 b.min-1). These results show that, when using the linear relationship between HR and EMG, it is possible to prescribe isometric exercise training, at intensities which elicit given heart rates, with great precision. This might be useful when studying the physiological mechanisms underlying the effect of isometric exercise training upon resting blood pressure, because it allows the 'cardiovascular training stimulus' to be quantified.

MUSCLE FORCE VARIABILITY STRUCTURE DURING FATIGUE AND HYPERTHERMIA

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Thomas et al. [2006] showed that the neuromuscular impairment during hyperthermia is primarily due to a central failure to fully activate skeletal muscles as it occurs independently of muscle and skin temperature. Muscle force shows significant variations when volunteers try to maintain it constant during isometric contractions (Tracy et al. 2005). It is not quite clear how hyperthermia affects force variation during such exercise. It was therefore the purpose of this study to determine how hyperthermia influence muscle voluntary activation and force variations during 2-min maximal voluntary isometric contraction (MVC) of the quadriceps muscle. Nine volunteers [mean (SEM); 21.7 (0.8) years of age] performed a 2-min maximal voluntary contraction (MVC) after 45-min passive body heating in the water at 44 C (HT experiment) and without the heating (ICON experiment). The degree of central activation ratio (CAR) during sustained maximal knee extensions was assessed by superimposed electrical stimulation with a 250-ms test train of stimuli at 100 Hz (MT100Hz) to nervus quadriceps. To examine the time-dependent structure, the sample entropy (SampEn) of force output was calculated. After passive heating, muscle temperature increased from 36.7 (0.28) C to 39.6 (0.31) C (p < 0.001) and Tre from 37.3 (0.32) to 39.3 (0.31) C (p< 0.001)!. At the same time the body mass decreased by 0.93 (0.32) kg which corresponds with 1.17 (0.4) % of the total body mass. During the first 30 s of MVC torque decreased to a lower level in hyperthermia compared to the control experiment ([52.6 (2.3)% and 69.0 (2.3)% of the best MVC, respectively, p<0.001). During the remaining 1.5-min MVC torque decreased at a similar rate in both conditions. The ANOVA showed that coefficient of variation for torque (CV) increased (p<0.0001) with exercise duration and was consistently higher in hyperthermia compared to the control condition. Allready after ~3-s of exercise, CAR was lower in hyperthermia compared to the control condition (p<0.03). The difference between the experimental conditions increased by 30-s of exercise (p<0.001). Afterwards, however, CAR underwent only minor changes and the difference between the experimental conditions was maintained until the end of exercise. There was a significant decrease (p<0.001) in the SampEn during 2-min MVC independantly of the exercise conditions.

It is concluded that hyperthermia inhibits voluntary activation and increases force variations during MVC. However, muscle force regularity (complexity) decreases and its does not depend on hyperthermia.

References.
FACTORS CONTRIBUTING TO THE INCREASE IN SPECIFIC FORCE OF THE QUADRICEPS FOLLOWING RESISTANCE TRAINING IN YOUNG MEN
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BACKGROUND: The maximal force a muscle can generate depends on the number of sarcomeres in parallel and thus its physiological cross sectional area (PCSA). However, the increase in muscle strength with training is widely reported to be greater than expected from the increase in these two. The aim of this present investigation was to systematically address potential problems such as may be caused by changes in voluntary activation and co-activation and changes in muscle architecture during maximum voluntary contraction (MVC). To our knowledge, this is the first study to investigate the effect of resistance training on specific tension taking into account the structural differences between the four quadriceps muscles. METHODS: Fourteen healthy male volunteers aged 21+-3 yrs performed unilateral leg-extension (4 sets of 10 repetitions at 80% 1RM), three times/wk for 9 weeks. Quadriceps tendon force (FT) was calculated by correcting maximum isometric torque obtained at the optimum knee angle for antagonist coactivation (estimated from electromyographic activity), voluntary agonist activation (using the interpolated twitch technique), patella tendon moment arm and the ratio of quadriceps tendon force to patella tendon force (2). The PCSA of each quadriceps muscle was calculated by diving the volume measured using magnetic resonance imaging by ultrasound measurements of fascicle length at MVC. The effective PCSA of the whole quadriceps was determined as the sum of the PCSAs of the four constituent muscles, each multiplied by the cosine of the appropriate pennation angle. The mean specific force of the quadriceps was then obtained by dividing FT by the sum of the effective PCSAs. RESULTS: Isometric torque increased by 33+-12%, (p<0.05) and total quadriceps ACSA increased by 5+-4% (p<0.05); quadriceps volume increased by 6+-3% (p<0.05); quadriceps PCSA did not change significantly (5+-11%), quadriceps tendon force increased by 22+-18%, from 53+-9 N/cm2 to 64+-10 N/cm2 (p<0.05). DISCUSSION: The quadriceps specific tension values in this study are noticeably higher than those reported in single fibre studies. The increase in specific tension for the whole quadriceps group increased by 22+-18%, from 53+-9 N/cm2 to 64+-10 N/cm2 (p<0.05). DISCUSSION: The quadriceps specific tension values in this study are noticeably higher than those reported in single fibre studies. The increase in specific tension confirms previous reports (see reference 1) and was not explicable by changes in muscle architecture, activation and/or co-activation. It is still not clear what causes the large specific force values or increase in specific force with training but differences or changes in myofibrilar packing and lateral transmission of force remain possibilities to be examined.

References:

INCREASED SOLEUS H-REFLEX EXCITABILITY DURING UNILATERAL LOWER LIMB SUSPENSION IS NOT ACCOMPANIED BY CHANGES IN DESCENDING NEURAL DRIVE
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While a decrease in voluntary activation capacity is typically observed following unloading or immobilisation (2, 3), several authors have reported an increase in resting Hoffmann reflex (H-reflex) excitability with this type of intervention (1, 2). By measuring an electromyographic variant of H-reflex, the volitional wave (V-wave), the purpose of the present study was to investigate whether the gain in H-reflex excitability induced by unilateral lower limb suspension (ULLS) were associated with changes in efferent neural drive to the planar flexor muscles.

Six male volunteers (23 ± 2 yr, 187 ± 6 cm, 79 ± 9 kg) completed 24 days of ULLS. Outcome measures included plantar flexor maximal voluntary contraction (MVC) force, and activation capacity (twitch interpolation), and soleus maximal electromyographic (EMG) activity, H-reflex and V-wave. Following ULLS, MVC force decreased by 15% (P<0.05). However, neither plantar flexor activation capacity nor soleus maximal EMG activity was significantly altered after the suspension. Consistently, V-wave remained unchanged after ULLS while H-reflex significantly increased (+20%). Furthermore, there was no significant relationship between changes in H-reflex and V-wave over the ULLS period. Unexpectedly, these findings indicate that 24 days of ULLS can result in a substantial reduction of muscle strength without any apparent change in efferent neural drive. Combined H-reflex and V-wave, measured for the first time in the context of unloading, suggest that the spinal adaptations underlying the unloading-induced increase in soleus H-reflex excitability did not significantly affect the efferent motor output to the plantar flexor muscles. These results indicate that the unloading-induced decrease in neural drive observed in other disuse paradigms is mitigated with ULLS. Consequently, the loss in muscle strength observed in the present conditions is likely explained by muscle atrophy and, possibly, by a reduction in single fibre specific tension.

References:

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MANUAL PREFERENCE IN INDIVIDUALS WITH AUTISM SPECTRUM DISORDERS
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The Autism Spectrum Disorder (ASD) is a global development disorder (Marques, 2000). Left-handedness or an ambiguous manual preference reveals a higher incidence in people with ASD than in general population, about 18% and 36%, correspondingly (McManus and Cornish, 1997; Hauck and Dewey, 2001). These values also seems to match with ASD mental retarded subjects (Bradshaw et al., 1996). The aim of this study was to assess manual preference in two groups, ASD and non clinical subjects. The sample comprises 130 subjects of both sexes, between 16 and 46 years old, divided in two groups. The ASD group had 65 subjects and the nonclinical group
had 65 impaired normal subjects. Subjects’ manual preference was assessed through a simple task, consisting in picking up ten objects, situated on a table, in the midline of the subject’s body. It was observed the chosen hand to pick up each of those objects. Results showed that the ASO group presented a higher percentage of left-handers (35.3% in males, 50% in females) when compared with their counterparts (7.8% in males, 7.1% in females). All differences between groups were statistically significant. The results of our study presented, as we expected, that the ASD subjects’ left-handed percentage is significantly higher when compared with that of the non clinical group. In the same way, Bradshaw et al. (1996) and Comish and McManus (1997) had already observed similar values in their studies. We’ve verified that the percentage of left hander’s in our study (38.5%) is higher than in Bradshaw et al. (1996) (18% of ASD subjects left-handers). However the values of ambiguous manual preference reach 36% in populations with PEA.

References.


A HOME-BASED AEROBIC EXERCISE TRAINING PROGRAMME IS SUCCESSFUL AT IMPROVING CARDIOPULMONARY AND QUALITY OF LIFE OUTCOMES IN BREAST CANCER SURVIVORS

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BACKGROUND: Recovery from breast cancer and its treatment has been reported to leave the majority of survivors with some form of fatigue, impairing quality of life (QOL). Exercise has been shown to be an effective strategy in combating such fatigue, and for improving the QOL of survivors. Consequently there is a requirement to develop easy and effective exercise strategies to improve physical capacity and patient well-being. PURPOSE: To determine the effects of a home-based 12-week aerobic exercise training programme on cardiopulmonary function and QOL within breast cancer survivors. METHODS: Forty breast cancer survivors were randomly assigned to an exercise (E) (n = 25, mean ± SD age 48 ± 9 years, body mass 67 ± 11 kg) or control (C) (n = 15, mean ± SD age 52± 8, body mass 71 ± 13 kg) group. E was prescribed a progressive aerobic training programme to be performed 4 times a week for 8 weeks liminal intensity 65% peak oxygen consumption (VO2 peak), and to be conducted without further advice for another 4 weeks. C was instructed to maintain their current physical activity level. VO2 peak, peak heart rate (PHR), oxygen economy at 2 minutes (VO2 2min), 4 minutes (VO2 4min), systolic blood pressure (SBP), diastolic blood pressure (DBP), BMI and QOL were determined in both groups pre-intervention and at 4-weekly intervals. Both groups completed a weekly Leisure Time Questionnaire to quantify additional exercise load. RESULTS: E completed 86 ± 6 % and 87 ± 10 % of sessions week 1-4 and week 4 8, but only 76 ± 14 % of sessions week 8 12. Non-protocol related exercise was not significantly different between groups at any time point (P > 0.05). There were no significant differences pre-intervention for any of the variables tested (P > 0.05). There was a significant time and interaction effect for VO2 peak (P < 0.05), but no treatment effect (P > 0.05). Post-hoc tests revealed a significant increase in E VO2 peak at week 4, 8 and 12, but no significant differences in C at any time point (P > 0.05). There was a significant time effect (P < 0.05), but no interaction or treatment effect (P > 0.05) for PHR. Post-hoc tests revealed a significant decrease in E at week 4 and a significant increase in C at week 4 and 12 (P < 0.05). There was no significant time, treatment or interaction effect for SBP (P > 0.05), but there was a significant time effect for DBP (P < 0.05). Post-hoc tests revealed a significant decrease in E at week 8 and 12, but no significant differences in C at any time point (P > 0.05). There was a significant time and interaction effect for QOL (P < 0.05). Post-hoc tests revealed a significant improvement in E at week 4, 8 and 12 (P < 0.05), but no significant differences in C at any time point (P > 0.05). CONCLUSIONS: A 4 times a week home-based aerobic exercise programme can successfully improve physical capacity and improve QOL among breast cancer survivors.

SELECTIVE WEAKNESS AT SHORT MUSCLE LENGTHS AFTER STROKE

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The majority of people after stroke have muscle weakness contralateral to the brain lesion, which causes problems in functional tasks like balancing, walking and transfers. Strength is proved to be affected by muscle length and this length-dependency of force generation contributes to the torque-angle relationship found in healthy humans (1), which is an important feature, since a whole range of muscle-lengths is used during daily activities. In stroke patients, knee extensor muscle function appears to be more affected when the knee is in the last 0-15º of extension (2). However, knowledge about possible length-effects of the thigh muscles, which are very important for mobility in daily life, is not available. Therefore, the purpose of this study was to investigate whether muscle function is selectively more affected as result of stroke at lower lengths of the thigh muscles and further to determine whether this selective weakness can be attributed to impaired activation at different muscle lengths. Therefore, maximal voluntary isometric torques of knee extensors and flexors were measured in 3 knee angles (30, 60 and 90º) in 14 stroke patients (bilaterally) and 12 healthy control subjects. Simultaneous measurements were made of agonist torque and surface EMG (sEMG) from agonist and antagonist muscles. Maximal voluntary torque and sEMG data were normalized to the values obtained at 60º knee angle for extension and 30º for flexion. At 30º knee angle, the extensor torque of the paretic lower limb (PL) was 73% of the torque of control subjects and knee flexor torque at 60º and 90º knee angles was 64% and 45% of control subjects, respectively. Thus, muscle function was selectively affected at lower muscle lengths of the knee flexors and extensors as result of stroke. Normalized knee extensor sEMG was significantly lower in P compared to controls (~71%) at 30º knee angle. Although not significant, mean values for the paretic knee flexors muscles in 60º and 90º were ~79% and ~67% of control, respectively. It is concluded that as result of stroke the lower muscle torque at lower muscle lengths of the knee extensors is caused by a length-dependent lower voluntary activation capacity, which may also be the case for the flexor muscles. From these results, it is recommended to investigate the role of specific training of the knee flexors and extensors of the (paretic) lower limb in especially the shortened position to improve the recovery of function after stroke.
MOTOR LEARNING THERAPY IN PARKINSON’S DISEASE: A LONGITUDINAL TRIAL

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Idiopathic Parkinson’s disease (PD) is a neurodegenerative disorder. Apart from pharmacological treatment, movement therapy shows positive effects on motor symptoms. There is evidence that automated movements of PD patients rely on impaired neural networks subserving the basal ganglia. Replication of these impaired movement patterns will probably not have a great effect in movement therapy. Therefore, we raise the hypothesis that, in addition with pharmacological treatment, movement therapy with a high demand on motor learning is more effective in maintaining motor performance of mild to moderate affected PD patients than movement therapy with well-known motor tasks.

Methods: 30 PD patients on stable medication (6.5±10 years, stage 2-2.5 according to Hoehn & Yahr stage) were included as subjects. The patients were tested in equal intervals of three weeks over a period of 9 weeks (4 baseline tests) before starting the training interventions. Subsequently they were divided according to sex, age, and physical activity level into training group A (steady contents therapy, consisting of gait, endurance, strength, flexibility training) and group B (new contents therapy, composed of motor learning of new and alertness demanding impulses). During the 12-week training period, patients were examined in the same intervals as during pre training (4 training tests). We collected norm data from 15 healthy age matched adults (64±4 years) that completed the test protocol once. The test protocol included biomechanical analysis of fine motor dexterity, reaction and aiming tasks, fast repetitive movements, postural stability, activities of daily living like standing up and gait using electromyography and goniometry. Beside this, a neurologist assessed the disease score (UPDRS, Unified Parkinson Disease Rating Scale) in the same intervals.

Results and Discussion: Neurological measures of the UPDRS reveal a decline in motor performance during the test period. Biomechanical parameters like muscle onset, movement time and movement precision in the acyclic movements aiming and reacting are good predictors to detect differences between healthy and neurological disabled individuals. Improvements during the therapy period could be detected in group A. Electromyographic parameters e.g. co-activation of flexor and extensor muscles in cyclic movements (hand tapping/ping/gait) reveal changes during the training period and can be used to detect differences between the more and the less affected body side of the patients. Modulations on the kinematic level were observed, regarding variability, and movement amplitude in gait. Differences between the groups are not consistent in all test situations, suggesting that different therapy strategies and/or diverse contents result in different effects on motor performance of the patients. However, we assume that the use of the spinal motor neuron set via unimpaired pathways can be accounted for changes on neuromuscular level that occurred.

EVALUATION OF A PROGRAM OF ADAPTED PHYSICAL ACTIVITIES FOR PATIENTS WITH CHRONIC LOW BACK PAIN WHO COMPLETED A FUNCTIONAL MULTIDISCIPLINARY REHABILITATION

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INTRODUCTION

Low back pain is a major health and socioeconomic problem in Western countries and is associated with high costs for the individuals and the health care system [1]. Among the many treatment modalities, functional multidisciplinary rehabilitation (FMR) seems to be the best strategy [2]. Post-FMR, the patient traditionally manages the problem himself with his general practitioner. The aim of the present study was to compare, after a FMR, the effects of the traditional follow-up with the effects of a program of adapted physical activities (PAPA) on the patients’ symptoms and functional status.

METHODS

105 chronic low back pain patients having completed a 3 week FMR were randomly assigned to PAPA or a control group (classical follow-up). PAPA included 24 exercise sessions during 12 weeks. Each session lasted 1.5 hours and included warm-up, strengthening, cardiovascular endurance training and passive stretching under the supervision of a sport therapist. Patients underwent evaluations of trunk muscle endurance (Shirado and Sörensen tests), spinal mobility (Modified-modified Schöber and finger-to-floor tests), cardiovascular endurance (Modified Bruce test), and pain (Visual Analog Scale) at T0 (beginning of FMR), T1 (end of FMR) and T2 (end of PAPA/control). Questionnaires measuring disability (Oswestry) and quality of life (SF-36) were filled in at T1 and T2. Wilcoxon and Mann-Whitney tests were used for statistical analysis of SF-36, Friedman and Mann-Whitney tests for pain and all physical condition parameters, and t tests for Oswestry.

RESULTS

Between T0 and T1, both groups significantly improved on all measured parameters except Modified-modified Schöber. Between T1 and T2, all improved physical parameters were stabilised except the Modified Bruce test which significantly decreased in both groups. A significant improvement was noticed in 6 of the 8 scales of the SF-36 test for the experimental group and 3 scales for the control group. Oswestry significantly decreased for the experimental group but not for the control group. No between groups differences were found.

DISCUSSION/CONCLUSION

As expected, FMR lead to a significantly improved functional status of the patients. Following FMR, PAPA had significantly better effects on disability and quality of life than the classical follow-up. The effects on physical condition and pain were comparable. These short term results will be completed by a 1-year follow-up which is currently underway.

In conclusion, experimental and control groups both maintained the main functional improvements due to FMR after 3 months, but patients who followed PAPA also significantly improved quality of life and decreased disability, which should reduce absenteeism from work and health care costs.

References.
COLD WATER CRYOTHERAPY AS A TREATMENT FOR MUSCLE SORENESS AND MUSCLE DAMAGE

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Recovery from exercise is an increasingly important part of elite athletic performance. Cryotherapy is one treatment that has gained widespread popularity over recent years. However research into its benefits has provided equivocal results (Wilcock et al., 2006). The purpose of this study is to investigate the effectiveness of 4 minutes of cold-water cryotherapy as a treatment for muscle soreness and muscle damage. Twelve untrained volunteers, (7 male, 5 female) aged 20y (±1.2y) performed 100 maximal eccentric contractions of the knee extensors of one leg on an isokinetic dynamometer. Three weeks later they performed an identical bout using their contralateral leg. Following the bout they were treated either with 4 minutes standing in a circulating water cryotherapy tank (Hydrotherapy Solutions, MCL, Co. Tipperary, Ireland) or warm immersion (CON) immediately after and at 24, 48 & 72h after exercise, in a randomised crossover design. The CRYO water temperature was set at 6±1°C, the CON water temperature was 19±1°C. Isometric Maximal Voluntary Contraction (MVC) force, maximal isokinetic force (both concentric and eccentric), electrical stimulation force ratio (20Hz,50Hz) and muscle soreness (SOR) acted as indirect markers of muscle damage and were assessed before and on the days following the damaging protocol. Results were compared using repeated measures ANOVA.

The damaging protocol proved effective, inducing a significant decrease in MVC (P<0.001) in the days following the exercise bout. The CRYO group recorded a Day 3 mean MVC of 551N (±296N), 78% of pre-test! with the CON group recording a Day 3 mean MVC of 513N (±251N), 77% of pre-test. Maximal eccentric torque (P<0.05) and electrical stimulation force ratio (P<0.05) also decreased significantly over time. Perceived muscle soreness scores increased significantly post exercise bout (P<0.05) to 160 (±120; arbitrary value) for the CRYO group on Day 4 and to 157(±113; arbitrary value) for the CON group on Day 3. However, while both treatment groups displayed significant signs of muscle damage on the days following the exercise bout no significant differences were found between treatment groups for the variables measured.

Therefore, cold water cryotherapy when compared to immersion in room temperature water was not effective in reducing muscle soreness or altering changes in indirect markers of muscle damage. It is possible that other combinations of immersion durations or water temperatures might produce differing results.

References.
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OP-SM01 Sports Medicine 1

ALTERATIONS OF SEVERAL SEMEN PARAMETERS AMONG PRACTITIONERS OF THREE DIFFERENT TRAINING MODALITIES

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INTRODUCTION

Sports activities are in rising demand since physical exercise is promoted for improving life quality, but without an adequate knowledge negative side effects may appear. A number of studies report effects of exercise on reproductive health, association mainly assessed in females due to unequivocal symptoms. Later, alterations in male athletes’ reproductive function were also reported with exercise volume thought to have greater impact; intensity was suggested later as equally or more deleterious than volume(1). We hypothesize that continued practice of different modalities, due to inherent characteristics (volume, intensity, etc.), can result in differences in semen parameters. Thus, it is the aim of this study to analyze the semen profile of three populations with different type and level of physical activity.

METHODS

Semen samples of 16 physically active subjects (PA), 14 water polo players (WP), and 15 triathletes (TA) were evaluated. The exclusion criteria were any factors that could interfere with semen production. The inclusion criteria were: not having any exclusion criteria, mini-mum practice of 3 hours/week and VO2max >/= 40 ml/min/kg. Macroscopic and microscopic observations of physical and qualitative parameters of sperm were performed (3-6 days of abstinence) assessing ejaculate volume (ml), sperm concentration (million/ml), total sperm number (million), and velocity type (a, b, c, d) according WHO’s guidelines. One-way ANOVA showed statistical differences for age, thus ANCOVA was used for further comparisons. The pos-Hoc comparisons used the Bonferroni correction.

RESULTS

Sperm concentration, total sperm number, and type a, b and d showed differences (P<0.05); no differences were observed in ejaculate volume or type c velocity. Sperm concentration, total sperm number, and type b velocity values were higher in PA than in TA (P<0.05). Type a velocity was lower in WP than PA and TA (P<0.05). On the other hand, the number of immotile sperm (type d velocity) was higher for TA than PA (P<0.05).

DISCUSSION AND CONCLUSIONS

Our main finding is that there are differences in semen parameters among the three groups. The PA group shows a trend for higher values, in agreement with results reported by other authors, and also reported previously by our group. The TA group shows poorer parameters, TA has greatest training volume and intensity, which agrees with the volume threshold hypothesis. Likewise, some studies with bikers, runners, and swimmers report some differences in semen parameters. In conclusion, there are differences in the seminalogical profiles of individual exercising in different modalities; those systematically undergoing high training loads showed lowered values for semen parameters. However, a less demanding activity does not seem to alter them.

References.
PHYSICAL ACTIVITY, ENERGY INTAKE AND BODY FAT AND ITS RELATION TO AEROBIC FITNESS IN ADOLESCENTS

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Background: Aerobic fitness is associated with physical activity in adults, whereas results are conflicting among children and adolescents probably due to methods of physical activity and aerobic fitness measures. The present study aimed to determine whether objective measured physical activity, energy intake and body fat is related to aerobic fitness in adolescents with and without asthma.

Methods: 174 adolescents [3-14yrs], 52 with current asthma (40 boys), 43 with asthma ever (25 boys) and 79 controls (41 boys) performed maximal running on a treadmill with oxygen consumption measurements. Peak oxygen consumption was defined as aerobic fitness. Sum of four skinfolds were measured, and the participants wore an activity monitor, SenseWearTM Pro2 Armband (BodyMedia, Inc., Pittsburgh, PA, USA), and recorded diet using validated pre-coded food diaries for four consecutive days. Analysis of covariance was performed adjusting for gender, age and pubertal stage in all models.

Results: We found no indications of any differences between adolescents with and without asthma in physical activity variables, aerobic fitness, sum skinfolds or energy intake. Consequently, we present analyses for pooled data only. Very vigorous physical activity alone explained 17% of the variability, and 60minutes daily increase in very vigorous physical activity was associated with 5.1 (95%CI: 2.7-7.6) ml/min/kg increase in aerobic fitness (p<0.001). Moderate and vigorous physical activities were not included in the final model (not significant). An inverse association was found for sum of four skinfolds and 10 mm reduction in sum of four skinfolds increased aerobic fitness with 2.9 (2.1-3.7) ml/min/kg (p<0.001). There was a positive association between energy intake and aerobic fitness (p=0.04). The variables included in the final model explained 56% of the variability in aerobic fitness.

Conclusions: The number of hours with very vigorous intensive physical activity is associated with aerobic fitness, although weakly. Sum skinfolds is associated with lower aerobic fitness.

IMPACT OF POLLUTION, HEAT AND HUMIDITY ON THE ACTIVATION OF AIRWAY INFLAMMATION IN ATHLETES PERFORMING AN 8 KM TIME TRIAL RUN

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One of the primary pollutants of concern to athletes competing in the Beijing Olympic Games 2008 will be the oxidant gas ozone (O3), especially when combined with the heat and humidity (H) of the summer months. Ozone has been shown to induce lung inflammation and decrease lung function. Clara cell protein (CC16) has been shown to be a sensitive biomarker of lung injury that occurs with exposure to pollutants. Together with other inflammation markers, such as IL-6, IL-8 and LDH, CC16 can be measured in nasal lavage, reflecting the inflammatory process in the upper respiratory airways.

AIM: To investigate the impact of a hot, humid and ozone-polluted environment during an 8 km time trial run on the activation of inflammation measured by the concentration of CC16, IL-6, IL-8, LDH and neutrophil count in nasal lavage. Additionally, C-reactive protein (CRP) and plasma CC16 were also measured.

METHODS: Using a single blinded randomized design, 10 male endurance athletes (mean (SD): 24 (5) years; 73 (7) kg; 181 (8) cm; 64.4 (3.6) ml/min/kg, 56% H, 54% H) performed an 8 km time trial run in four different environmental conditions: 20 degrees Celsius (Control), 20°C + 50% H + 0.10 ppm O3 (Control + O3); 31°C + 70% H (Heat); 31°C + 70% H + 0.10 ppm O3 (Heat + O3). The athletes' performance was measured by the total time to complete each trial. Nasal lavage and blood samples were collected post-exercise. Data was analysed using repeated measures ANOVA with Tukey's post-hoc test.

RESULTS: The total time to complete the Heat (32m35s) and Heat + O3 (33m09s) trials were significantly higher when compared with the Control (29m33s). Even though there is no statistical difference between the Heat and the Heat + O3 trials, the time to complete the latter was, on average, 3.4 sec longer when compared to the former. In a competitive 8 km race environment, this time difference could be very important. Nasal lavage CC16 levels showed an increase in the Heat + O3 trial compared to the Control; however, no differences were found in the plasma concentration. The IL-6 levels could not be measured in the nasal lavage and no differences were found in either the IL-8 or in the LDH concentration. There was an increase trend in the CRP plasma levels for the ozone trial and the Heat trial, with the Heat + O3 presenting the highest CRP concentration. Even though there was no statistical increase in the neutrophil counts, an increase in all trials when compared to the Control was observed. In addition, some athletes appeared to experience different toxic effects when exposed to ozone, suggesting an individual intrinsic response to the inflammatory effects of this pollutant.

CONCLUSION: In the conditions studied, ozone alone did not impair performance or activate lung inflammation. Nevertheless, when combined with heat and humidity, significant performance decrements occurred together with an increase in some inflammatory markers.

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THE EFFECTS OF EXERCISE INDUCED MUSCLE DAMAGE ON SENSORIMOTOR AND NEUROMUSCULAR PERFORMANCE IN MALES

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Optimal functioning of the musculature in a timely manner is paramount to the dynamic stabilisation of synovial joints. It is plausible that exercise-induced muscle damage (EIMD) might be an important determinant of the extent of injury-risk and influence performance capabilities including muscle activation patterning and sensorimotor control at the extremes of the joint’s range of motion. The aim of this study was to assess the effects of EIMD on sensorimotor and neuromuscular performance in males.

Peak force, electromechanical delay, sensorimotor performance (force error relative to a ‘blinded’-target) capabilities and descriptive markers of EIMD (perceived muscle soreness, passive hip flexibility) were assessed in ten males (age: 20.9 ± 2.3 yr; height: 1.78 ± 0.06m, body mass: 72.3 ± 7.4kg [mean ± SD]) prior to and at 0.5h, 24h, 48h, 72h following a damaging exercise protocol incorporating six sets of 10 isokinetic eccentric contractions of the ipsilateral knee flexors. Neuromuscular and sensorimotor assessments were completed at 30 degrees of knee flexion. Results showed that while performance capabilities remained constant in the control period and contralateral control leg, the EIMD intervention provoked reduced performance of the involved leg compared to pre-intervention levels in peak force (33.7%: 259.2 ± 69.8 N versus 166.7 ± 45.1 N [pre- versus post-48h], F4,36) = 3.3; p<0.05), passive hip flexibility (22.5%: 0.268 ± 0.083 m vs. 0.205 ± 0.064 m [pre- vs. post-72h], F4, 36) = 10.9; p<0.001), electromechanical delay (32.7%: 55.1 ± 5.2 ms vs. 84.0 ± 5.9 ms [pre-
MUSCULOSKELETAL INJURIES ON PROFESSIONAL DANCERS IN PORTUGAL

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Introduction.

Dance is a predisposing profession to the occurrence of injury, being physically and psychologically demanding, with different risk factors. General purpose: To determine the annual prevalence of injuries on professional dancers in Portugal and to characterise associated its risk factors.

Methods.

In this epidemiologic retrospective study, each participant completed a self-completing questionnaire that collected information about the personal data, professional activity and occurrence of injuries. 193 questionnaires were distributed among 17 professional dance companies. We have used the Spearman correlation test and the Chi-square association test to treatment of the data. The significance level was decided from p<0.05.

Results.

The population consisted of 1,791 skaters and 2,347 riders. They sustained respectively 209 and 341 injuries that were registered in BIS.

The overall incidences injuries per 1,000 hours of sport were for ice skating 3.7 and for horseback riding 1.1. The incidence during matches was higher than during training: ice skating training 2.1 and match 8.6 and horseback riding training 0.9 and match 2.4.

For both sports most injuries were new, acute (skating 73%, riding 90%), often falling accidents (skating 37%, riding 72%) and haematomata/contusion/bruises (often in combinations with other diagnosis) are common (skating 30%, riding 56%).

The most injured body part in skating is the knee (20%), acute injuries are also often head injuries (8%) and overuse injuries are often localised in the lower back (16%). In riding the most injured body parts are the head (16%) and also the lower back (15%). A striking difference is: skaters don't wear helmets (2%) and riders do wear helmets (81%).

Conclusions.

In general the web based registration works well and provides more detailed information on sports injuries in ice skating and horse back riding than other Dutch registration systems. The Royal Dutch Skating Union and the Foundation Safe Horse Back Riding can improve their preventive policy by

WEB BASED SPORTS INJURY REGISTRATION; ICE SKATING AND HORSEBACK RIDING

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Background

The number of sports injuries in the Netherlands is about 1,5 million every year. The yearly costs are high and sports injuries are an important cause for people to stop participating in sports. For the Ministry of Health, Welfare and Sports these are important reasons to invest in adequate registration and prevention of sports injuries.

TNO developed a web based registration and information system called BIS (Injury Information System) to gain insight in the frequency, the characteristics and the consequences of sports injuries and the effects of preventive measures. BIS is operational for 18 sports: badminton, dancing, fitness, futsal, gymnastics, hockey, horse back riding, ice skating, judo, karball, running, lamateur and professional, skating, soccer, squash, swimming, tennis, volleyball and winter sports. The results for ice skating and horseback riding will be presented.

Methods.

The study was designed as a retrospective cohort study of sports injuries by means of a web-based survey. A cohort of skaters and a cohort of riders were asked to fill in a web-based questionnaire. Information was gathered on background, sports injuries and recovery. In the communication to the skaters and riders safety was emphasized to stimulate not only injured but also not injured skaters and riders to fill in the questionnaire. The skaters were licence holders of the Royal Dutch Skating Union, members of skate schools and other skate clubs. The riders were visitors of the Horse Event in Deurne in the Netherlands, members of the newsletter Horses.nl and members of a newsletter for owners of riding passports of the Federation of Dutch Riding Accommodations.

Results.

The population consisted of 1,791 skaters and 2,347 riders. They sustained respectively 209 and 341 injuries that were registered in BIS.

For both sports most injuries were new, acute (skating 73%, riding 90%), often falling accidents (skating 37%, riding 72%) and haematomata/contusion/bruises (often in combinations with other diagnosis) are common (skating 30%, riding 56%).

The most injured body part in skating is the knee (20%), acute injuries are also often head injuries (8%) and overuse injuries are often localised in the lower back (16%). In riding the most injured body parts are the head (16%) and also the lower back (15%). A striking difference is: skaters don't wear helmets (2%) and riders do wear helmets (81%).

Conclusions.

In general the web based registration works well and provides more detailed information on sports injuries in ice skating and horse back riding than other Dutch registration systems. The Royal Dutch Skating Union and the Foundation Safe Horse Back Riding can improve their preventive policy by

VERSUS POST-0.5h [F(4,36) = 6.5; p <0.01] and sensorimotor performance (5.8% [0.3 ± 3.7% vs. 6.1 ± 5.9%] [pre- versus post-24h]; F(4,36) = 5.9; p <0.05). Performance capabilities had not recovered significantly 72 hours after the damaging protocol.

The EIMD-related sensorimotor and neuromuscular performance deterioration was prominent for 72 hours and was sufficiently potent to raise concerns about a commensurate loss of capability for rapid and dynamic stabilisation of synovial joints during episodes of threat from injury.
In many daily activities as well as during sport, there is an interaction between the human system and elastic or viscoelastic surfaces. Although in many cases, such as the interaction human-shoe, the energy exchange is too small to have a direct effect on energy expenditure, in other cases the interaction between the surface and the human body has a significant influence on performance. The human system is able to adjust its behavior to the different surfaces which it is interacting with or use these systems to improve their own motor performance. Precisely this has been happening in the sport context, where modifying the interactions between athlete and elastic or viscoelastic surfaces is able to adjust its behavior to the different surfaces which it is interacting with or use these systems to improve their own motor performance. In a series of experiments we examined the effect of the interactions between athlete and elastic surfaces (i.e. high bar, uneven parallel bars and pole vault) on the performance capability. Athletes use the elastic surface during this interaction by (a) store part of their kinetic energy as strain energy and convert this strain energy into potential energy and (b) produce muscular work to increase the total energy.

Furthermore, it is well accepted that the non rigidity of the tendon and aponeurosis allow the muscle fibres to contract at lower shortening velocities than the whole muscle-tendon unit and as a consequence of the force-velocity relationship their force generating potential will be higher. Due to the non rigidity of the tendon and aponeurosis, when the muscle-tendon unit is elongated, strain energy can be stored. This way the whole energy delivered during the shortening of the muscle-tendon unit can be enhanced. Therefore, in a second series of experiments we examined the mechanical properties of the lower extremities muscle-tendon units (MTU) from athletes displaying different stiffness in the triceps surae MTU and a higher compliance of the quadriceps tendon and aponeurosis at low level tendon forces. The faster sprinters exhibited a higher elongation of the vastus lateralis (VL) tendon and aponeurosis at a given tendon force and a higher maximal elongation of the VL tendon and aponeurosis during the MVC. Furthermore, the maximal elongation of the VL tendon and aponeurosis showed a significant correlation with the 100 m sprint times ($r = -0.567$, $P = 0.003$). It has been supposed that, the more compliant quadriceps tendon and aponeurosis will increase the energy storage and return as well as the force potential of the muscle due to the force-velocity relationship. A higher force potential of the muscle would decrease the volume of active muscle at a given force decreasing the cost of force production, or increase the force at a given activation.
BIOMECHANICS IN ALPINE SKIING: APPLICATION AND SCIENTIFIC SUPPORT IN ELITE SPORT

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Modern alpine ski racing is characterized by high acting forces in combination with the challenge of keeping the balance and the ideal loading of the ski. Therefore biomechanical diagnostics on the one hand is focused on those acting forces and the corresponding strength abilities of the athletes, on the other hand is trying to measure, evaluate and improve movement abilities during skiing. This paper tries to show the application of different biomechanical methods and results in the concept of the scientific support of the German Ski Team in cooperation with the Olympia-Aetzpunkt Bayern and the Technische Universität München.

To measure the acting forces during skiing two general systems are used. The first consists of a force plate mounted between ski and binding collecting data of forces (Fz) and moments (mx, my). The raw data are transmitted wireless, evaluated in real-time and synchronized to the video recording. Right after the run, information about the loading position and posture can be given to racers and coaches. The second measurement system is a pressure insole device (Parotec, Paromed, Germany) which is inserted into the ski boots. Data are stored in a data logger and the runs are video recorded. The evaluations can be presented in breaks of the training session or after the training. For certain analyses additionally knee angles are measured by goniometry.

To assess the individual strength abilities of the racers maximal isometric (knee angles: 90°, 120°) and concentric/eccentric tests in different angular velocities (45°/s, 90°/s, 180°/s) on a leg press (Desmotronic, Schnell, Germany) are performed. Additionally speed strength is measured by common jumping tests as squat jumps and counter movement jumps on a force plate.

Results of the measurements in skiing approved the amount of acting forces known from literature in different disciplines in a range of 1500 up to 3500 N. Model based calculations also showed, that the racer has to sustain average maximum forces up to 2.5 g in GS and SG. Concerning the movement behaviour, the trainability of ideal positions in straight gliding could be shown as well as the importance of certain movement patterns during turns.

Relating the individual strength abilities to the measured acting forces in skiing by using different custom built models, the muscular expenditure of individual force production in skiing was estimated. Results show that in all measured cases the intensity of the estimated muscular expenditure in turns is higher than 50% of maximum tested in lab. The highest expenditure was recorded in SL with maximal intensities up to 100% depending on very low knee angles in some situations. However, the time of this maximum force production in SL is comparatively low. Averaging the values over 20s, the mean expenditure in all disciplines is about 40%. This indicates the high energy demands and needs of specific strength endurance abilities in alpine ski racing.

Invited symposia (IS)

IS-PM03 Features of the metabolic syndrome in children

PHYSICAL ACTIVITY AND CLUSTERED CARDIOVASCULAR RISK. WHY DO RISK FACTORS CLUSTER AND HOW MUCH ACTIVITY DO CHILDREN NEED? THE EUROPEAN YOUTH HEART STUDY

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Background Atherosclerosis develops from early childhood. Physical activity (PA) may positively affect this process. The aim of the present study was to assess the associations of objectively measured PA with clustering of cardiovascular disease (CVD) risk factors in children and derive guidelines based on the analysis. Possible explanations for risk factors to cluster will be discussed.

Methods Cross sectional study of 1732 9- and 15-year-old randomly selected school children from Denmark, Estonia and Portugal. Risk factors included in the composite risk factor score (mean of z-scores) were systolic blood pressure, triglyceride, ratio total cholesterol:high density lipoprotein (HDL), insulin resistance (HOMA), sum of four skinfolds, and aerobic fitness. Subjects having a risk score above 1SD of the composite variable were defined to be at risk. PA was assessed by accelerometry. Findings Odds ratios for having clustered risk for ascending quintiles of counts per minute (cpm) were 3.29 (95% CI: 1.96-5.52), 3.13 (95% CI: 1.87-5.25), 2.51 (95% CI: 1.47-4.26), and 2.03 (95% CI: 1.18-3.50), respectively, compared to the most active quintile. The first to the third quintile of PA had elevated risk in all analyses. Fitness showed the same strength of association with the clustered risk score as did skinfold and waist circumference. Physical activity was associated with clustered risk even after adjustment for fitness and fatness with an odds ratio for the upper quintile of 1.81 (95% CI: 1.18-2.76).

Interpretation Clustered cardiovascular risk seems to be a plausible biological measure of metabolic health condition. Many physiological mechanisms may be responsible for risk factors to increase simultaneously, but most are related to physical activity or training. Physical activity, fitness and fatness may partly affect these mechanisms independently.

PREVALENCE AND CORRELATES OF THE METABOLIC SYNDROME IN CHILDREN

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The metabolic syndrome (MS) comprises visceral adiposity, hypertension, glucose intolerance and dyslipidaemia (elevated triglycerides and decreased HDL-cholesterol levels). The coexistence of multiple metabolic risk factors has recently been observed in children, likely driven by the increasing prevalence of obesity. However, until recently, no standard definition of the MS for use in paediatric populations was available. Consequently, researchers have used a plethora of definitions with prevalence figures of the MS in young people varying between 0% and 60%. Recently the International Diabetes Federation (IDF) released its guidelines for defining and diagnosing the MS in young people.

To develop a simple unified definition which can be used as a diagnostic tool for early detection of the MS in young people. According to this definition the prevalence of the MS was 5.2% in 14 year old US adolescents and 7.1% in 16 to 17 year olds US adolescents using data from the NHANES 1999 to 2004. Comparable data in European youths participating in the European Youth Heart Study suggest a substantially lower prevalence of 1.4% in the 15 year old boys and girls. A direct comparison between the 14-year-old US and the 15-year-old European adolescents revealed that these differences are explained by a higher prevalence of central obesity in US compared with European youth (25.6% vs. 16.4%). This despite remarkably higher cut offs for central obesity used in US adolescents. The
prevalence of hypertriglyceridemia (10.0% vs. 3.3%), and low HDL cholesterol levels (18.6% vs. 11.0%) were higher in US compared with European adolescents, whereas the prevalence of elevated blood pressure (4.9% vs. 5.3%) was similar. In opposite, the prevalence of hyperglycemia was slightly higher in European compared with US adolescents (17.6% vs. 14.2%). Similar to the observations in US youths, the prevalence of the MS increased with age, and was higher in males compared with females. Even if the absolute prevalence of the MS was low, more than 15% European youth were categorised at risk of developing the MS as they are either centrally obese (≥90 percentile for waist circumference) or had two or more of the other risk factors.

Cardio-respiratory fitness (OR=0.22, 95% CI: 0.07, 0.67), physical activity (OR=0.996, 95% CI: 0.993, 0.999) and maternal BMI (OR=1.12, 95% CI: 1.02, 1.2) were all independently associated with the MS after adjustment for sex, age group, study location, birth weight, and sexual maturity in European youth. Increasing daily moderate intensity physical activity by 10% to 20% above current levels was associated with a 33% risk reduction.

In summary, the prevalence of the MS is low in European youth but approximately 15 to 20% may be at risk of developing the syndrome. High maternal BMI, low levels of physical activity and cardio-respiratory fitness independently contribute to the MS in youth.

IS-PM03-3

PHYSICAL FITNESS AND CLUSTERED CARDIOVASCULAR RISK IN CHILDREN

Anderssen, S. NO

Without abstract submission!!

Invited symposia (IS)

IS-SH04 Physical activity and children's health

CHILDREN'S PHYSICAL ACTIVITY: FINDINGS OF ACCELEROMETRY AND GPS MONITORING

Cooper, A., Page, A., Jago, R., Hillsdon, M.

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There is growing recognition of the role of the environment in influencing health and health behaviours, and an environment that encourages excess energy intake and reduced energy expenditure is widely considered to be a driving force behind population-wide weight gain. Expert bodies have highlighted the importance of environmental factors on obesity and there have been strong calls to focus on changing the environment. Physical activity is seen as an important behaviour to target for intervention and one behaviour that is readily amenable to change is active travel to school. Young people who walk or cycle to school have been shown to be more active than those travelling by car, often to a greater extent than may be explained by the journey itself (1,2). One potential reason for this may be greater play after school, and preliminary data suggest that boys who walk to school may spend more time in outdoor running/chasing games than car travellers (3).

To date, few studies have used objective measurement to investigate physical activity in the environment. The PEACH project is funded by the UK National Prevention Research Initiative to explore changes in physical activity behaviour and the personal, social and environmental correlates of physical activity across the transition from primary to secondary school. Thirteen hundred final year primary school children are currently being recruited in Bristol, England, and will be assessed 1 year later in their first year of secondary school. At both time points the participants wear an accelerometer (Actigraph GT1M) for 7 days to provide an objective measure of physical activity and the environmental context in which this activity takes place.

This presentation will describe the methodology for integrating accelerometer and GPS data recorded at 10-second epochs, and will present preliminary data from the PEACH project describing the association between active travel to school, children's physical activity and the environmental context in which this activity takes place.

References


ENVIRONMENTAL DETERMINANTS OF PHYSICAL ACTIVITY IN CHILDREN: FINDINGS FROM THE PEACH PROJECT

Page, A., Cooper, AR., Jago, R., Hillsdon, M.

The University of Bristol, United Kingdom

There has been considerable interest in recent years in the role of the environment in influencing physical activity. Studies of the effects of the environment on levels of physical activity have largely investigated perceptions of the environment. These perceptions include safety, availability and access, convenience, local knowledge and satisfaction, urban form, aesthetics, and supportiveness of neighbourhoods. However data outside the US and Australia is limited. This presentation will investigate the environmental factors which relate to objectively measured physical activity in children aged 10 to 11 years involved in the PEACH Project.

The PEACH project is funded by the UK National Prevention Research Initiative to explore changes in physical activity behaviour and the personal, social and environmental correlates of physical activity across the transition from primary to secondary school. Thirteen hundred final year primary school children have been recruited in Bristol, England, and will be assessed 1 year later in their first year of secondary school. At both time points the participants wear an accelerometer (Actigraph GT1M) for 7 days to provide an objective measure of physical activity and also wear a personal Global Positioning System (GPS) receiver after school. Participants also complete a detailed computerised questionnaire to assess personal, social and physical environmental determinants of physical activity.
Data presented will include measures of ‘independent mobility’ or freedom to roam unsupervised and how these relate to other more established perceptions of the environment. The presentation will also outline how perceptions of the environment can be linked to more objective data provided by the GPS to provide, for example, more expansive measures of time outside and its relationship to physical activity and adult supervision.

References
The Peach Project (www.bris.ac.uk/enhs/PEACH)

ASSOCIATIONS BETWEEN CHILDREN’S ACTIVITY AND FEATURES OF THE METABOLIC SYNDROME: EFFECT-MEDIATION BY FITNESS AND FATNESS

Brage, S.
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The metabolic syndrome may be defined as the co-existence of multiple metabolic risk factors. In adults, the syndrome increases the risk of cardiovascular disease and type 2 diabetes.

It has recently been recognized that metabolic risk factors also cluster in young people but less so in those who are physically active. These associations may be mediated or indeed modified by fitness and fatness, which would suggest that primary prevention could be targeted at certain high risk groups to maximize cost-effectiveness. The interpretation of existing data which forms the basis of such public health strategies is, however, made difficult by different definitions of metabolic dysfunction and differential measurement error and sources of bias in the exposure variables. The reason why these issues are important is that prevention strategies may look rather different if the primary purpose is to improve fitness and/or promote weight loss, compared to adapting a more general physically active lifestyle without any change in fitness or fatness.

This talk will discuss how these issues may be addressed in the interpretation of data from population studies using data from the European Youth Heart Study.

Oral presentations (OP)

COACHING THE SCANDINAVIAN WAY? CASE STUDIES OF THE PEDAGOGY OF SUCCESSFUL SCANDINAVIAN TEAM SPORT COACHES

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Three recognized professional coaches in Norway and Denmark, having coached female national teams to Olympic and/or World Championship success, was selected as informants in this study. The aim of the study was to map and analyze these coaches’ pedagogical practices, particularly in terms of (a) their facilitation of a holistic learning environment, and (b) their use of problem based learning. The coaches and their teams were observed during training camps and matches, whilst the coaches were also subjected to in-depth interviews.

The three coaches were strategically selected to be able to study successful coaches who have adopted a more player-centered and holistic philosophy and approach than their colleagues. As a result of the internal logic of competitive sport, and the technologization processes going on, top level sport of today might constitute a single-tracked and even dehumanizing environment to the athletes. Within elite sport it is not easy for coaches to keep up a holistic approach to facilitate human development, even though recent coaching research has supported such an approach to the coaching process (Cushion, 2007). Investigating the three selected coaches might generate knowledge of how learning processes can be handled to combine success in elite sport with player development in a wider sense.

Analysis of the data identified four dimensions characterizing the coaches’ pedagogical practices. That is, they were (i) highly team-oriented, they initiated a variety of (ii) problem based learning situations, they organized activities to (iii) utilize and spread the qualities embedded in the team, and they strove to see each athlete as (iv) a ‘whole’ and individual person. Taken together their practices draw heavily on Lave and Wenger’s (1991) conception of situated learning within the team, and the coaches proposed learning as a process of participation in the community of practice. Emphasis was put on each player’s inclusion and contribution to the community, and the activities implied changing of locations, roles and constellations.

The pedagogical enterprise undertaken also brought consequences for the coaches’ role. Leadership was transformed from traditional instruction to emphasis on orchestration of team processes and optimizing the conditions for each team member to release their resources. Jones and Wallace’s (2005) conception of ‘coaches as orchestrators’ seems to fit well the practice of the three coaches under study, in terms of how they worked to influence and coordinate complex team processes.

References

PRE-DECISIONS, POST-DECISIONS AND BEHAVIOUR OF TOP HANDBALL COACHES DURING GAMES

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Introduction
We consider very important to analyse and reflect about the behaviour of Top Coaches. Research the behaviour of Handball Coaches during a Handball game, through observation, is a way to help the development of handball and the coaches education. We think that the context plays an important role in this matter.

Aim of the study
The purpose of this study is to find out if the coaches’ behaviour during a game and their decisions before and after the competition are consistent or if there are any changes.

Methods
Our sample was composed by 6 handball coaches, 18 handball games and 36 interviews from the 2000/2001 and 2001/2002 season. We observed 3 games from each coach. The training sessions and the games were video taped. The results from the observation were based on the total game and training time.

We used the SOTA observation system (18 categories). The development of the interview was based on a previously established script and on the SOTA observation system. A common tape recorder was used to record the interviews. We used the method of content analysis that allows inferences about the production conditions of the communications, based on quantitative indicators or others. We compared the behaviour of the handball coaches between the games using descriptive statistic (Schmitt & Hanke, 2001).

Results
The categories with the highest results are Silent Observation (49.78%) and Prescriptive Information (18.65%).

Before the game the coaches’ main decisions are: win the game, athletes have a good performance, give much prescriptive instruction, some questioning, some positive evaluative instruction, put the athletes in pressure during a long period of time and spend some time in silent observation. After the game the coaches’ main decisions were: the aim of the game was achieved, gave much prescriptive information, some questioning, put the athletes in pressure during a long period of time, positive and negative affective interactions, spend short time with his assistance coach, not much time in silent observation and there will be relation of this game with the next training sessions.

Discussion/Conclusions
Concerning the results we identified that the coaches decisions before and after the handball competitions and their behaviour are not very consistent. We suggest research on this two topics with increase the number of coaches, games and training sessions and in another sports.

References

SOCcer COACHAS’ INSTRUCTION TO PREPARE THE ATHLETES TO THE GAME
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We think it is essential that the coaches’ instruction during a competition reveals a high congruency, because with that he can help the players to achieve a higher performance. Therefore the aim of the present study is based on the comparative analysis of the soccer coach instruction, between different moments in the competition.

Twelve games were analyzed. Each competition contained 3 different moments: before game, during game and half time. Six soccer coaches were observed in male senior teams on 2nd B Portuguese League. We used the System Analysis of the Information in the Competition (SAIC) as an instrument to collect data and evaluate the Instructions. We used an event recording, which was afterwards used to codify all information units in agreement with SAIC adapted system with 3 dimensions: objective, direction and contents of information. To be able to prove the existing differences between the 3 different moments in the competition, the statistical test of wilcoxon was used, with the error probability (p-value) <=0.05.

Before the game Vs. During the game - regarding the objective of the instruction, we verify significant differences on the prescriptive category, although in both moments this instruction comprehended 80%, concerning the direction of the instruction, the results revealed a significant difference on the most important categories, the information before the game was mainly focused on the team and during the game focused on the player; concerning the contents of the instruction, we found significant differences, because before the game, it exist a supremacy of psychological than tactical contents, although in both moments more than 75% of the instruction belonged to this two categories.

Before the game Vs. Half time - concerning the objective, more than 80% of the instruction doesn’t reveal any differences, and it’s mostly prescriptive, concerning the direction of the instruction, more than 60% of the instruction doesn’t reveal any significant difference, regarding the contents of the instruction, we verified similar results of the last comparison.

During the game Vs. Half time - concerning the objective, in both moments more than 75% of the instruction is prescriptive; concerning the direction of the instruction, clearly exists a significant difference, so during the game the instruction is mainly focused on the player, while at the half time the coach focuses on the whole team or on various groups; concerning the contents of the instruction, the majority of the instruction doesn’t show significant differences.

In a competition the information that is instructed by the coach has a strong remark on prescriptive and descriptive information regarding its objective and the contents are mainly tactical and psychological. We found some important specification but when compared with other moments, we can assume that the soccer coaches demonstrate a high congruence profile of instruction in competition.

EVOLUTION OF THE PROFESSIONAL PERSPECTIVES OF PHYSICAL EDUCATION AND SPORT STUDENTS DURING THEIR UNDERGRADUATE STUDIES IN THE PUBLIC AND PRIVATE SECTORS 2ND STUDY
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This study represents the intermediate stage of a wider research that has as its main goal to perceive the transformations that take place in Physical Education students during their course, on their professional perspectives and conceptions concerning Physical Education and Sport. The socialization of a teacher is preceded by experiences that mark the form as the future teacher values the experiences of its undergraduate studies, being the experiences as students pointed out as the most relevant in the period of pre-socialization. On the other hand, the transition from university to school is accompanied by the difficulty of linking the perspectives, knowledge and action priorities transmitted by university to those conveyed by teachers in schools, the cooperating teacher included. It is crucial to understand the role of the undergraduate studies in the transformation of the perspectives resulting from pre-socialization and the adaptation to the perspectives of the professionals, in order to improve the quality of the intervention at the undergraduate level.

The sample is constituted by 246 pupils from the 1º year and 30 student teachers (in both cases 50% of ISMAI - private and FADEUP - public). In the first case it was employed an inquiry with open and closed questions. For the treatment of the closed questions we used

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the basic descriptive statistics, and for the open questions the NVIVO program was used. For the analysis of the student teachers’ perceptions the material came from the final reports. All the mentions to the cooperating teacher were looked for and later transcribed and introduced in the NVIVO program. The analysis of the student teachers’ perceptions with regard to determination, tolerance and prevention of doping on a national and international level. Considering the huge doping scandals of the last ten years, controls and sanctions could not reduce doping in sport in a sufficient amount. Besides repressive measures, prevention is the only additional possibility to minimize doping changing especially doping attitude and willingness of athletes. Further the Conventions claim, that States Parties should encourage sports organizations and anti-doping organizations to implement ongoing education and training programmes and to promote anti-doping research in all fields of prevention, such as health consequences, behavioural and social aspects. Additionally the World Anti Doping Code demands, that the stakeholders should plan, implement, evaluate and monitor information and education programs and promote such research. The Sport Science Information Forum SPORTIF of the BISP, and SPORTDISCUS of the Sport Information Resource Centre, SIRC, were analyzed focussing on prevention, doping, violence and 80 original papers and also related articles detected in review articles since 2000 were evaluated. A lot of material on doping prevention measures, presentations and papers, can be found free accessible in the internet, too. If they were published from Anti Doping Organisations or from other stakeholders in this field they were collected and evaluated using criteria according primary, secondary and tertiary prevention and contents, target groups, and kinds of measures. The collected and evaluated results will be presented and analyzed for additional necessities. Prevention of drug abuse and violence and health prevention will be compared and a common basis will be shown for use in doping prevention, too. A model of prevention measures including the primary, secondary and tertiary level will be shown with special aspect to the tertiary level. How we have to deal with athletes, who had doped to prevent relapses and avoid negative feedback to young athletes. The cooperating teacher and the supervisor distribute, now, this desideratum.

Belonging to two different institutions did not reveal to be a factor of differentiation relatively to previous conceptions about what it is a “good teacher”. Concerning the evolution from the 1st to the 2nd moment it is evident that: the factors related with the moral dimension, innovation, persistence, efficiency, devotion are little valued; the mastery of the teaching techniques is the most valued category and the student teachers recognize in the cooperating teacher a plurality of roles. The cooperating teacher is recognized as a person that supports them in the professional aspect as well in their personal and human aspects.

NEW ASPECTS IN DOPING PREVENTION

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The purpose of the Anti-Doping Convention of the Council of Europe and the International Convention against Doping in Sport is to promote the fight against doping in sport, with a scope on the reduction and elimination of doping in sport. The World Anti Doping Code claims measures with regard to detection, deterrence and prevention of doping on a national and international level. Considering the huge doping scandals of the last ten years, controls and sanctions could not reduce doping in sport in a sufficient amount. Besides repressive measures, prevention is the only additional possibility to minimize doping changing especially doping attitude and willingness of athletes.

Further the Conventions claim, that States Parties should encourage sports organizations and anti-doping organizations to implement ongoing education and training programmes and to promote anti-doping research in all fields of prevention, such as health consequences, behavioural and social aspects. Additionally the World Anti Doping Code demands, that the stakeholders should plan, implement, evaluate and monitor information and education programs and promote such research.

The Sport Science Information Forum SPORTIF of the BISP, and SPORTDISCUS of the Sport Information Resource Centre, SIRC, were analyzed focussing on prevention, doping, violence and 80 original papers and also related articles detected in review articles since 2000 were evaluated. A lot of material on doping prevention measures, presentations and papers, can be found free accessible in the internet, too. If they were published from Anti Doping Organisations or from other stakeholders in this field they were collected and evaluated using criteria according primary, secondary and tertiary prevention and contents, target groups, and kinds of measures.

The collected and evaluated results will be presented and analyzed for additional necessities. Prevention of drug abuse and violence and health prevention will be compared and a common basis will be shown for use in doping prevention, too. A model of prevention measures including the primary, secondary and tertiary level will be shown with special aspect to the tertiary level. How we have to deal with athletes, who had doped to prevent relapses and avoid negative feedback to young athletes. Finally the lack of knowledge to boost the effectiveness of preventive measures will be elaborated.

Oral presentations (OP)

OP-PM04 Physiology 4 - Neuromuscular

NEUROMUSCULAR FATIGUE DURING TRICEPS SURAE LOW-FREQUENCY ELECTRICAL STIMULATION IN SUBJECTS WITH DIFFERENT FORCE GENERATING CAPACITY

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Fatigue induced by neuromuscular electrical stimulation (NMES) is poorly understood. Furthermore, although recent researches give evidence for implication of different sites along the pathway of force production, the muscle factors susceptible to influence the response to electrically induced fatigue are still unknown. The purpose of the present study, therefore, was to identify the time course of neuromuscular changes during NMES according to muscle’s capacity to generate force.

Twelve healthy subjects with different force generating capacities (7 Strong (S) with mean torque during Maximal Voluntary Contraction (MVC) 88.8±1.6Nm and 5 Weak (W) with mean torque 64.4±3.2Nm) participated in an electrostimulation protocol for the triceps surae, composed of 3 series of 17 stimulation trains [4s ON - 6s OFF, pulse duration 450µs, frequency 30Hz, at maximal tolerated intensity]. Neuromuscular tests were performed before, during and immediately after the protocol. Torque and EMG activity of the gastrocnemius medialis muscle were continuously recorded. Alterations in muscle’s characteristics (excitability and contractile properties) were evaluated by analysis of the muscle compound action potential (M-wave) and twitch torque. Motoneuron excitability was assessed by the H-reflex, expressed in absolute value and normalized to M-wave maximal amplitude (respectively Hmax and H/M). Changes in the central command were assessed by using the twitch interpolation technique and the root mean square (RMS and RMS/M) obtained during MVC. MVC significantly decreased from the first 17-train bout and throughout the protocol for both groups (from 88.8±1.6Nm vs 64.4±3.2Nm at pre to 78.8±3.3Nm vs 58.2±2.7 at post51, for S and W respectively), giving evidence of precocious neuromuscular impairments. Motoneuron excitability was not affected (no change of Hmax and H/M). Muscle contractile properties were significantly potentiated at post17 and for the rest of the protocol (H2±e14% for S vs 37±e6% for W for Pt values at post51 for both groups. Muscle excitability was significantly altered only in S, as proved by the significant decrease in M-wave amplitude and muscle response to trains of stimulation (-2.9±3.7% and -13±4.5% for post1 respectively). Level of voluntary activation assessed by the twitch interpolation technique was lower for W and, although RMS/M was significantly decreased for both groups, the decrease in W was significantly more pronounced (-21.8±4.5% vs -14.5±6.2% for S).
Neuromuscular fatigue can be attributed to both central and peripheral mechanisms for the S group, while for W it appears that mainly central mechanisms are involved. These observations should be taken under consideration when seeking to optimise training strategies for people with neurological disorders. The results show that improving muscle strength would not necessary delay neuromuscular fatigue, but changes its nature.

THE EFFECTS OF SKILL TRAINING ON STRETCH REFLEX INSTABILITY

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Stretch reflex instability (SRI) is one of the possible mechanisms underlying tremor, either in normal or exaggerated conditions (Durbaba et al., 2005). It has been shown that SRI decreased following isometric strength training in healthy young individuals, along with increased levels of maximal voluntary contraction (MVC, Durbaba et al., 2008). However, the question arose from this study as to whether the reduction in SRI could be partly attributed to following visual feedback on a computer screen, i.e. skill training. Here we investigate the effects of short term skill training, without strength training, on muscle strength and SRI in healthy individuals.

Sixteen individuals (aged 21-29 years), with no known history of neurological disorder, took part in the study. Local Ethical Committee approval was obtained for the study and subjects gave written, informed consent. With subjects seated comfortably, force of contraction from knee extensors of the dominant leg was recorded using a dynamometer (Kin-Com, Chattanooga, USA) to assess MVC and SRI at baseline and after 4 weeks. Following the baseline recordings, 8 subjects were instructed to continue their levels of activity as normal and acted as controls. The remaining 8 subjects undertook a 4-week skill training programme. This involved subjects attending the laboratory 3 times a week for 25 minutes of visual feedback exercise (12 sets, 10 repetitions each (5s contraction, 3s rest), between 6% and 8% of MVC, with a 30s interval between each set). Stretch reflex instability was induced during anisometric contractions at 30% baseline MVC, with 2 spring loading resistances that preferentially activated the long or short latency components of the stretch reflex (long=5.35 N mm⁻1, short=11.06 N mm⁻1). The anisometric contractions were analysed to compute autospectra of force fluctuations.

For both the training and control subjects, MVC did not significantly change (1.0% and 1.1% increase, respectively). Skill trained individuals showed a significant reduction in the amplitude of force fluctuations in anisometric contractions against the long spring (-106.0±10.9 µm, compared to +28.5±42.0 µm in the controls; P<0.01). There was no significant decrease in force fluctuations when anisometric contractions were initiated by the short spring (-99.4±41.5 µm, compared to +14.5±31.2 µm in the controls). The results indicate that the skill training only protocol may reduce tremor by reducing the long-latency SRI, and could be a useful rehabilitation tool in individuals with exaggerated forms of tremor.

References.

DIFFERENCES IN RATE OF FORCE DEVELOPMENT AND NEURAL ACTIVATION BETWEEN ELITE EXPLOSIVE POWER ATHLETES AND CONTROLS

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There is evidence of a relationship between muscular rate of force development (RFD) and neural activation (De Ruiter et al., 2004), and therefore it might be expected that explosive power athletes have a greater RFD than non-athletes due to enhanced neural activation, but this has not yet been investigated. The present study compared differences in RFD, neural activation, and electromechanical delay (EMD) between elite explosive power athletes (ATH; n = 9) and aged-matched controls (CON; n = 10). During 3 separate trials (each separated by 1 week) participants sat in a custom built isometric rig (hip and knee angle 90° and 80° respectively), and completed a series of involuntary and voluntary isometric contractions of the knee extensors of their dominant leg. Force was measured from a strain gauge, sampled at 2000 Hz, and electromyography (EMG) was recorded from the rectus femoris (RF), vastus lateralis (VL), and vastus medialis (VM). The maximum M-wave of each muscle was established by supramaximal stimulation of the femoral nerve with single pulse (100 µs) twitch contractions. Maximum voluntary force (MVF) and root mean squared (RMS) of the EMG signal at MVF (RMSmax) was established from four 3-isometric maximum voluntary contractions (IMVC), each separated by 30 s. To assess RFD parameters participants performed 10 explosive IMVC (the instruction was to push as fast and hard as possible for 1-2 s), separated by 20 s. The three contractions with the highest peak RFD (RFDp) were analysed to establish average RFD from 0-40 ms (RFD40) and 0-100 ms (RFD100), and each of these variables was normalised to MVF. The RMS of the EMG signal was analysed in three consecutive 50-ms time windows (0-50, 50-100, and 100-150 ms), commencing from EMG signal onset, and was normalised to both maximum M-wave (RMS:M) and RMSmax (RMS:RMSmax). Maximum EMD (EMDmax) was classified as the longest EMD of the 3 knee extensor muscles. A mean of the second and third trials was used for analysis. The ATH had a greater MVF than CON (+28%, P<0.01). The ATH also had a greater RFD40, RFD100, and RFDp (+145%, +39%, and +48%, respectively; P<0.01), however, when these variables were normalised to MVF only RFD40 remained greater in ATH (3.4 ± 1.2 vs. 1.6 ± 0.9 MVFs⁻1; P<0.01). During the 0-50 ms window the ATH had a greater RMS:M ratio in all muscles, and a greater RMS:RMSmax ratio in the RF and VL (P<0.05). There was also a trend for CON to record a longer EMDmax than the ATH (19.1 ± 4.3 and 15.9 ± 2.8 ms, respectively; P = 0.08). The results of this study suggest there may be a difference in EMD between ATH and CON. A greater normalised RFD40 in ATH was found and appeared to be due to a greater neural activation during the initial phase of the contraction. Conversely, any difference in absolute RFD during the later phases of the contraction appeared to be due to the greater strength of the ATH.

References.

SPINAL REFLEXES AND NEUROMUSCULAR FUNCTION IN RESPONSE TO SUBMAXIMAL FATIGUING CONTRACTION DURING SEVERE HYPOXIA

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During submaximal contractions, a progressive central contribution to fatigue may occur before the moment of task failure, suggesting that exhaustion is linked, at least in part, to a decline in muscle activation i.e., motivation, motor cortex capacity to adequately drive the
ASSESSMENT OF NEUROMUSCULAR FATIGUE COMPONENTS DURING A HIGH-INTENSITY TENNIS BOUT

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Introduction: Tennis is characterised by repetitions of fast starts, stops and changes of direction during brief periods of exercise at maximal or near maximal intensity, followed by rest periods. These repeated muscle actions on lower limbs induce processes resulting in neuromuscular fatigue. The latter may in turn affect speed and accuracy of movements during a tennis match. The aim of this study was to assess acute neuromuscular fatigue and its components in knee-extensor muscles during a high-intensity tennis bout as seen in typical tournament.

Methods: 9 well-trained male tennis players of national level (mean ± SD: 21.2 ± 1.7 yr; mass: 77.6 ± 8.9 kg; body fat: 12.1 ± 3.0%) performed a standardized tennis bout representative of the degree of intensity occurring during a match. Neuromuscular tests were performed before and immediately after each of the 4 intermittent 8-min heavy exercises proposed (closed situations with basket feed-throughout recovery in hypoxia but not in normoxia. The MVIC force recovery profile was associated with a progressive restoration of the group III and IV muscle afferents. Finally, our results put forward the major role of supraspinal and spinal mechanisms in limiting to the same extent endurance time during submaximal contraction in normoxia and hypoxia.

Discussion/Conclusions: The high-intensity tennis bout resulted in a significant neuromuscular fatigue observed from the third out of four contractile dysfunction. Both the neuromuscular tests and the proposed 4 intermittent exercises may be used regularly to track the physiological training-induced changes in tennis players over the season.
The healthy subjects showed concomitant increases in muscle activity with both ATF muscle length estimates. This within-step modulation is likely to stem from proprioceptive afferents, as no modulation was seen in the deafferented subject’s activation pattern.

References.

**Oral presentations (OP)**

**OP-PM05 Physiology 5 - Conditions**

**THE EFFECT OF CARBOHYDRATE INGESTION ON THE INTERLEUKIN-6 RESPONSE TO A 90-MINUTE RUN TIME-TRIAL**

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Cytokines released during exercise have been implicated in suppressing the immune system [1,2] and mediating fatigue [3]. Carbohydrate (CHO) ingestion during constant load exercise is associated with an attenuated interleukin-6 (IL-6) response immediately post-exercise [1,2], although, during intermittent high intensity exercise [4] and self-paced running [5,6] the effect of CHO ingestion on immediate post-exercise IL-6 is equivocal. However, the self-paced studies comprise field studies and as such factors known to affect IL-6 release (e.g. intensity) were not accounted. Therefore the aim of this study was to evaluate the effect of CHO ingestion during a laboratory-controlled self-paced time-trial on post exercise IL-6 concentration. Seven recreationally trained runners completed two 90-minute time trials ingesting either CHO or a placebo, in a randomized order. The study was of a double-blinded, placebo-controlled, cross-over study design. Immediate post-exercise IL-6 levels were significantly lower in the CHO trial compared with the placebo trial (5.3(1.9) pg/ml vs. 6.6(3.0) pg/ml, respectively, p=0.029). Furthermore, distance covered in 90 minutes was significantly greater with CHO compared to placebo ingestion (19.1(1.7) km vs. 18.3(1.9) km, respectively, p=0.002). Blood glucose was maintained during both conditions. The results from this study support the model in which IL-6 release during exercise is attenuated by CHO ingestion. Furthermore, the full extent of the mediating effect of CHO is probably masked by the increased intensity at which the CHO trial was performed. However, improvement in time to performance is unlikely to be explained by the physiologically insignificant difference in post-exercise IL-6 between trials. The confounding effect of intensity in self-paced exercise trials examining IL-6 illustrates the need to use a different model to assess the role of IL-6 in mediating fatigue. In conclusion, CHO intake attenuates the immediate post-exercise IL-6 response in a 90-minute running time-trial.

References.

**PROTECTIVE EFFECT OF EXERCISE ON STRESS-INDUCED IMPAIRMENT OF SPATIAL MEMORY IS DEPENDENT ON IGF-1**

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Introduction.
Habitual exercise improves learning and memory in mice and rats. Improvement of learning and memory is closely related to neurogenesis in hippocampus and dependent on uptake of blood insulin-like growth factor 1 (IGF-1) into brain. On the other hand, chronic stress impaired learning and memory of the animals and is related to neurogenesis in hippocampus. Therefore, purpose of this study was to investigate whether exercise might protect stress-induced impairment of learning and memory and protective effect of exercise might be dependent on IGF-1.

Methods.
Male C57BL/6 mice aged 2 weeks old were randomly divided into four groups: control mice, restraint-stressed mice (RS mice), exercised mice (Ex mice) and JB1-administrated mice (JB1 mice). Control mice were fed in a standard mice cage (width 32 cm, length 21.5 cm, height 10.5 cm). In this case, four mice were fed in a cage. RS, Ex and JB1 mice were fed in a six-divided cage to make physical activity of mice small. In the six-divided cage, the living space per a mouse was 10 cm wide, 10 cm long, and 10.5 cm tall. In JB1 mice, osmotic pump contained JB1, antagonist for IGF-1 receptor, was implanted into their back, while osmotic pumps contained saline was implanted in control, RS and Ex mice. RS, Ex and JB1 mice were exposed to 8 h of immobilization daily. In addition, Ex and JB1 mice were performed 1 hour of treadmill running daily. Four weeks later, spatial learning was measured by water maze test. After water maze test, brains of mice were removed under anesthetization, cut into slices and used for immunohistochemical analysis of Ki67-positive cells in the granule cell layer (GCL) of the hippocampal dentate gyrus.

Results and Discussion.
RS mice showed significant impaired spatial memory and suppression of Ki67-positive cells in GCL of the hippocampal dentate gyrus compared with control mice. Though Ex mice were exposed to 8 h of immobilization daily as same as RS mice, Ex mice did not show impaired spatial memory and suppression of Ki67-positive cells. On the other hand, JB1 mice showed significant impaired spatial memory and suppression of Ki67-positive cells as same as RS mice in spite of 1 h of treadmill running daily. These findings suggested that chronic stress induced by daily immobilization and restriction of physical activity impaired spatial memory and neurogenesis in hippocampus. Exercise prevented the impairment of spatial memory and suppression of neurogenesis, while JB1 canceled protective effect of exercise. Therefore, protective effects of exercise on stress-induced impairment of spatial memory and neurogenesis might be dependent on IGF-1.

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DECREASED IRS-1 (SER 307) PHOSPHORYLATION IS ASSOCIATED WITH HEIGHTENED INSULIN SENSITIVITY FOLLOWING SHORT TERM ENDURANCE TRAINING

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Introduction: Insulin receptor substrate-1 (IRS-1) is an important protein involved in insulin signal transduction and can undergo post-translational modulation on many serine/threonine residues. IRS-1 serine 307 (ser307) has been identified as one such residue that once phosphorylated can prevent the interaction with the insulin receptor and therefore inhibit downstream insulin signalling events. We hypothesize that a reduction in IRS-1 (ser307) phosphorylation is one of the many mechanistic alterations that can result in improvements in insulin sensitivity following exercise training in obese men.

Methods: Seven sedentary obese, but otherwise healthy male participants (Age, 40 ± 7 y; BMI, 34.2 ± 1.7; VO2max, 35.5 ± 5.9 mL/kg/min) were recruited for the purposes of this study. Endurance exercise training at a predetermined intensity eliciting maximal fat oxidation was performed five times per week for four weeks. During the week preceding exercise training and 72 hrs following the final exercise bout, a muscle biopsy, OGTT, VO2max test and measurements of body composition were undertaken. IRS-1 (ser307) in human skeletal muscle was measured using western blot following immuno-precipitation. Diet was controlled the day before all trials (50% carbohydrate, 35% fat and 15% protein, ~2900 kcal/day). Variables were compared using paired students t-tests.

Results: On average exercise training intensity was 48 ± 6 %VO2max, with an average heart rate of 112 ± 4 bpm. Maximal oxygen uptake was significantly increased following exercise training (34.8 ± 6.2 mL/kg/min and 36.4 ± 5.5 mL/kg/min, pre and post training respectively) or body composition (32.6 ± 4.2 and 32.4 ± 3.5 % body fat pre and post training respectively).

Conclusion: Four weeks of low intensity endurance exercise training reduces IRS-1 (ser307) phosphorylation and increases insulin sensitivity in sedentary obese men.

UPPER RESPIRATORY TRACT INFECTIONS AND NAIVE AND MEMORY T CELL SUBSETS ALTERATIONS IN SWIMMERS DURING A TRAINING SEASON

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Objectives
Very few studies have looked at changes in lymphocyte recirculation after exercise and even fewer have looked at the chronic effects during a training season. The aim of this study was to study how training load might influence the proportion of circulating naive and memory T cells subsets in peripheral blood (PB) of high competitive levels athletes and how it could affect susceptibility to disease.

Methods
To study the response of naïve and memory T cell subsets, quantification, by flow cytometry, of PB cells from 19 well trained swimmers (13 men and 6 women, mean age 17±1.25 years old, was done in four different moments of the training season that matched the transitions between preparation cycles. The CD4, CD8 and G/D T cells expressing the naïve (TN), central memory (TCM), effector memory (TEM) and effector (TEFF) T cells compartments were determined by CD45RA and CCR7 expression (I). The upper respiratory tract infection (URTI) episodes that occurred during the training season were registered using daily logs. Training load and participation on competition events were also monitored.

Results
An increase in CD8+ memory effector cells (CCR7-CD45RA-) and a decrease in the CD4+ memory effector T cells (CCR7-CD45RA+) were found between the first and second moment of the training season. G/D T cells also increased their memory effector cells and decreased their terminal effector cells (CCR7-CD45RA-) from the pre-season to the 2nd evaluation. An increase in naïve CD4+ and CD8+ T cells (CCR7+CD45RA+) between the 1st and 2nd moments of evaluation also occurred but with no statistical significance (P=0.1 and P=0.62 respectively). Furthermore, athletes that suffered more infectious episodes appear to show a higher number of CD8+ and CD4+ effector T cells compared to those athletes that had less than 3 URTIs during the training season.

Discussion
An increase in training load volume seems to induce a change in the basal number TME and TEFF cells that are CCR7- and cannot efficiently recirculate through the lymph nodes and Peyer’s patches but migrate to peripheral and non-lymphoid tissues were they can exert their citotoxic activity. An increase in the number of lymphocytes in the lung has been described after exercise (2) which might be an adaptation to increased ventilation during exercise. The redistribution of effector lymphocytes into target organs may represent an increase in immune surveillance in organs that serve as major defence barriers of the body. The higher number of effector cells in those athletes with more than 3 URTI may reflect the response of to an invasive agent.

This preliminary data seem to indicate that quantitative and qualitative alterations observed in T cell subsets may be related to the participation of athletes on specially intensive and voluminous training programs and their susceptibility to infections.

ELECTRICAL STIMULATION SENSORY THRESHOLD IS RELATED TO SUBCUTANEOUS FAT THICKNESS

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We recently demonstrated lowered electrical sensory thresholds in women than in men (1), i.e., female subjects perceived electrical stimulation with lower current amplitudes than their male counterparts [-43%]. Interestingly, the lowest sensory currents were observed in those subjects with the largest skinfold thicknesses (women), therefore suggesting a link between subcutaneous adipose tissue mass and sensory excitability. To confirm these observations, we compared detection-threshold stimulation levels between men and women having wide ranges of subcutaneous fat i.e., obese individuals. Moreover, since skinfold thickness does not provide an accurate assessment of the quantity of subcutaneous fat, we quantified thigh subcutaneous fat thickness using B-mode ultrasound (2), and attempted to relate this parameter to sensory threshold.

Thirty adult obese individuals (15 men and 15 women, BMI 41.6 ± 42.8 kg/m², respectively) were enrolled in this study. B-mode ultrasound images were obtained from the lateral aspect of the vastus lateralis muscle at half of femur length, while the subject was
seated with an angle of 90° at the hip and knee joints. In the same position, the quadriceps femoris muscle was stimulated at 50 Hz with a portable electrical stimulation unit and two surface electrodes. Electrodes were placed 5 cm below the femoral triangle and at half of femur length, over the vastus lateralis muscle belly. The investigator progressively increased current amplitude (mA) from zero to sensory threshold, i.e., when the subject indicated lowest perception of stimulus sensation. Subcutaneous fat thickness and sensory thresholds were measured during stimulation of 300 ms (±15%) for KE in women (24.4±7.0 mm) and in men (12.7±3.6 mm). Sensory threshold was significantly lower in women (23.3±0.75 mA) than in men (38.0±0.70 mA). The lowest sensory thresholds were observed in those subjects with the largest fat thicknesses and vice versa. p<0.001, fat thickness=0.58×sensory threshold+3.62.

In line with our previous investigation, the present findings allow us to speculate that the number and/or sensitivity of cutaneous and subcutaneous receptors activated by detection-threshold current could differ between men and women, both obese (this study) and nonobese (1). Considering that the low electrical stimulation levels would predominantly activate large-diameter A-beta afferents, sex differences could exist in the properties of encapsulated nerve endings (such as Pacinian corpuscles and Merkel disks). The choice of optimal current amplitude is paramount to the effectiveness of electrical stimulation treatments (e.g., for TENS). We therefore recommend that practitioners consider that women may present lower sensory thresholds than men.

References

SIMULATED ALTITUDE DURING THE NIGHT AMELIORATES SYMPTOMS OF ACUTE MOUNTAIN SICKNESS
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Acute mountain sickness (AMS) occurs after rapid ascent to high altitude in otherwise healthy mountaineers. The risk of AMS is influenced by individual susceptibility, absolute altitude, rate of ascent and preacclimatisation. All these risk factors have been shown to be approximately the same weight. Since individual susceptibility and absolute altitude and in most cases also rate of ascent are given for a particular expedition or trekking tour, preacclimatisation is the only preventive factor that can be influenced individually. Thus we hypothesised that regular exposure to normobaric hypoxia during the night leads to ventilatory acclimatisation and reduces incidence and severity of AMS.

To test this hypothesis 75 healthy men at the age between 18 and 55 years were included in a randomized double blinded study. For preexamination subjects were exposed for 4 h at a FiO2 of 12% (approx. 4500m). Before and at the end of this exposure AMS (Lake Louise (LL)-score, AMCS-sc, ventilation and blood gases were assessed. Then an acclimatisation period of 14 nights in commercially available “hypoxia-tents” followed. Hypoxia (HYP) and control (CON) group received visually identical equipment which was technically adapted to the assigned group. Handling of the equipment was the same in both groups. All subjects were advised to set the level of hypoxia to a FiO2 of 15.4% (approx. 2500m) in the first night, then gradually decrease FiO2 each night by 0.2% until the final “altitude” of 33.08% (FiO2=14.0%) was reached. This altitude was then sustained until the 14th night. After a break of 4 days subjects were examined during one day (20 h, 3:00 p.m. – 11.00 a.m.) at FiO2 of 12%. Again AMS, ventilation and blood gases were assessed before, after 4 and after 20 h of hypoxia.

For technical reason most subjects did not reach the desired sleeping altitude of 3043m at average. We therefore analysed the 21 “highest” (=HYP) and the 21 “lowest” (=CON) according to the performed power analysis. Mean sleeping altitude in HYP was 2599m compared to 2355m in CON. Both, LL- and AMCS-score were significantly reduced by sleeping in hypoxia (LL: 3.1±2.2 vs. 5.6±3.6, p=0.039, AMCS-c: 0.38±0.38 vs. 1.10±1.23, p=0.014). The incidence of AMS was 29% in HYP compared to 57% in CON, which was not significant (Chi²-test p=0.119). Blood gas and ventilatory parameters showed no significant difference between HYP and CON. Sleepquality during the acclimatisation period in the tents was not affected by hypoxia.

The results of the study indicate that preacclimatisation during 14 nights in normobaric hypoxia reduces symptoms of AMS and therefore is useful to prevent AMS if acclimatisation in natural altitude is not possible. The effects can be expected to be even more pronounced if a higher degree of hypoxia be can be attained in the tent.

HOW FATIGUED ARE WE AFTER A 24 H RUN?
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Introduction. Neuromuscular fatigue after ultra-endurance exercises (> 4h) has been mostly studied during real competition (e.g. Millet et al. J Appl Physiol 92(2): 486-492, 2002) so that only pre-post measurements are generally performed. In addition, despite an increasing number of people participating in 24h races, such extreme fatigue has rarely been investigated. The aim of this study was to examine the causes and the kinetics of neuromuscular fatigue induced by a 24h run.

Methods. Neuromuscular function evaluation (NMFE) was performed before, every 4 h during and after a 24h treadmill run in 12 experienced ultramarathon runners. NMFE was conducted in determined extensors (KE) and flexors (PF) with maximal voluntary contractions (MVC, global fatigue), KE and PF maximal voluntary activation (%AV; central fatigue), vastus lateralis and soleus M-wave (sarcolemmal excitation), KE and PF low and high frequency stimulation (excitation-contraction coupling), and KE absolute force of MVC + 0.3 s superimposed tetanus at 100 Hz (intrinsic fatigue). Blood samples were taken immediately after each NMFE.

Results. The subjects ran an average of 18.65±0.68 h on the treadmill, which equated to 149.2±15.7 km at an average intensity of 39.4±4% of their velocity associated with VO2max. KE strength losses were greatest during the first 12h (−32%), KE MVC decreased 41±17% (P<0.001) at Post 24h. PF MVC decreased linearly to its lowest value -34±16% (P<0.001) after 20h. %AV decreased by 33±22% (P<0.001) and 15±19% (P<0.011) for KE and PF, respectively. M-wave alterations were only observed for soleus. Low-to-high frequency ratio remained unchanged in both muscle groups. Intrinsic KE force decreased to a low extent (-10%, mostly during the first 16h) and a large variability was found for this factor (±16%). This large variability was also observed for serum creatine kinase concentrations (±16%).

Conclusion. Large strength losses were observed in both plantar flexor and knee extensor muscles. Fatigue after the ultra-endurance running event was mostly attributable to central mechanisms for all the subjects, especially for KE. On the contrary, a large heterogeneity was found between subjects for markers of muscle damage. Intrinsic fatigue showed a plateau after 16h and no low-frequency fatigue was observed, in line with previous reports on prolonged but not extreme exercises (Millet and Lepers, Sports Med 34(2): 105-116, 2005).
2004, suggesting that excitation-contraction coupling does not play a role in fatigue induced by an ultramarathon. Finally, the alteration of sarcolemmal excitability seems to be dependant on the muscle group.

**Oral presentations (OP)**

**OP-PM06 Physiology 6 - Adaptation**

**TYPE II MUSCLE FIBER HYPERTROPHY AFTER RESISTANCE TRAINING IS ACCOMPANIED BY A FIBER TYPE-SPECIFIC INCREASE IN SC CONTENT IN ELDERLY MEN**

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Satellite cells (SC), or muscle stem cells, are the only known source for the generation of new myonuclei in skeletal muscle tissue. SC normally lie quiescent between the basal lamina and plasma membrane of muscle fibers. Upon activation, SC can proliferate and differentiate into normal myonuclei that fuse with existing myofibers. As such, SC are essential for myofiber repair, maintenance and growth. We recently reported that muscle fiber type-specific atrophy, which is characteristic for age related loss of muscle mass, is accompanied by a reduction in type II muscle fiber SC content (Verdijk, 2007). In the present study, we aimed to determine whether muscle fiber type-specific hypertrophy following resistance type exercise training (RT) in the elderly is associated with changes in SC content. A total of 13 healthy elderly men (65-85y) participated in a 12 week RT program for the lower extremities. Muscle strength for leg extension and leg press exercise was determined before and after the intervention program. In addition, body composition (DEXA and CT) was assessed, and muscle biopsy samples were collected before and after intervention. Immunohistochemical procedures for MHc- and CDS6-staining were used to determine fiber-specific changes in muscle fiber area and SC content in skeletal muscle tissue. One-repetition maximum strength for leg press and leg extension increased 25-30% after training (P<0.001). Leg lean mass increased from 18.3±0.5 to 19.3±0.5 kg, and quadriceps cross-sectional area increased from 75.9±3.7 to 82.4±3.9 cm² following intervention (P<0.001). At baseline, type II muscle fiber area was smaller than type I fiber area, and myonuclear number was smaller in the type II vs type I fibers. In addition, SC content was significantly lower in the type II vs type I fibers (0.048±0.003 vs 0.089±0.006 SC/fiber, respectively; P<0.001). In contrast to type I muscle fiber area, type II fiber area increased from 5438±319 to 6982±503 µm² following 12 weeks RT (P<0.001). The latter was accompanied by an increase in type II muscle fiber SC content (from 0.048±0.003 to 0.084±0.008 SC/fiber, P<0.001), whereas no changes were observed in type I muscle fiber SC content. Muscle fiber type specific differences in size, myonuclear number, and SC content observed prior to intervention had entirely disappeared after intervention. We conclude that type II muscle fiber atrophy in the elderly can be reversed by resistance type exercise training. This study is the first to show that fiber type-specific hypertrophy is accompanied by the specific increase in type II muscle fiber SC content in the elderly.

References.

**POSITIVE EFFECTS OF COLD WATER IMMERSION AND ACTIVE RECOVERY ON SUBSEQUENT MAXIMAL CLIMBING PERFORMANCE IN FEMALE CLIMBERS**

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Introduction Rock-climbing is becoming more and more popular and the number of climbing competitors is increasing every year (Mermier 1997, Sheel, 2004). Climbing competitions often require subsequent climbs (Watts et al. 2000). While the effects of active versus passive recovery on lactate removal after climbing have been studied, the impact on subsequent climbing performance remains unknown (Watts 2000, Draper 2006). Moreover, no other modalities of recovery have been tested to increase performance. Therefore the aim of this study was to investigate the influence of passive, active (cycling), electromyostimulation and cold water immersion (CWI) on subsequent maximal climbing performance.

Material & Methods Thirteen trained female climbers (12.7 +/-. 8.9 years, indoor-climbing level on overhanging wall from 6b to 7b+, French grading system), VO2max: 47.5 +/- 5.3 mL/min/kg, came to the climbing centre on four occasions separated by one week. On each occasion, they had to perform two climbing tests (C1 and C2) until volitional exhaustion on a pre-practised route (overhanging wall, level 6b), between which they recovered for 20 minutes. Four recovery methods were used in randomised order: passive recovery, active recovery on electricity braked cycle ergometer at 30-40 W, electromyostimulation on the forearm muscles (bimetric TENS current, decreasing from 9Hz to 2 Hz) or CWI of the forearms and arms (three periods of 5 min at 15 +/- 1 °C). The effects of recovery methods on performance (number of movements and climb duration and distance) at C2 and physiological parameters during the 20-min recovery (blood lactate, heart rate, skin temperatures) were assessed with two-factors repeated measures ANOVA.

Results Using active recovery and CWI, performance at C2 was maintained in comparison with C1 performance (recovery method-by-climb interaction, P < 0.05), whereas C2 performance was impaired compared to C1 (P < 0.01) using electromyostimulation and passive recovery. Lactate decreased during recovery with the four methods. The greatest decrease occurred with active recovery with lactate levels achieving the lowest concentrations (at 10 and 20 min of recovery) (P < 0.05) (time-by-recovery method interaction, P < 0.001). Skin temperatures of arms and forearms, but not chest and shoulders, were lower throughout the CWI recovery compared to the other three methods (P < 0.001).

Conclusion Active recovery and CWI are two means of preserving performance when repeating acute exhausting climbing trails in female climbers. The positive effects may partly depend on a greater lactate removal and on possible decreases of subcutaneous tissues temperatures, for the active and immersion methods, respectively.

References.
THE POTENTIAL OF WHOLE BODY VIBRATION TRAINING TO INTEGRATIVELY COUNTERACT THE EFFECTS OF 14-DAYS OF IMMOBILIZATION

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Mechanical stimulation is essential for the homeostasis of the musculo-skeletal system. In microgravity the human body responds with deconditioning to the lack of mechanical loading. On earth these effects can be simulated with immobilization at 6°-head-down-tilt bed rest (HDT). In the 'Vibration Bed Rest Study' (VBR-Study) we hypothesized that whole body vibration training will change the response of the body to HDT with focus on balance, skeletal muscle performance, and knee cartilage. Vibration training seems to be a promising method because of beneficial effects that have been found in previous training studies. We investigated the combined effect of HDT and vibration training (twice per day; 5 x 1 Minute; 20 Hz) on muscle strength, balance performance, and cartilage morphology. 8 male healthy subjects performed two phases of 14-days of HDT in a randomised cross-over design. The experiments were scheduled before and after the HDT period. Blood was drawn at predefined times during the study. HDT lead to a significant decrease in maximal power of the knee extensors which could be prevented by vibration training. Maximal power of the knee flexors was not affected by HDT. Isometric force did not change due to HDT for the knee flexors and knee extensors. The results indicated that changes in isometric force and power after 14 days of HDT were muscle and subject specific and may have been influenced by their initial physical status. In reference to the power of the knee extensors, the used training protocol was sufficient to cause a significant difference in the response to HDT. The analysis of balance performance was done with the Posturomed device, using the parameters ‘holding time’ and ‘displacement’. HDT did not lead to deterioration in both parameters, whereas vibration training lead to a significant decline in the balance performance level. Decreases in cartilage thickness after bed rest were observed for the tibial condyle using magnet resonance imaging of the right knee. The effects inverted into an increase with vibration training. No changes were observed for the femoral condyle. After 24h of HDT, blood serum concentrations of ‘Cartilage oligomeric matrix protein’ (COMP) decreased significantly and the values returned to baseline after bed rest. Vibration training did not alter this effect. Summarizing the results, the degenerative effects of HDT were not to the degree that was previously expected. This may be the effect of the well controlled study conditions, the normo-caloric diet, the length of the training intervention and the allowance to walk to the training room twice daily. As the deconditioning was missing in some parts, the training intensity may not have been appropriate to impact the HDT effects. Generally, higher training intensities in the scope of bed rest studies are recommended, in addition to an individually tailored vibration training protocol for each subject with a progressively increasing training intensity.

INFLUENCE OF INGESTING A CARBOHYDRATE-ELECTROLYTE DRINK BEFORE AND DURING 1 H RUNNING PERFORMANCE

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The aim of this study was to investigate the influence of carbohydrate (CHO) ingestion before and during a 1 h running performance test. Seven male endurance trained runners completed three 1 h performance runs separated by 1 week. The study used a double blinded placebo (PLA) controlled design. On two occasions runners consumed a placebo (P1, P2) solution, 8ml/kg 30 min prior to 1 h run and 2ml/kg at 15 min intervals thereafter (15, 30 45 min). On a separate occasion runners consumed the same quantity of 6.4% CHO-electrolyte solution (CI). Total distance covered for P1, P2 and C was 1397 ± 1205 m, 1368 ± 1231 m and 14045 ± 1193 m respectively. There was no difference between the two P trials (P>0.05). Distance covered during run C was significantly greater than both P1 and P2 (P<0.05). The ingestion of CHO resulted in a higher blood glucose concentration at the onset of exercise (P<0.05), but was not different compared to P1 or P2 at any other time point. No significant gastrointestinal discomfort was reported. Blood lactate, CHO and lipid oxida- tion were no different in the three runs. In conclusion, the ingestion of a 6.4% CHO-electrolyte solution before and during exercise improved endurance performance in runners compared to the ingestion of colour and taste matched placebo.

CHANGES IN THE POWER VS. PEDAL SPEED RELATIONSHIP DURING REPEATED SPRINTS IN CHILDREN AND ADULTS

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Only few studies have examined the effect of fatigue on muscle mechanical characteristics, as these are described by the force vs. velocity relationship. Buttelli et al. (1) reported that fatigue causes a leftward and downward shift of the force vs. velocity relationship, resulting in a decrease in maximal theoretical pedal speed (Vo) and force (Fo). However, there is no information concerning the influence of fatigue on the optimal pedal speed (Vopt), although this parameter may be related with the ability of muscles to generate power. The aim of this study was to examine the changes of power vs. pedal speed relationship during repeated sprints in boys and men, in an attempt to further investigate the causes of fatigue during this type of exercise. Twelve preadolescent boys (age: 11.8±0.2 y, height: 152±2 cm, body mass: 44±2 kg) and 10 men (age: 21.2±0.6 y, height: 177±2 cm, body mass: 74±2 kg), performed 10 sprints separated by 24s of passive recovery on a Monark cycle ergometer, against a load corresponding to 50% of the optimal resistance (Fopt) as determined by a force-velocity test. Instantaneous power was calculated taking into account the changes in kinetic energy of the flywheel (2). Force, pedal speed and power output for each down stroke were used to determine the linear (r²=0.98) force vs. pedal speed and the quadratic (r²=0.95) power vs. pedal speed relationships for each sprint. Optimum pedal speed (Vopt), Vo and Fo for each sprint were then calculated. Test-retest reliability for these indices was examined in a separate experiment (r²=0.92, P<0.01 for all indices). Differences between the two groups were analyzed using two-way ANOVA with repeated measures on one factor. Peak (PPO) and mean power output (MPO) for the first sprint were higher in men than in boys (peak: 1199±31 vs. 460±28 W, mean: 879±22 vs. 356±20 W, mean ± SE, P<0.01), but men exhibited a more than 3-fold higher drop from the first to the 10th sprint in both PPO (36±3 vs. 11±3%, P<0.01) and MPO (33±2 vs. 9±2%, P<0.01). Vopt in men was 126±3 rpm in the first sprint and significantly dropped to 106±2 rpm to the 10th sprint (P<0.01), a drop equal to 15±2%. Boys Vopt in the first sprint (110±2 rpm) was lower than men’s but remained unchanged during the 10 sprints. Higher values in men than in boys were observed for Fo (boys: 8.6±0.5 vs. men: 19.1±0.3 kg and Fo (boys: 207±3, men: 249±5 rpm) in the first sprint. The drop in Fo from sprint 1 to sprint 10 was 25±3% in men and 7±2% in boys (P<0.01). However the drop in Vo was significant only in men (16±2%) but not in boys (3±3%,NS). The main finding of the present study is that repeated sprints on a cycle ergometer cause a...
significant drop in Vopt only in men and not in preadolescent boys. This may be the result of a greater selective fatigue of fast twitch fibers, in men compared with boys.

References.

CONTRIBUTION OF RESPIRATORY MUSCLE BLOOD FLOW TO EXERCISE-INDUCED DIAPHRAGMATIC FATIGUE IN TRAINED CYCLISTS


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We investigated whether the greater degree of exercise-induced diaphragmatic fatigue previously reported in highly-trained athletes in hypoxia (compared to normoxia) (Vogiatzis et al., 2007) could have a contribution from limited respiratory muscle blood flow. Seven trained cyclists (maximal oxygen uptake: 63.7±4.2 ml/kg/min, mean ± S.E.M.) completed in balanced order three 5 min exercise tests leading to different levels of end-exercise arterial oxygen saturation (71.8±2.3, 95.0±0.5 and 99.8±0.1%) via variations in inspired oxygen fraction (0.13%, 0.21% and 1.00%, respectively). Work rates were selected to produce the same tidal volume, breathing frequency and respiratory muscle load at each inspired oxygen fraction (63±1, 78±1 and 87±1% of normoxic maximal work rate, respectively). Cardiac output and leg blood flow were measured by the dye-dilution method. Respiratory muscle blood flow was measured by near-infrared spectroscopy (NIRS) over the left 7th intercostal space using indocyanine green. After hypoxic exercise, twitch transdiaphragmatic pressure fell by 33.3±4.8%, significantly (p < 0.05) more than after normoxic (25.6±3.5% reduction) exercise confirming greater fatigue in hypoxia, hyperoxia produced similar degrees of fatigue (26.6±3.3% reduction) as normoxia. In addition, the mean pressure time product of the diaphragm did not differ across the three exercise tests and ranged between 1056±98 and 1226±87 cmH2O/s/min. Furthermore, arterial lactate concentration did not differ across the three conditions and ranged between 11.5±2.6 (hypoxia) and 9.7±1.6 (normoxia). Despite lower power output in hypoxia, neither cardiac output nor leg blood flow (27.6±1.2 and 15.9±0.9 l/min, respectively) was significantly different compared to normoxia (28.4±1.9 and 17.5±0.9 l/min) and hyperoxia (27.8±1.6 and 14.7±0.4 l/min). Although a substantial cardiac output-leg blood flow difference, >10 l/min, was presumably available for other tissues, respiratory muscle blood flow was surprisingly not different across hypoxia, normoxia and hyperoxia (49.4±11.6, 44.8±7.9 and 37.3±9.3 ml/100ml/min, respectively) and approached in both conditions the level previously reported (Guenette et al., 2008) during resting hyperventilation (50.1±12.5 ml/100ml/min) in these subjects. We conclude that when respiratory muscle load is similar during heavy but submaximal normoxic and hypoxic exercise, respiratory muscle blood flow does not sufficiently increase to effectively lessen the greater diaphragmatic fatigue observed in hypoxia.

References.

Human respiratory muscle blood flow measured by near-infrared spectroscopy and indocy

Oral presentations (OP)

OP-PS01 Psychology 1

COPING WITH STRESS IN SPORT: AN ALTERNATIVE APPROACH

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Lazarus and Folkman (1984) provided an alternative to the stimulus-based sources of stress approach used in stress and coping by proposing that eight properties underlie the stress appraisals of any situation. Their theory stated that for a situation to be appraised as stressful at least one of these eight properties must be present. Thatcher and Day (2008) demonstrated that these properties are evident as antecedent variables of stress in competitive sport. Subsequently, it may also be suggested that an athlete will select coping strategies based on the underlying properties of the situation. This study aimed to examine whether coping strategies are selected to specifically limit the effects of the underlying properties of stress.

Participants were 8 national level, male squash players aged from 18-28 years (M = 23.3yrs, SD ±3.3yrs). For each participant one squash match was filmed for use in a stimulated recall interview. Participants were asked to watch their recorded match and provide a commentary on their thoughts, feelings and actions at the time. Questions were based on a semi-structured guide to gain information on stressful situations and coping responses during the match. Stimulated recall interviews were transcribed verbatim and all dialogue was logged in the context of the point discussed and the actions viewed on the match tape. Themes were then examined deductively and labelled according to their role in the stress process (e.g., underlying property, coping strategy). Data from all participants were combined, similar coping strategies used by participants were grouped together and labelled with a description. Results showed that following the occurrence of a stress appraisal, participants had two potential coping options. First, specific coping strategies were chosen to limit the effects of the particular underlying property. These were focused on reducing the characteristics of that property (e.g., information seeking in ambiguous situations makes the situation less ambiguous). Second, general coping strategies were chosen that were not specific to the underlying property but which lowered stress overall (e.g., self-talk in ambiguous situations is not aimed specifically at making the situation less ambiguous but may help the individual to perceive the situation more positively and thus reduce stress). Consequently, once a stress appraisal had been made participants coped either by reducing the effects of the underlying property or by employing a general strategy to lower overall stress or by combining the two strategies. The results from participants in this study indicate that it is not the situation itself that leads to the choice of coping strategy but the underlying property of the situation.

References.
CURRENT INSIGHTS INTO THE VISUAL BASIS OF BASKETBALL SHOOTING

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In the present contribution, we review our current understanding of the visual control and optical basis of basketball shooting. Previous research on the visual control of basketball shooting suggested that eye and head stabilization relative to the target were crucial for successful performance[1]. It was also established that although visual acuity had not proven a necessary asset[2], experts maintained a long fixation on the target before initiating the free throw[3]. This was interpreted as evidence that movement was pre-programmed during fixation and subsequently executed in an open-loop fashion. However, critics charged that these interpretations were invalid in more dynamic instances, namely in jump shooting, or when the style used allowed vision of the target during movement execution. In support of this assertion, it was demonstrated that seeing the target only during the final shooting movements provided enough information for accurate shooting[4]. We further examined the gaze behaviour of expert basketball players taking free throws and jump shots[5].

It appeared that low-style players looked at the target longer in the free throw than in the jump shot but maintained their performance in both conditions, whereas high-style players always looked at the target during the final shooting movements. In another study we found that introducing visual delays between viewing the target and shooting not only affected performance but also the coupling between adjacent joints of the shooting arm. Both these studies indicated that basketball shooting is controlled online by vision. Thus, to examine whether there was a preferred timing of optical information pick-up, we asked expert players to take jump shots under intermittent viewing. As expected, players preferred to see the target as late as possible, as permitted by the employed shooting style. Having established that basketball shooting is controlled online and that players rely on the latest and most updated information about the target, we investigated what information sources underlie this perceptual-motor task. In a series of experiments it was shown that players use the angle of elevation as they direct eyes and head to the target, and that the use of this information source is calibrated to the height of the basket.

References.

THE EFFECT OF INCREASING CONTEXTUAL INTERFERENCE ON THE PRACTISING OF A MOTOR SKILL

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The Contextual interference (CI) effect refers to the learning benefits that result from practising a number of skills in a random (RA) or serial (S) format rather than in a blocked (BL) format, whereby practice on one skill is completed before practising on the next. The CI effect has been demonstrated with both novice (Goode & Magill, 1986) and experienced (Hall et al., 1994) performers. Porter & Magill (2004) found trends that novice putters in golf might benefit most from an increasing CI (ICI) practice schedule, involving a progression from BL to S to RA practice. The purpose of this study was to test the ICI schedule with experienced putters.

Participants (n= 21) with a minimum of 2 years experience, were assigned to an ICI, RA or BL practice group, following a familiarisation session. The study involved a golf putting task at three distances, 1.83m (6ft), 2.44m (8ft) and 3.05m (10ft). A pre-test was undertaken, followed by 54 practice trials, in the order of the practice group to which participants were assigned. For the ICI group, 18 trials in a BL order were followed by 18 trials in a S order and finally 18 trials in a RA order. This was followed by a post test. Retention and transfer tests took place 5 days later. An undulating green were used in the study in order to provide for ecological validity. Outcome measures for performance were total accuracy and total consistency. These were derived from a 95% standard ellipse area calculated, based on the exact final ball position of each putt.

A statistically significant improvement in consistency was found in the ICI and RA groups from pre to retention tests. Trends in results, although not statistically significant between groups, indicated that the BL and ICI groups performed better than the RA group during acquisition, while the ICI group had the greatest accuracy in the transfer test. These findings are similar to those of Porter & Magill (2004) and indicate the potential that one type of practice schedule may have over another in producing performance benefits. Trends in results suggest that it may be possible, using an ICI practice schedule among experienced performers, to reduce acquisition performance decrement usually seen with RA practice, without consequently sacrificing any long term learning benefits. However, this warrants further study. Increasing the number of practice sessions may yield more significant findings. Further study should also consider skill level within those classified as experienced.

References.

A NOVEL MEASURE OF ATtributions, AND MAIN AND INTERACTIVE EFFECTS OF ATtributions UPon SELF-EFFICACY AND PERFORMANCE

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Rees, Ingledew, and Hardy (2005) proposed that attribution research should focus on the main effects of controllability, together with the interactive effects of controllability and generalisability dimensions (stability, globality and universality) upon outcomes such as self-efficacy and performance. Five studies are reported, providing evidence of construct validity for a novel measure of attributions, together with evidence of main and interactive effects for attributions upon self-efficacy and performance.
In study 1, the factor structure of a four-factor 16-item measure of attributions (the CSGU) assessing the dimensions of controllability, stability, globality and universality was confirmed across all successful conditions ranging from a child born in December, though both find themselves in the same age group. Using data from the NHL, Grondin et al. (1984) found a strong over-representation of players born at the beginning of the year and an under-representation of those born late, the former being taller than the latter. Given that height is the most valued physical attribute in youth categories, players born a long time after the cut-off date may be over-represented among dropout athletes.

In conclusion, support was provided for the factor structure of the CSGU, together with evidence of main effects for attributions upon outcomes following more successful performances and interactive effects following less successful performances (and failure). The interactions suggest that where opportunities for self-enhancement are precluded personal self-belief will be compromised and performance will suffer.

References

MacNamara, A., Collins, D. University of Limerick, Ireland

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References

MacNamara, A., Collins, D. University of Limerick, Ireland

MORE THAN THE X FACTOR: CONSIDERING THE ROLE OF PSYCHOLOGICAL CHARACTERISTICS IN TALENT DEVELOPMENT

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University of Limerick, Ireland

More than the X factor: Considering the role of psychological characteristics in talent development

Talent is typically conceived as the ability to perform at an elite level, with little consideration given to the capacity that such an individual needed in order to negotiate the pathway to excellence. The importance of psychological factors as determinants of elite performance is already well established in the literature (Gould, Differenbach & Moffett, 2002). However, given the complexities involved in the development of talent, it is pertinent to consider the role that Psychological Characteristics of Developing Excellence (PCDEs) play as ‘determinants of development’. In short, modern talent development approaches are beginning to stress the importance of Psychological Characteristics of Developing Excellence (PCDEs) as the best way to identify, and then realize through systematic development and facilitation an individual’s potential. However, the application of PCDEs may be complicated by differences between both activity-related developmental pathways (e.g. sport and music), and the challenges faced at different stages of development. Therefore, the purposes of this study were firstly to examine whether the same PCDEs shown as important for elite performance facilitate the successful negotiation of the pathway to excellence, and secondly whether PCDEs are deployed differently at different stages of development and within different domains. Twenty four elite participants were purposefully sampled from different performance domains (athletics N = 8, team sports N = 8), and music N = 8). A retrospective, semi structured interview methodology was adopted. Results suggest that the participants employed a range of PCDEs similar to those found at elite level as they negotiated the inevitable challenges and transitions encountered along the pathway to excellence. However, PCDEs were deployed differently depending on the challenges faced by performers at different stages and within different domains. In fact, the application of PCDEs appeared to be on a continuum from teacher led behaviours in the sampling years towards self initiated PCDEs in the specialisation and investment years. Recognising this, TID models should consider, monitor and develop all the components (e.g. physical, technical, psycho-behavioural) that influence the fulfilment of potential and underpin a performer’s capacity to develop within performance domains. Importantly, this research serves more than academic interest, as findings would sensibly form the basis of TID models as well as broader coaching and development processes.

References


INFLUENCE OF THE RELATIVE AGE EFFECT ON THE DROPOUT OF A SPORTS ACTIVITY

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Understanding the determinants of sport dropout is an important issue for the sport federations that want to grow up durably. It is hence fundamental to attract new members while developing the loyalty of current members, notably in youth categories. Loyalty may be developed only after having identified and mastered the factors of dropout.

In sport, cut-off dates are used to put in place different categories of practice according to the players’ age in order to allow a more balanced competition. However, in a system based on the 1st January, a child born in January will have an advantage in physical and cognitive maturity of 11 months compared to a child born in December, though both find themselves in the same age group. Using data from the NHL, Grondin et al. (1984) found a strong over-representation of players born at the beginning of the year and an under-representation of those born at the end. They suggest that this biased distribution is a consequence of the cut-off date in the 1st January which is used to determine the age categories. Indeed, this distribution was explained by a mode of selection preferring an early physical development discriminating against players born late in the competitive year.

Recently, Delorme & Raspaud (in press) reported the existence of a significant relative age effect (RAE) in all youth male and female age categories of French basketball. In addition, they found important differences between the height of the players born early in the competitive year and those born late, the former being taller than the latter. Given that height is the most valued physical attribute in youth categories, players born a long time after the cut-off date may be over-represented among dropout athletes.
The aim of this study was to examine the distribution of the birth dates of the young male (n = 44,498) and female (n = 30,147) French basketball players who dropped out this sport during or at the end of the 2005-2006 season, to examine whether the RAE plays a significant role with regard to this phenomenon. The results showed an under-representation of players born early in competition year and an over-representation of players born late from 9 to 14 years old for males (<0.0001) and from 9 to 17 years old for females (<0.0001). Despite the growing number of articles on this topic, the RAE has not been mentioned in the recent reviews of literature of the psychological and sociological factors influencing the dropout rate of the young sports participants. The results of the present study confirm that this effect should be taken into consideration in studies about sport dropout as a variable that may influence significantly this phenomenon.


References.

1. Mastrogiannakis, D. University Paris XI, University Lille 2, France


3. Breedveld, K., Hoekman, R. WJH Muller Institute, Netherlands

4. Physical activity is generally assumed to be beneficial for one’s health. The importance of physical activity in relation to people’s health has resulted in international consensus on guidelines for Healthy Physical Activity. These guidelines contain a minimum quantity and intensity of physical activity. In the Netherlands the Dutch Healthy Physical Activity Guideline (NNGB) is used. The NNGB is based on a minimum of 30 minutes moderate physical activity for five days a week.

5. Earlier research shows that Dutch adult sportsmen are more likely to meet the requirements of the NNGB, than those who do not participate in sports.

6. This research was based however on a simple dichotomy between those who do and those who do not participate in sports. However, the group of sportsmen is not a homogeneous group and is made up of people performing different sports, in different contexts, with differing degrees of participation.

7. In this paper we will therefore further investigate compliance to norms for physical activity within the group of sportsmen.

8. Our analyses, performed on the survey Injuries and Physical Activity in the Netherlands (OBiN- a nationally representative sample of over 5,000 persons), indicate that sportsmen who more frequently take part in sport (at least two times a week) are far more likely to meet the NNGB than the rather large group of sportsmen who participate in sport not more than once a week. The second half of the paper therefore investigates determinants of more frequent sports participation, linking frequent sports participation to organisational setting (club, commercial sports centre, unorganised), main type of sport and motives to take part in sport, as well as standard background variables such as age, gender and levels of education.

9. Our analyses, performed on the survey Injuries and Physical Activity in the Netherlands (OBiN- a nationally representative sample of over 5,000 persons), indicate that sportsmen who more frequently take part in sport (at least two times a week) are far more likely to meet the NNGB than the rather large group of sportsmen who participate in sport not more than once a week.

10. The paper adds to literature on the significance of sports for maintaining healthy lifestyles and to the literature on explaining and understanding sports participation.

THE REGULATION OF THE ECONOMIC STAKE OF FOOTBALL HOOLIGANISM - THE GREEK CASE

Mastrogiannakis, D. University Paris XI, University Lille 2, France

Since the institutionalisation of professional football in Greece in 1979 and the efforts for its modernisation at the end of the 90’s, the championship is mainly characterized by these two phenomena. On the one hand, there is a continuous economic decline of the football clubs; a fact, which is accompanied by the low attendance in the football grounds and on the second, is the permanent manifestation of hooliganism which is something that actually marks this era. Our main assumption, according to Bourdieau’s social theory, suggests that the Greek legislation against football hooliganism constitutes the principle of construction of a specific social field in order to fight against the phenomenon. Having in mind the above mentioned hypothesis, we were brought to identify a hierarchical structured microcosm, between two principal poles: the first one which is the dominating one, is the public pole which consists of the Ministry of Sports and the Ministry of Public Order, and then, the second pole, the dominated, where order the Greek Football Federation, the Professional League and the clubs. Thus, although the fight against hooliganism appears as a ‘game’, which is produced in this social space, it appears as a political one. If this social field is a space of forces and struggles between the actors of the various positions with matter of these stakes, the existence of this one presupposes nevertheless, a collusion of those that are committed there. The aim of this contribution is the presentation of the games between the occupants of the different positions in order to regulate the economic stake, related to the manifestation of the hooliganism.

RISK SPORTS - SOCIAL CONSTRAINTS AND CULTURAL IMPERATIVES

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Participation in sport activities involving excitement and risk, such as climbing, surfing, river kayaking, is increasing in the Western world (e.g. Rinehart and Sydnor 2003, Wheaton 2004). In this talk I will identify and discuss two seemingly opposing sociological understandings of the motivations for getting involved in risk sports. Within the compensation model, risk sports are seen as a legitimate way to express affections and desires normally suppressed by societal norms. In this model, voluntary risk taking is seen as a compensation for a highly regulated and constrained modern life. In opposition, the adaptation model sees risk taking as a result of emerging cultural norms that embrace risk. The ethos of risk sports are then seen as concurring with values in present day society. Within the compensation model voluntary risk taking is seen as...
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a result of a society that is too safe and regulated, whereas the adaptation model sees the same phenomena as resulting from cultural norms that cultivate and worship risk taking.

In the talk I will evaluate the two models’ underlying understanding of society and individual desire development. I will argue that the two models are not necessarily opposites, but that they emphasize different sides of modernity that are simultaneously present. I will use Peter Wagner’s historical sociology (Wagner 1995) to show that modernity simultaneously consists of tendencies of both discipline and liberty. When it comes to understanding actors’ motivation to participate in risk sports, I will scrutinize how the two models understand development of desire. The compensation model understands desire as developing from deeply rooted human needs. The adaptation model on the other hand sees desire as socially constructed. I will use Crossley (2001) to argue that seeing desire as constructed, better explains the rising popularity of risk sports. Nevertheless, many actors find themselves living their daily lives in constraining settings. I will argue that the rising popularity of risk sports to some extent can be explained by the tensions created by a mismatch between desire structures developed from cultural imperatives in late modernity, and the factual constraining settings of every day life.

References


**WE NEED YOU! - A QUALITATIVE EVALUATION OF PROJECTS FOR INTEGRATION AND PLURALISM WITHIN THE ‘HANDSHAKE’ BETWEEN THE SWEDISH GOVERNEMENT AND SWEDISH CONFEDERATION OF SPORTS**

Lundvall, S.

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Between 2004 and 2007, 90 million Euros were given to the Swedish Confederation of Sports (RF) by the Swedish Government in order to stimulate participation in sports for young people. RF gave priority to five areas: open the doors for all, promote girls’ sports, fight against drugs, keep fees down, intensify school cooperation.

Objective

This study is focussing on several years’ projects aiming at integration and pluralism (27 out of 84). The objective has been to i/ describe the project applications through a textual analysis, ii/ explore the fulfilling and challenges of six strategically chosen projects and iii/ to understand the participants experiences of them.

Methods

Six field visits, lasting one day, and semi structured interviews with project leaders, coaches, assisting adults, participants (aged 9-27 yr), parents and school personnel (in total 45) were made. All projects were geographically spread and within multicultural areas in Sweden. As theoretical frame intercultural migration research has been the point of departure for understanding mechanisms behind power distribution, discrimination and exclusion. Ethnicity has been used as an analytical tool on a discursive textual and practical level within the projects.

Results

On a discursive level the majority of the applications illustrated the need of “the others” (participants with immigrant background) in relation to the majority culture represented by clubs and sports associations, describing the lack of meaningful leisure time and physical activities, non-integrated social environments and risk behaviours. Immigrant girls and parents were portrayed as passive, in the need of role models and new norms. Though, 5 out of 27 applications took another ideological stand turning to the need of the sports movement. These projects indicated problems for the sports movement to develop itself and support democratic values without the inclusion of “the others” - claiming for mutual benefits and new methodologies.

The interviews display how new ways of organizing sports became important factors for success. The participants expressed joy of having activities close by their school and living. Girls stressed the importance of getting an arena by their own. In a project for recruiting leaders with immigrant background, problems with discrimination were revealed in terms of earlier and present experiences of discrimination. Parents and assistant adults witnessed never before being approached by the sports community.

Discussion

If the sports movement in Sweden is striving for inclusion and pluralism - steps need to be taken on both a strategically and practical level. People living in multicultural areas are willing to contribute to the process of inclusion and sport participation but on shared premises.

References


**MANAGING THE PASSION FOR COMPETITION - NIETZSCHE AND THE EUROPEAN SPORT MODEL**

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Introduction

The idea of "agôn" conceptualized as fair and noble competition has a central place in the Friedrich Nietzsche (1884-1900) thinking. Since his first period which occurred under the influence of Wagner and Schopenhauer, marked by texts like "The Birth of Tragedy" (1872), "Homer on Competition" (1872) and "Unlimited Meditations" (1873-1876), Nietzsche, departing from the classics wrote about the nature of human existence, beginning with the struggle for survival, and envisioning the building of success and excellence, which the Greeks named “arête”.

In the present paper we will undertake a close reading of Nietzsche work, exploring the nature of strife, how this strife channels itself into cultural forms, and how these forms according with Nietzsche’s thinking should organize a new paradigm for the “European Sport Model (ESM)".

Methods

In “The Birth of Tragedy” and in “Human, All Too Human” (1878), Nietzsche started the development of a research method which he named “genealogical”, derived from the philological method of research. Its application was done later by means of what the philosopher called “transvaluation of all values in the sense of humankind overcoming”, and conceptualized as an historical process of forming the prevalent moral values represented by the binomial good/evil.

Development

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The characteristics of the ESM are: (1) corporative, (2) pyramidal, (3) pedagogical, (4) nationalist, (5) standardized, (6) of open competitive leagues, and (7) integrating a vertical structure of social values.

In the "transvaluation of the values" we analysed the present and future meanings of the “ESM” according with the following items: (1) Natural Law; (2); Super-Man; (3) Power Need; (4) Dionysius vs Apollo; (5) Eris; (6) Socrates Demonian; (7) Ostracism Principle; (8) Eternal Return; (9) Good and Evil; (10) State; (11) Democracy; (12) Europe.

The entrance of television in the big sports events, which was really initiated with the Rome Olympic Games (1960), originated the consequent and progressive contamination of sports by the “monies”. So, from the sport point of view the “ESM” is now in a profound identity crisis.

Conclusion

Crossing over the Nietzschean 12 categories with the seven characteristics that determine the ESM we came to the conclusion that the system evolution points hypothetically to a configuration which has the following organizing attributes: (1) under a market economy, (2) network-based, (3) of entertainment industry, (4) "clubist-centered", (5) of variable geometry, and (6) integrating a vertical structure of economic values.

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FORMING OF MEDIA IMPERIALISM IN SPORTS AND EFFECT OF COLONIALIZATION ON OLYMPIC WRESTLING

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Introduction.

Opposing the practice of the previous centuries, the present day financial and political groups of interests reach their aims not by means of military technique, but via media.

The economic, political and cultural capital piled up by the media empires is the result of a kind of modern colonialization. As a consequence of this kind of colonialization, certain nations and social groups lose their previous identity and become defenceless. Sport cannot be an exception from this either, and it is forced to continuously transform/change in favour of increasing Olympic profit. The negative trends having formed during the past decade in the content values of wrestling is continuing.

Methods.

The followings were applied during 1500 bouts (Olympics, World Championships: WCh'85, Atlanta '96, Athen '04, WCh. '05, WCh '07)
Direct recorded information from the minutes of the bouts:
  • number of bouts
  • duration of bouts
  • number of falls
  • number of technical points
  • Indirect observation methods:
    • simple attack
    • complex attack
    • attempted attack and completed attacks are registered on a special survey sheet

Results.

As a result of the changing rules of the past years, wrestlers have minimised their actions initiated from standing, have decreased the number of their complex, but spectacular actions, have set themselves for holds worth one or two points. The number of falls and technical falls decreased to half in the past years, so - although suitable to TV broadcasting - wrestling has gradually lost its spectacle and spirit. The number of technical points for a time unit has not changed, which unambiguously means the devaluation of the contextual value of wrestling, although the length of the bouts shows a tendency to decreased.

Conclusions

Spectacular throws executed from standing should be valued in a way, that it should mean end of the bout. The first action should have a double value and of decisive importance in case of a tie.

Oral presentations (OP)

OP-TT02 Training and Testing 2

INTER-LUMB COORDINATION PERFORMANCES FOLLOWING A YOUNG BASKETBALL MATCH

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Introduction

Since basketball matches require high-intensity activities (Hoffman et al., 1999; Kalinski et al., 2002), it is possible to hypothesize a decrease in the player’s coordinative performances at the end of the match. Thus, the aim of this study was to verify differences in inter-limb coordination performances following a basketball match in young players.

Methods

Before and after a friendly 4-period basketball match, 10 young players (age: 16±0 years) were administered in-phase (IP) and anti-phase (API) inter-limb coordination (flexions and extensions of hand and foot at 80, 120, and 180 beats/min (bpm) velocities, for 60 s maximum) tests (Capranica, et al., 2004). The intensity of the match was evaluated by means of rates of perceived exertion (RPE) and muscle pain (RMP), and heart rate (HR) expressed as a percentage of HRmax i.e., maximal effort, ME: >95% HRmax; high-intensity, HI: 86-95% HRmax; low-intensity, LI: 76-85% HRmax, active recovery, AR: 65-75% HRmax, passive recovery, PR: <65% HRmax). Differences (p<0.05) were evaluated by means of ANOVA for repeated measures with PLSD post-hoc.
results of endurance athletes’ group showed a clear pattern of occurrence of aerobic-anaerobic transition which is in agreement with practices, experiences of OT, and psychosocial stress. Athletes participated in 7 different sports and 30% competed at national level.

Acknowledgments: Suunto Oy and Myontec Oy for providing technical support.

References.


ANALYSIS OF THE AEROBIC-ANAEROBIC TRANSITION DURING INCREMENTAL TREADMILL RUNNING WITH THE USE OF ELECTROMYOGRAPHY

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Introduction. A non-linear increase of EMG has been identified as a threshold (EMGT) and its occurrence has been shown to correlate with first (VT1) or second ventilatory (VT2) threshold during cycling [1]. Running presents a biomechanically more complex movement pattern where modest changes in technique can be used to compensate for fatigue [2]. In field conditions during everyday training, novel textile electrodes embedded into clothing [3] could provide a convenient way to determine EMGT. The purpose of this study was to examine use of textile electrodes in detecting aerobic-anaerobic transition during incremental treadmill running.

Methods. 28 males (25±3 yrs, 178±5 cm, 71±8 kg) accomplished VO2max test on a treadmill (3 min ramp model, 1 km/h increments). Subjects were analyzed in two groups: 15 recreationally active (VO2max = 50±7 ml/kg/min) and 12 endurance athletes (VO2max = 64±8 ml/kg/min, 5 endurance runners, 7 orienteerers). EMG using textile electrodes embedded into shorts [3], heart rate (T6, Suunto, Finland), lactate (Lactate Pro) and respiratory gases (Sensor Medics Vmax 229) were assessed. Second ventilatory threshold (VT1), onset of blood lactate accumulation (OBLA) and EMGT using two-segment linear analysis (quadriceps and hamstrings combined) were determined [4, 5 and 1]. Pearson’s correlation coefficients, ANOVA and Bland & Altman procedures were used for statistical analyses.

Results. EMGT of recreationally active subjects did not show a consistent pattern by its timing in relation to VT1 or VT2. However, the EMGT results of endurance athletes’ group showed a clear pattern of occurrence of aerobic-anaerobic transition which is in agreement with VT2 and OBLA methods. There were no significant differences in VO2max at the different thresholds: VT2 occurred at 59.6 ± 5.0 ml/kg/min, OBLA at 62.6 ± 5.0 ml/kg/min and EMGT at 62.6 ± 5.0 ml/kg/min. Correlation coefficient between EMGT and VT2 was 0.77 (P<0.05) and 0.67 (P=0.07) between EMGT and OBLA. The data collection in the athletes group with good quality was 67%. The remaining 33% of data was non-analyzable due to improper size of the shorts where EMG electrodes were embedded [3].

Discussion/Conclusion
Although matches put a heavy load on players, the coordination abilities tend to increase at the end of the match. Actually, a little margin of improvement was expected considering that before the match the players showed high performances when compared to those reported for young sedentary individuals [Capranica et al., 2004]. Therefore, it is possible to speculate that an acute bout of intense exercise exerts beneficial effects on the efficiency of executive and attentive control functions involved in complex motor behaviours.

References.


INCIDENCE OF NON-FUNCTIONAL OVERREACHING IN YOUNG ATHLETES PRACTICING INDIVIDUAL SPORTS

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Incidence of non-functional overreaching in young athletes of individual sports

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Introduction: When the balance between training stress and recovery is disproportionate, an athlete may be at risk of becoming overreached or overtrained. Two studies which investigated the prevalence of overtraining (OT) in young athletes (11-18 years old) reported an incidence of OT of 35% [Raglin et al., 2000] and 37% [Kenia et al., 2001]. However, information concerning the occurrence and nature of OT in younger athletes are still scarce, whilst recording a wider range of symptoms such as upper respiratory tract infections (URTI), apathy, bad mood during times of hard training and not doing enough to meet training goals have been largely ignored. The aim of the study was to assess the incidence of self-reported non-functional overreaching (NFOR) using a more extensive list of associated signs and symptoms in athletic children (Meuuseen et al., 2006).

Methods: Ninety-two athletes (48 girls and 44 boys) with a mean age of 14.7 ± 1.7 y completed a 92-item questionnaire about training practices, experiences of OT, and psychosocial stress. Athletes participated in 7 different sports and 30% competed at national level. Athletes were classified as being NFOR if they reported to ever have experienced daily fatigue and a significant decrement in perform-
ance for long periods of their training. Data were analysed using the Mann-Whitney non-parametric test and statistical significance was set at p < 0.05.

Results: Thirty-four percent of athletes were classified as NFOR. The NFOR athletes reported significantly greater incidence of problems with sleep (p=0.002), URTI (p=0.004), fatigue during periods of hard training (p=0.000), mood fluctuations (p=0.001) and feelings of apathy (p=0.000), and perception of failure to meet self (p=0.001) and coach expectations (p=0.007).

Conclusion: The results have shown that 34% of the athletes have experienced NFOR at least once, and the same signs and symptoms reported in adults are present in children, supporting two other surveys on young athletes (Kenta et al., 2001; Raglin et al., 2000). Over-training seems to be associated with fatigue caused from training and the related psychological and social stressors.

References:

CAN 2000-M ROWING ERGOMETER TIME BE USED AS A VALID PREDICTOR OF 2000-M ON-WATER PERFORMANCE?
A STUDY OF 398 ELITE JUNIOR ROWERS
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Introduction
Rowing ergometers are designed to simulate movements performed during on-water rowing and are widely considered to be valuable tools for rowing training, the evaluation of rowers’ sport-specific performance, and the detection of any changes in performance capacity. The aim of this study was to predict on-water rowing performance, as measured by final rankings at the most important competition for junior rowers the FISA World Rowing Junior Championship (WRJC), based on the 2000-m ergometer times in a sample of 398 male and female junior rowers competing in all 13 events of the 2007 WRJC.

Method
At the FISA WRJC (Beijing, People’s Republic of China, 8-11 August 2007), a total of 398 junior rowers from 45 countries were interviewed using a questionnaire. The sample included competitors participating in 13 events held during the Championship, as well as the reserves (1.3% of the sample). Coxswains were not included. The sample represented 65.9% of all competitors, including 52.5% of the A finalists as well as 39.9% of the medallists. Following the exclusion of invalid data, the sample eventually comprised 382 junior rowers (222 males and 160 females) who entered statistical analyses. Out of 382 rowers, 360 (94.2%) used a stationary Concept II rowing ergometer for testing purposes, 15 (3.9%) used a Concept II rowing ergometer on slides, and 7 (1.8%) used a RowPerfect rowing ergometer.

Results
In all 13 events the competitors’ 2000-m ergometer times were significantly (P<0.05-0.001) correlated with their final WRJC rankings. The highest correlations were obtained for the rowers’ ergometer times in women’s single sculls (r=0.922) followed by men’s single sculls (r=0.804) and women’s double sculls (r=0.793). The obtained correlations are generally higher for smaller boats i.e. singles, doubles and pairs (r=0.638-0.922) than for larger boats i.e. quads, fours and eights (r=0.308-0.699). Simple regression analyses were used in order to define the prediction models, and the highest predictive power (R²=0.850, SEE=1.96) was obtained for women’s single sculls.

Discussion and conclusions
The main findings of the present study are that the 2000-m rowing ergometer times of competitors participating in all 13 events of the 2007 WRJC are significantly (P<0.05-0.001) correlated with their final championship rankings and that improvements in their final rankings correspond to improvements in rowing ergometer times. Although the majority of obtained correlation coefficients range from medium to very high, the use of ergometer times for predictions of on-water performance is limited by the fact that on-water rowing requires specific techniques compared to rowing on an ergometer e.g. manipulation of the oar handle, the synchronization of individual motor performances in team boats, and is performed under various environmental conditions, all of which cannot be measured on an ergometer.

EFFECTS OF IN- AND EXPIRATORY MUSCLE TRAINING ON RUNNING PERFORMANCE
Sperlich, B., Fricke, H., de Maréès, M., Mester, J.
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Introduction: The fatigue of respiratory muscles (RM) during exercise is being debated to have a limiting effect on physical performance. During rest 2-4% of the entire oxygen consumed (VO2) is used for metabolism in RM. During heavy exercise this amount increases to 10-16% of maximal VO2 (KROIDL et al. 2007, SCHARDT 2005). In this case oxygen consumed by RM may compete against peripheral consumption.

During rest 2-4 % of the entire oxygen consumed (VO2) is used for metabolism in RM. During heavy exercise this amount increases to 10-16% of maximal VO2 (KROIDL et al. 2007, SCHARDT 2005). In this case oxygen consumed by RM may compete against peripheral consumption.

In conclusion with findings of MCCONNELL/SHARPE (2005), WILLIAMS et al. (2002) & HART et al. (2001). The RMT performed in this study corresponds to improvements in rowing ergometer times. Although the majority of obtained correlation coefficients range from medium to very high, the use of ergometer times for predictions of on-water performance is limited by the fact that on-water rowing requires specific techniques compared to rowing on an ergometer e.g. manipulation of the oar handle, the synchronization of individual motor performances in team boats, and is performed under various environmental conditions, all of which cannot be measured on an ergometer.

References. On request by author

Thursday, July 10th, 2008 10:15 - 11:45
COMPARISON OF THREE DIFFERENT TEST PROTOCOLS IN SWIMMING

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Introduction
Many different step test protocols exist for defining training workload in competitive swimming. When performing step tests in swimming without flume the distance of each step remains the same while the time per step decreases. Step distance of 200m or shorter will lead to an exercise time shorter than 2 seconds. A step shorter than 2 minutes is too short to achieve steady state in lactate concentration during incremental testing. Many coaches, even those working with elite athletes, use the results of these tests to control their training. Very often the workloads for the lower training paces given by these tests are much too low for the swimmers. The aim of this study was to compare two common test designs with a test protocol with constant time length for every step, common to the test designs on a treadmil.

Methods
20 male swimmers participated in the study (17.8±3.7 years, 184±7.6 cm, 77.1±8.4 kg). The first protocol was a set of 7x200m, start every 5 min. The pace for the 1st 200m was personal best+35 sec. Following 200m time should decrease by 5 sec.

The second step test protocol consisted of 5 steps. It was a set of 8x200m with varying rest periods. The velocity of the first step should be 70-85% of personal best. The last swim was supposed to be personal best. After each swim blood samples were taken for lactate measurement, and heart rate was measured immediately. After the last swim lactate was continuously measured until the 10th minute.

Results
The mean velocity at 2mmol/l lactate in the 7x200m protocol was 1.25±0.06 m/s, in the second protocol 1.24±0.07 m/s and in the third protocol was 1.25±0.06 m/s.
At 3mmol/l lactate the velocities were 1.30±0.06 m/s in the 7x200m, 1.28±0.07 m/s in the second test and 1.29±0.07 m/s in the third protocol.

The mean velocities for fixed 4mol/l lactate threshold were: 7x200m 1.31±0.07 m/s, second test 1.31±0.07 m/s, third protocol 1.32±0.07 m/s. At lactate values of 2, 3 and 4mol/l, there are no significant differences in velocity between the three protocols.
In the fastest mean velocity in the final step was achieved in the second test protocol (1.46±0.08 m/s). The final velocity in the 7x200m test was 1.43±0.09 m/s and 1.39±0.06 m/s in the 3min-step-protocol.

Discussion
All three test designs showed no significant differences in the velocities at 2mmol/l, 3mmol/l and 4mmol/l lactate between the different protocols. The decreasing time of the steps during swimming tests is no criterion which leads to results, which can't be compared with the results of tests with constant steps. Nevertheless the velocities given by these tests for aerobic training workouts are too high. The athletes won't stay in aerobic metabolism after a short time of training.

12:00 - 13:15

Plenary sessions (PS)

PS-2 Metabolic syndrome - Obesity & Diabesity

THE HARD EVIDENCE THAT AN ACTIVE LIFESTYLE PREVENTS METABOLIC SYNDROME

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The World Health Organisation predicts that in 2020 sixty-70% of all chronic diseases leading to death will be lifestyle related. The combination of physical inactivity and an imbalanced nutrition containing too many calories and fat will lead to further epidemic increases in obesity, metabolic syndrome, type 2 diabetes and cardiovascular disease and become the biggest premature killer. In order to make individuals and populations change lifestyle it is important to understand the physiological and biochemical mechanisms by which an unhealthy lifestyle leads to the metabolic syndrome and related pathologies and the health benefits of regular exercise. This lecture will first describe the metabolic impairments that result from the combination of too little exercise and too many calories. Uncomplicated gains in body weight will soon be followed by obesity and via mechanisms that among others involve a plasma fatty acid/lipid overload and inflammation lead to functional impairments of the (micro)vascular endothelium, insulin resistance, type 2 diabetes and cardiovascular disease. A high frequency of these previously named age-related chronic diseases is now observed in children and adolescents in most countries worldwide. Single bouts of exercise have many biological benefits not only in healthy lean, but also in obese individuals and patients. Selected examples will be given of the metabolic effects of individual bouts of exercise on insulin sensitivity of skeletal muscle and function improvements of the vasculature. Large accumulative effects are observed in individuals training 3-4 times a week for several months up to more than 1 year. The adaptability of the muscle is remarkable both in terms of its ability to oxidize fat, but also in its ability to regain sensitivity to insulin. Changes in the vascular wall are reversible as well and the current literature seems to suggest that these changes may be even faster and achievable at lower training loads. Even severe cardiovascular pathology is reversible when the exercise program is intense enough and supervised by professional trainers. The success of voluntary lifestyle intervention programs, involving both exercise and diet, either undertaken individually or in groups in achieving measurable biological effects is rather minimal though and this is among others related to the strong intrinsic motivation that is needed to perform intense exercise training and reduce food intake for prolonged periods of time (covered by Joan Duda). Very important also are the exercise infrastructure limitations in a highly populated world with a high traffic density. Modification of inner city infrastructures with traffic free walking and cycling lanes should have the highest possible priority of governments and public health authorities.

Reference.
NEW APPROACHES TO PROMOTING AN ACTIVE LIFESTYLE
Duda, J.
University of Birmingham, United Kingdom

There is currently a considerable amount of evidence regarding the impact of regular engagement in physical activity (PA) on physical and mental health. We also now know more about the physiological and biochemical mechanisms by which exercise contributes to health as well as the means by which inactivity can lead to metabolic disorders and disease states. However, despite these marked advances in our knowledge base, there is a large and increasing percentage of the population who do not participate in PA at the intensity and frequency necessary to accrue the health benefits associated with regular exercise. Interventions to promote PA levels have involved informational campaigns and modifications of the physical environment so that it is more conducive to an active lifestyle. Community-based PA promotion programmes have also been done. This presentation centres on individual-based intervention strategies and, in particular, speaks to the importance of personal autonomy regarding successful behavioural change. Pulling from Self-Determination Theory (SDT; Deci & Ryan, 2000), people are autonomously motivated when they engage in an activity or cease an activity for reasons that come from within the self and are freely chosen. Research grounded in SDT has associated autonomous motivation with improved attendance and greater reductions in body mass indices within weight reduction programmes, long-term medication adherence, improved glycemic control and dietary self-care in diabetes patients, reductions in intensity and frequency of smoking in adolescents, and maintained smoking cessation in adults. Recent research findings will be presented (e.g., Edmunds, Ntoumanis, & Duda, 2007a,b) regarding the role of self determination, and its social environmental determinants, to PA engagement.

References:
treadmill exercise (60 min, 28 m/min, 0% grade) program on plasma, liver and skeletal muscle ATP contents in wild type male rats. Methods: forty male Wistar rats (age 17 weeks, 218 +/- 1.6 g) used for this study and divided into four; fed-control, fed-exercise, fast-control, and fast-exercise. Animals were sacrificed 24 hours after the last session of exercise, the blood and tissue samples were collected. ATP was measured by using an enzymatic (luciferine-luciferase) method. Normal distribution of dependent variables was documented by Kolomogorov-Smirnoff test. The data were analyzed by ANOVA univariate and one way ANOVA. The level of statistical significance was set at P<0.05. Results: the data indicate that the level of liver ATP was significantly higher (P<0.028) in trained group when compared with control group. A higher but non-significant plasma and muscle ATP concentrations were observed in trained rats. However, fasting lowered liver, plasma, and muscle ATP contents only in control not trained-fasted rat. Discussion: the main finding of this study was a higher levels of liver ATP in trained rats following the treadmill training. Data also shows training attenuated a fasting-induced reduction of ATP in the liver, plasma, and muscle. A non-significant increase in plasma ATP levels might be related to the release of ATP from blood cells (erythrocyte and leukocytes) and a non-significant increase of muscle ATP content following treadmill exercise due to incomplete recovery of muscle glycogen content which acts as a source of ATP synthesis. This the first study which investigate the effects of 10 weeks of treadmill exercise training on plasma, liver and muscle ATP contents at rest. Conclusion: a higher resting liver ATP might be due to an exercise-induced increase in liver glycogen content and ATP uptake from plasma.

### A SINGLE CIRCUIT-RESISTANCE EXERCISE HAS NO EFFECT ON PLASMA OBESTATIN LEVELS IN FEMALE COLLEGE STUDENTS

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Birjand University, Tarbiat Modares University (TML), Birjand University, Tarbiat Moallem University, Shaheed Beheshti University of Medical Sciences, Iran

Obestatin is a 23 amino acid peptide recently isolated from rat stomach that is encoded by the same gene as ghrelin[1,2]. Although ghrelin and obestatin originate from the same precursor prepropeptide, Most reports suggest that obestatin has opposite action to ghrelin on food intake and energy balance[1,4]. Until now, obestatin’s biological effects have been tested only in mice and rats[2,3]. The specific aim of the present study was to investigate the effect of a single session circuit resistance exercise (CRE) on plasma obestatin and growth hormone (GH). Twenty volunteer young female lage 22.84 ± 0.57 year, height 162.37 ± 1.2 cm, body weight 54.02 ± 1.7, and body mass index (BMI) 20.40 ± 0.415 kg/m²) were randomly divided into four: 40, 60, 80% one-repetition maximum (1RM) and combined (40+60+80%) load groups (COL). Subjects performed a single session of CRE, consisting of 3 sets of 9 exercises (25 seconds per each exercise with 1 minute interval between each set). Blood samples were collected before and immediately following the exercise protocol. Changes in plasma obestatin levels were not significant within and between groups. Plasma GH concentrations were significantly higher (P<0.001). Results of this protocol of sprint exercise training are consistent with previous work that demonstrates an increase in lipid peroxidation in response to high intensity exercise [3, 4]. Indeed, the present study indicates that long-term, high intensity training can effectively reduce the role of oxidative stress by cause adaptation in antioxidant systems that confirm prior studies. However, detraining reversed improvement.
Obestatin is a 23 amino acid peptide recently isolated from rat stomach mucosa. It is encoded by the same gene that encodes ghrelin; however, obestatin has an opposite effect on food intake and plays a role in energy balance. The purpose of the present investigation was to determine the effect of various periods of endurance and sprint training on lipoperoxidation (MDA) and antioxidant defence system including Ferric Reducing Ability of Plasma (FRAP), bilirubin, uric acid and total protein. Methodology. A total of 54 three month old rats were selected for this purpose and they were randomly assigned to three groups of endurance training (n=18), sprint training (n=18), and control group (n=18). The rats in the experimental conditions performed an either an endurance or sprint training program for 12 weeks, three time a week. The training protocols were designed based on oxygen cost (intensity of the endurance training was set at 1%70-80, while for the sprint training group was set to 1%100 v02max). The variables of interest were measured at three intervals using kit (bilirubin, UA and TPI, TPTZ reagent (MDA) and Thiobarbituric acid marker (FRAP)).

Results and conclusion. The results of analysis by using of Two way repeated ANOVA showed that no significant changes occurred within the control condition, where as, considering MDA, bilirubin and uric acid in endurance training group and based on MDA, FRAP, bilirubin and uric acid within the sprint training group significantly changed. Also, the type of training (sprint vs. endurance) had a significant effect on FRAP (p=0.001) and bilirubin (p=0.008), while no significant changes was found for MDA, uric acid or total protein. In summary, the findings of this research indicated that participation in regular endurance or sprint training program leads to the improvement in oxygen cost and immune cell number. Fifteen healthy and trained men were randomly assigned to one of two groups: control or N-acetylcysteine (NAC, 1200 mg ·d·1 for 8 days prior to and 600 mg on the day of exercise trial). To measure the ergogenic effectiveness of NAC, athletes performed incremental cycle exercise until exhaustion.

NAC administration elevated the resting and post-exercise total antioxidant status (TAS) by 33–57% and reduced level of oxidative stress markers i.e. protein carbonylation (PC) and lipid peroxidation (TBARS) by more than 30%. The plasma PC and TBARS did not correlate with muscle damage markers and immune cell numbers. NAC significantly influenced on number of pathological cells at post-exercise i.e. neutrophils and monocytes increased by 30–64% whereas lymphocytes decreased by 40% compared with control group. The activities of creatine kinase (CK) and lactate dehydrogenase (LDH) were reduced by NAC by more than 30% at post-exercise period. NAC did not cause any changes in myoglobin (Mb) and interleukine-6 (IL-6) levels. All tested markers of muscle damage directly correlated with number of lymphocytes and monocytes. NAC treatment, in the contrary to expectations, did not significantly affect exercise performance.

ASSOCIATION BETWEEN 5-HT1B RECEPTOR GENE (HTR1B) G861C POLYMORPHISM AND THE LEVEL OF PHYSICAL ACTIVITY

Slowinska-Lisowska, M., Haber, E., Jozkow, P., Laczmanski, L., Medras, M.
University School of Physical Education, Poland

Relationship between genetic factors and physical fitness is evident, but the actual role of genes for adherence to physically active lifestyle has not been fully elucidated. The 5-HT1B receptor has been implicated in several psycho-pathologies including pathological aggression, [Saudou et al. 1994], suicide [Youg-yu et al. 2003] and attention deficit hyperactivity disorder [Smoller, 2006]. Animal studies confirmed that stimulation of 5-HT1b receptor increases locomotor activity [Tatarczynska E et al. 2005].

The aim of our work was to search for relationships between 5-HT1B Receptor Gene (HTR1B) G861C polymorphism and level of physical activity in men living in Lower Silesia (Poland).

The study was carried out on 387 men aged 24-72 (mean 47±12). Their mean weight, height and BMI were respectively 85±13 kg, 176±6 cm and 27±4. The most frequently reported diseases were: arterial hypertension (21% of subjects), chronic low back pain (19%), benign prostatic hyperplasia (5%) and diabetes (4%).

Level of physical activity in studied subjects was determined with use of International Physical Activity Questionnaire (last 7-day recall) [http://www.ipaq.ki.se/]. Subgroups presenting high, moderate and low level of physical activity were distinguished.

Genomic DNA was isolated from EDTA anticoagulated whole blood by using standard methods. The polymorphism estimation of the HTR1b (G866C) gene was made by polymerase chain reaction (PCR) and minisequentioning (SNAP-shot kit, Applied Biosystems) in ABI 310 sequenator (Applied Biosystems).

Relationship between physical activity level and the polymorphism of the serotonin receptor gene were evaluated by non-parametric test ch2. The trust level p>0.05 was defined as statistically significant.

The statistical discordance was confirmed in the particular genotypes frequency distribution in persons declaring low physical activity and the according Hardy-Weinberg principle.

In persons declared their moderate and high physical activity the genotypic distribution of the polymorphism G861C Serotonin Receptor 1B Gene (HTR1B) was compatible (P>0.05) to this expected under Hardy-Weinberg equilibrium. We conclude that there is an association between 5-HT1B serotonin receptor gene (HTR1B) G861C polymorphism and the level of physical activity in men.

References.
Youg-yu Jungu., Oguendo M.a., Friedman J.M et all: Substance abuse disorder and major Depression are associated with the human 5-HT 1B receptor gene (HTR1B) G861C polymorphism. Neuropsychopharmacology 2003, 28, 163-169.
Smoller JW., Biederman J ,Arbeitman L et all: Association between the 5HT1B gene (HTR1B) and inattentive subtype of ADHD, Biol Psychiatry 2006, 1, 59 (5), 460-7
Tatarczynska E., Antkiewicz-Michaluk L, Klodzinska A. et all: Antidepressant-like effect of selective-5-HT1B rece

CAG REPEAT POLYMORPHISM IN THE ANDROGEN RECEPTOR GENE AND THE LEVEL OF PHYSICAL ACTIVITY

Slowinska-Lisowska, M., Jozkow, P., Laczmanski, L., Medras, M.
University School of Physical Education, Poland

Though an association between genetic factors and physical fitness is evident the actual role of genes for adherence to physically active lifestyle has not been fully elucidated.

Androgens are thought to influence sport performance, increase activity and aggressiveness. Differences in the length of the CAG repeat may not only affect function of multiple body organs [Langdahl 2003], but mental status and mood as well [Harkonen 2003].

Our aim was to search for associations between CAG repeat polymorphism in the androgen receptor gene and the level of physical activity in men living in Lower Silesia (Poland).

The study was carried out on 387 men aged from 24 to 72 (mean 47±12). Their mean weight, height and BMI were respectively 85±13 kg, 176±6 cm and 27±4. The most frequently reported diseases were: arterial hypertension (21% of subjects), chronic low back pain (19%), benign prostatic hyperplasia (5%) and diabetes (4%).

Level of physical activity in studied subjects was determined with use of International Physical Activity Questionnaire (last 7-day recall) [http://www.ipaq.ki.se/]. Subgroups presenting high, moderate and low level of physical activity were distinguished.

Genomic DNA was isolated from EDTA anticoagulated whole blood by using standard methods. Number of the GAC repeats of the androgenic receptor gene was performed by polymerase chain reaction (PCR). The amplifiacation product was analysed using capillary electrophoresis (ABI PRISM 310).

The investigated group was divided into subgroups of different activity level: high, moderate and low.

Comparison of CAG repeat polymorphism in distinguished subgroups was performed by one-way ANOVA. The level of statistical significance was defined at p<0.05.

We did not find any statistically significant differences of AR length and CAG repeat polymorphism in subjects presenting different levels of physical activity.

Furthermore we did not find any association between AR CAG repeat polymorphism and the level of physical activity in healthy men. This work is supported by the Ministry of Science and Higher Education of Poland (grant code:2PO5D 0730).

References.
Langdahl BL., Stenkjaer L., Carstens M et all: A CAG repeat polymorphism in the androgen receptor gene is associated with reduced bone mass nad increased risk of osteoporotic fractures. Calcif Tissue Int. 2003, 73 (3), 237-43
Sakamoto, M., Sekine, M., Muro, M., Oka, K.

Kitasato University, Japan

Introduction

Satellite cells are the stem cells of skeletal muscle cells and play an important role in the development and regeneration process. They are located between the sarcolemma and the basal lamina of the muscle fiber. The cytoplasm of the satellite cells contains myonuclei and myofibrils. The function of the satellite cells is regulated in relation to the insulin. Larger concentration of lipolysis during effort also influences reduction of excess fatty tissue increasing quality of life and the energetic profile.

Results

Three-week-old and 12-week-old female ICR mice were used. Five animals from each age group were used in this experiment. Randomly 300 nuclei surrounded by the basal lamina of the soleus muscle fiber were observed in each animal. All of the nuclei were divided into satellite cell nuclei or myonuclei from the SEM images. The percentage of satellite cells nuclei (satellite cells/ myonuclei) was calculated in each animal.

Discussion

In the present study, satellite cells were detected by SEM and the fluorescent antibody method. The percentage of satellite cell nuclei was higher in young animals. This was in agreement with the previous study [2]. It seems that the percentage of satellite cells declines with age. The fluorescent antibody method allowed detection of satellite cells and myonuclei. However, for more accurate detection, examination using several antibodies for satellite cells is necessary. Based on these results, it is suggested that SEM is an accurate and convenient method for detecting satellite cells.

References


HORMONAL AND METABOLIC RESPONSE IN MIDDLE-AGED WOMEN TO MODERATE PHYSICAL EFFORT DURING AEROBIC TRAINING

Charmas, M., Opaszowski, B., Charmas, R., Róaska, D., Jówko, E., Sadowski, J.

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Due to the metabolic changes, the physical effort of the weak factor stimulating the secretion of hormones, and the intensity of the hormonal response depends on e.g. the intensity and duration of the effort. Beside the 24-hour rhythm, also the systematic physical training modulates the intensity of the hormonal reaction. Especially, the aerobic training is illustrated in hormonal adaptation to the effort, through modification of the metabolic profile. In particular, this refers to relations between improvement of respiratory efficiency and better use of fatty compounds and preservation of the carbohydrate reserves of the organism by activation of those hormones that are counter-regulative in relation to the insulin. Larger concentration of lipolysis during effort also influences reduction of excess fatty tissue increasing our BMI. Popular "aerobics" activities are aimed e.g. at regulation of the body weight, accompanied by appropriate diet, and improvement of the physical efficiency factors. It is in particular important in case of middle-aged women, where lack of physical activities may cause increased obesity. Therefore, our research is aimed at observation of the selected metabolic and hormonal factors in women subjected to systematic aerobics training. Group (n=13) of women aged on average 37.4 years exercised with music (aerobics) for a period of 12 weeks, 3 times a week for 60 minutes. Prior to the training (I series), after 6 weeks (II series), and at the end of the period (III series) one standard aerobics session was monitored. The blood samples were taken before and after the session, to mark the concentration of lactic acid, glucose, free fatty acids, insulin, growth hormone, testosterone and cortisol. The heart rate was registered (HR). In each series of tests, forced dehydration caused significant (P<0.05) reduction in the body weight, increased concentration of LA, reduction in glucose and increased free fatty acids. Similarly, the significant (P<0.05) forced increase in GH and reduced insulin concentration was noticed. In case of cortisol, the changes were irrelevant. Similarly in case of insulin, the declining tendency was seen statistically irrelevant. Several weeks of training caused the tendency to reduce the biological cost of 60 minutes of effort in the women tested. It was found that the post-effort concentration of LA in the III series was smaller than that of the II series of tests. Similarly as in case of free fatty acids, glucose, and GH concentration. It was accompanied by smaller average increase of HR. This may emphasize the smaller energy cost of the exercises practiced with simultaneous increase of physical efficiency (technique of activity) of the women subjected to training. At the same time there were no adverse hormonal responses, the energetic profile was stable, the body weight was maintained, which means that the results of the training were beneficial.

SALIVA SECRETORY IMMUNOGLOBULIN A RESPONSE TO ACUTE MODERATE EXERCISE IN OLDER RATS


Tsukuba University, Japan

Background: Secretory immunoglobulin A (SgA) plays the major role in effective specific immunity and provides protection of mucosal surfaces via several mechanisms. Polymeric immunoglobulin receptor (pIGR) on the surface of the epithelial cells combines with immu-
noglobulin A to form SIgA. Ageing is associated with a functional decline in several components of the immune system. Moderate exercise training may attenuate the impact of ageing on the immune system, such as SIgA. However, it is uncertain how moderate exercise affects the process of SIgA secretion in older individuals.

Objective: The intent of this study was to describe the impact of acute moderate exercise on SIgA concentration in saliva and pIgR mRNA expression in salivary gland of older rats.

Methods: Male Wistar rats were assigned to treadmill running exercise (Ex group: N = 6) or remained sedentary (Con group: N = 6). In the Ex group, rats ran for 30 min at 15 m/min-1, and their saliva was collected before and after exercise, the salivary glands were removed after exercise. In the Con group, saliva collection and gland removal were also performed, but the rats did not exercise. SIgA concentration in saliva was measured by ELISA, and pIgR mRNA expression in the glands was analyzed by the 7500 Fast Real Time PCR System.

Results: The mean SIgA concentration in the Ex group was 11.12 ± 5.20 µg/mL before exercise and 11.15 ± 5.62 µg/mL after exercise. On the other hand, the SIgA concentration in the Con group was 6.45 ± 2.82 µg/mL before the Ex group began its exercise session and 6.08 ± 3.21 µg/mL after the exercise. There was no significant change in SIgA concentration in both groups. Expression of pIgR mRNA was 0.71 ± 0.64 Ex and 0.97 ± 0.23 Con, respectively. There was also no significant effect of acute moderate exercise on pIgR mRNA expressions in salivary gland.

Conclusion: The findings of this study was that acute moderate exercise have neither affect on SIgA in saliva nor pIgR expression in salivary gland of older rats.

EFFECT OF EXHAUSTIVE EXERCISE AND LONG-TERM MODERATE EXERCISE TRAINING ON MACROPHAGE IMMUNORESPONSE IN MICE


Chungnam National University, Korea, South

Objective. The present research was to investigate the effect of Exhaustive exercise and long-term moderate exercise training on macrophage immunoresponses in mice.

Methods. Male Balb/c mice (4 weeks, n = 30) were used and randomly divided into 3 groups; Control group (CON, n=10), Exhaustive exercise group (EXH, n=10, 14-28 m/min, 5%, 90 min at 16 weeks) or Moderate exercise group (TRA, n=10, 10-14 m/min, 5%, 30-50 min/day, 5 day/week for 16 weeks). 4% Thioylate (1/2 ml) was used to collect peritoneal M. To identify M cells, CD11b was incubated with the cells for 30 mins. Then, Phagocytosis, CD 86, NKC II, LPS or IFN induced Nitric Oxide (NO) production, proliferation and Cytoxines (IL-1, IL-12, TNF-α) were measured. To measure phagocytosis, M cells (1 X 106cells/150ul) were treated with Dextran MW 70,000 at 37°C with 5% CO2 in humidified air for 2 hours, compared to control at 4°C. To measure NO, M cells (2 X 105cells/well) were cultured at 37°C with 5% CO2 in humidified air for 24 hours with LPS (1ug/ml) or LPS (0.5ug/ml)/IFN (100U). Then, Sulfanilamide, NED Griess Reagent and nitrile standard were used. To measure cytokines, commercial ELISA kits were used. Repeated measures ANOVA and One-way ANOVA were used and p value under 0.05 was considered as statistical significance.

Results. Weight of training group was significantly lower than that in both CON and EXH groups at 2, 10, 15 and 16 weeks. Both exhaustive exercise and long-term moderate exercise training enhanced M phagocytosis as compared to CON group. NO, CD86 and MHC were not significantly changed by both exhaustive exercise and long-term moderate exercise training. M presenting IL-12 in training group was higher than that in both CON and EXH. M proliferation was not affected by both exhaustive exercise and long-term moderate exercise training. IL-15 and IFN were slightly but not significantly changed by both exhaustive exercise and long-term moderate exercise training. Conclusion. It seemed that both exhaustive exercise and long-term moderate exercise training can enhance M phagocytosis. We did not find any significant evidence that exhaustive exercise suppressed M immunorespense. However, it is clear that long-term moderate exercise training could positive effect on M immunorespense by improving phagocytosis and presenting IL-12 which helps Th1 cells.

THE EFFECTS OF A 30 HOUR PERIOD OF SLEEP DEPRIVATION ON SELECTED IMMUNE RESPONSES TO EXERCISE

Costa, R., Cartner, L., Oliver, S., Laing, S., Bilzon, J., Walsh, N.

Bangor University, United Kingdom

Objective. To determine the effects of a 30 h period of sleep deprivation on selected immune responses to intense exercise.

Methods. Using a repeated measures cross-over design, eleven healthy males completed two trials separated by seven days. On one occasion participants slept normally (8 h) and on another occasion they were deprived of sleep for 30 h. Nutrient and fluid intake was prescribed and controlled to meet daily requirements on the day prior and during both trials. After 30 h participants performed 30 min exercise. On one occasion participants slept normally (8 h) and on another occasion they were deprived of sleep for 30 h. Nutrient and fluid intake was prescribed and controlled to meet daily requirements on the day prior and during both trials. After 30 h participants performed 30 min exercise. On one occasion participants slept normally (8 h) and on another occasion they were deprived of sleep for 30 h. Nutrient and fluid intake was prescribed and controlled to meet daily requirements on the day prior and during both trials. After 30 h participants performed 30 min exercise.

Results: No significant trial x time interaction was observed for circulating leukocyte, neutrophil, lymphocyte, T-lymphocyte subset (CD3+, CD4+, CD8+) counts, bacterial-stimulated neutrophil degranulation, S-IgA concentration and secretion rate. However, a main effect of time (P< 0.01) was observed for the leukocytosis (9.7 ± 1.1 X10^9/L), neutrophilia (6.6 ± 1.0 X10^9/L), and lymphocytosis (1.2 ± 0.3 X10^9/L) post TT. Significant increases in circulating CD3+ and CD8+ subsets (P< 0.05) and decreases in bacterial-stimulated neutrophil degranulation per neutrophil were observed post TT (24% post TT and 23% 2 h post vs. 30 h, P<0.01). The TT also increased S-IgA concentration (61% vs. 30 h, P< 0.05) but did not alter S-IgA secretion rate. The observed changes were mainly attributed to circadian variation and exercise-induced immune alterations.

Conclusion. A 30 h period of sleep deprivation does not alter resting immune response or the immune response to intensive exercise.
EMG REACTION TIME AND MUSCLE ACTIVITY PATTERNS IN THE UPPER LIMBS FOR KENDO STRIKES

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PURPOSE
Visual stimulation-reaction time and muscle activity patterns in the upper limbs during kendo strikes were assessed using an electromyo-
graphic [EMG] reaction time.

METHODS
Twenty-one males (kendo athletes: KA [n=7], non-kendo athletes: non-KA [n=7], non-athletes: sedentary [n=7]) were asked to per-
form kendo strikes in response to visual stimulation from a flashing light signal. The strikes, Hiki-Men (HM) to the frontal region of the head and
Hiki-Kote (HK) to the right wrist, were performed as quickly as possible with a bamboo sword (shinai) using the upper limbs. EMG signals
from bilateral biceps brachii, bilateral triceps brachii and the right flexor carpi ulnaris muscles were recorded together with elbow joint
angle and hitting shock. Muscle activity patterns, total task time (TTT), pre-motor time (PMT), motor time (MT), and action time (AT) were
measured for the HM and HK tasks. Photo-stimulation body reaction time (BRT) was also measured.

RESULTS
BRT in both athlete groups (KA and non-KA) was significantly shorter than that in the sedentary group (P<0.05). No significant differ-
ences were seen between KA and non-KA. TTT and AT in HM and HK tasks were also significantly shorter in athlete groups than in the
sedentary group (P<0.05). However, no significant differences were observed between KA and non-KA for TTT, PMT, MT or AT in HM and
HK tasks. In muscle activity patterns at HM and HK tasks, the timing of muscle recruitment in accordance with different striking tasks was
altered by KA, but not by non-KA or sedentary. Significant strong positive correlation were observed between PMT and TTT for both HM
and HK tasks in athletes (P<0.01, r=0.88-0.93) and sedentary subjects (P<0.01, r=0.97-0.98). Furthermore, significant strong positive
correlations were observed between MT and TTT for HM (P<0.05, r=0.76), AT and TTT for HK (P<0.05, r=0.76) in the sedentary group. Z-
test showed that the coefficient of correlation [r] between TTT and PMT was highest in the athlete groups.

DISCUSSION/CONCLUSION
These results suggest that no differences exist in time factor on neuromuscular function for HM and HK tasks between KA and non-KA.

PREVENTION OF ACUTE AND CHRONIC OVERUSE INJURIES OF THE LOWER LIMBS IN SPORTS

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Introduction: The prevention of acute and chronic overuse injuries is of major importance to athletes, especially high performance ath-
estics. High risk sports are already identified. However, little is known of the diagnostics of individual and specific risk factors. Therefore,
the aim of this study is to identify the relationship between individual anatomical factors of foot and ankle and acute and chronic overuse
injuries by means of a new diagnostic measurement system and a treadmill-analysis.

METHODS: A ultrasonic pulse-echo based measurement system (modified Zebris technology®) (HOCHWALD 2004) determines the axis of
the talocrural and talocalcaneal joint in vivo and in real time. This method is based on a movement analysis of the foot and tibia. Arch
index, the angle of gait, and the center of pressure will also be determined by a treadmill that enables plantar pressure measurement.
Video-analysis will allow for analysis of the rolling motion of the foot while walking. Anamnesis data are collected with a questionnaire.
Participants: 293 subjects mainly including long distance runners with a running performance of at least 25 km per week and a running
history of 3 years were measured so far.

Findings: Until now 586 talocrural and talocalcaneal axis were determined. 444 of these were included. The average of the inclination
angle of the talocalcaneal axis was 40° and the deviation angle 13°. 218 out of 293 tested subjects (74%) have been injured before. We
counted a total of 682 injuries. 23% of these injuries were located at the ankle, 20% at the knee and 14% at the achilles tendon. Discussion:
The work is still in progress. Until now the average of inclination angle (40°) approximates the conclusions of ISMAN (1969)
(41°). In contrast to this the average of deviation angle is lying between the conclusions of ALT (2001) and ISMAN (1969). Maybe the differ-
ence between the results is based on the difference of used methods. A direct comparison between both methods seems to be needful.
Next step is to determine the relationship between the collected anatomical individual factors and the overuse injuries by means of
statistical-analysis. This will be continued till June 2008.

References:

COMBINED EFFECTS OF STRETCHING AND RESISTANCE TRAINING ON THE ANKLE JOINT RANGE OF MOTION

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Introduction
The use of stretching to improve flexibility is a widespread practice among athletes and normal individuals. As a measurement of flexibil-
ity, active and passive joint range of motion (ROM) is often used (Gehlsen and Whaley, 1990). The former is especially important in physi-
cal activities, and can be influenced by the extensibility of muscle and tendon and muscle strength of the agonists (Altet 1996). The pur-
pose of this study was to examine the effect of a 6-week program of combination of static stretching of plantar flexors and resistance
training of dorsiflexors on ankle joint range of motion in healthy subjects.

Methods

Poster presentations (PP)

PP-BN01 Biomechanics 1
Sixteen men participated in a training program in this study. They were randomly assigned to a training group (n=8) or to a control group (n=8). The training program consisted of either stretching and resistance training (combination program), or stretching only, which was allocated in the right or left leg at random. Before and 1, 2, 4, and 6 weeks after the onset of the training program, we measured active and passive ROM, and also measured ankle joint passive stiffness during passive dorsiflexion. We also measured the same parameters 1, 2, 4, and 6 weeks after the completion of the training program. To measure both active and passive ROM, the subjects were in supine position on a test bench, with the knee joint in full extension, and the goniometer was attached to the ankle joint. Subjects were asked to perform maximal dorsiflexion, beginning from the 30 degrees plantar flexion. Ankle joint passive stiffness was calculated based on the ankle joint angle – passive torque relationship.

Results and Discussion

In the combination program side, active ROM increased significantly after the onset of training 4 and 6-week (mean dorsiflexion angles (DF) were 20, 21, 23, 28, and 29 (deg), for pre, 1, 2, 4, and 6-week, respectively), and the training effect remained until detraining 4-week (mean DF: 27, 26, 26 (deg), and 24, 1, 2, 4, and 6-week, respectively) while in the stretching program side, active ROM did not change. Passive ROM increased significantly 2-weeks later and remained until detraining 4-week. This improved flexibility was associated with a decrease in ankle joint stiffness, especially in the dorsiflexion position. The results show that the 6-week program of static stretching is not sufficient to increase active ROM. However, only stretching would be effective to increase the passive ROM. We conclude that one should take into consideration the method to improve flexibility, based on the purpose (to increase active and/or passive ROM).

References.


THREE-DIMENSIONAL ANALYSIS OF INTRACYCLE VELOCITY FLUCTUATIONS IN FRONT CRAWL SWIMMING

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The magnitude of velocity fluctuation (Vfluc) and the maximum (Vmax) and minimum instantaneous velocity (Vmin) during a stroke cycle (SC) have been linked to swimming performance. However, despite the multi-planar nature of swimming and the importance of the centre of mass (CM) calculation as a representation of body motion, two-dimensional methods and fixed points on the swimmers’ bodies have been used in the majority of studies. Moreover, changes in Vfluc have not been assessed during the course of an event or for any directions other than the swimming direction. The purpose of this study was to determine the three-dimensional methods, the magnitude of Vfluc, Vmax, Vmin of the CM during a 200m maximum front crawl swim and to examine whether they are associated with performance (as indicated by mean SC velocity (Vmean)).

Eleven male swimmers of national/international level performed a maximum 200m front crawl swim. Six stationary and synchronised cameras (four below and two above the water) recorded the performance at 50 Hz and four SCs were analysed (one for each 50m). Vmean, Vmax and Vmin (m/sec) in the swimming direction were obtained from the intracycle V data of the CM. Vfluc (m/sec) in each direction was calculated by subtracting Vmin from Vmax. The relative Vfluc/Vmax/Vmin were also calculated as a percentage of Vmean. Anthropometric data were calculated with the use of the elliptical zone method. Repeated measures analysis of variance and post hoc tests were performed to identify differences between SCs throughout the test, while pairs of variables were correlated to assess the nature and strength of relationships. Significance was accepted at p<.05.

Vmean generally decreased throughout the test. Vmax and Vmin were significantly higher in SCI than in other SCs (p=0.001) and had a high and positive correlation with performance (0.81 0.98, 0.001 8804, p=0.003). However, relative Vmax and Vmin were remarkably consistent during the 200m (110.8±0.4 % and 88.6±0.3 % respectively) and were not associated with performance. Vfluc and relative Vfluc in all directions did not change significantly during the test and, for the vast majority of SCs, were not associated with performance. Vfluc in the lateral and vertical directions were higher than in the swimming direction. Although Vmax and Vmin changed during the test and appeared to be good indicators of performance, no other variables were linked to performance or affected by technique deterioration. Considering that Vfluc is also influenced by resistive forces, which seem to have a non-linear relationship with V, the possibility of a non-linear relationship between Vfluc and performance could be examined in subsequent studies. Moreover, the large magnitude of Vfluc in the vertical and lateral directions suggested that future research needs to investigate more closely their causes and effects, especially for strokes with pronounced vertical movements such as butterfly and breast.
affected by the loading height. Therefore, pre-activation depends very little on the loading condition or type of jump performed. Pre-activation seems to represent a preprogrammed muscular activation functionally necessary for preparation of the landing in high level volleyball players (Reeser JC et al. However, sedentary group do not display the activation patterns that the high level volleyball players does.

References

MUSCULAR ACTIVITY OF KICKING LIMB DURING DIFFERENT KICKING TECHNIQUES IN SOCCER
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The kick is one of the most important skills in soccer and it is used for passing the ball or more often for scoring (1). The purpose of this study is to determine muscular activation patterns during different kinds of kicking techniques using electromyography (EMG) in soccer. First division soccer players have performed six different kicking techniques (side foot, lofted, inside curve, instep, outside and outside curve kicks) with one-step to a stationary ball towards a target 15 m away. Players have performed 3 maximum trials for each of the given techniques using the preferred leg. 45, 0, -45 approach angles have been used. Bipolar surface EMG activity of the rectus femoris (RF), vastus lateralis (VL), vastus medialis (VM), biceps femoris (BF) and gastrocnemius (GAS) muscles were recorded. The measurement sites were prepared and Ag/AgCl surface electrodes, filled with conductive electrolyte, were then positioned longitudinally along each muscle. Raw EMG records, 1-s before and after the ball contact were rectified, integrated and normalized. During back swing, there was a high activation of the BF in 6 kicking techniques and VL muscle had almost the same activation as BF in outside and side foot kick. GAS and VL were also active muscles during backswing whereas RF activity remained low and VM was slightly activated in all kicking techniques. The main forward swing was characterized by high activation of VL in all styles. VM and RF demonstrated their peaks just prior to ball impact during all kicking techniques. However VM has shown almost same activation in backswing and forward swing in side foot and outside kick. At impact time, BF and GAS become active whereas other muscles relaxed after contraction in forward swing in all kicking techniques. All muscles showed a gradual relaxation after impact in side foot, inside curve and outside curve kick. However all muscles demonstrated activation in lofted, instep and outside kick after impact. VL and GAS were the most active muscles during follow through.

The pattern of kicking is often described as a proximal-to-distal sequence of segmental movements (2). During the kicking motion, the foot rotates about both the medio-lateral (frontal) and longitudinal (vertical) axes of the body (3). So, the current study supports the earlier findings, which have been gathered via movement analysis techniques, from the muscular activation patterns aspect. However, it has not been clarified yet if there is any significant difference between high level and low/beginner soccer players.

References

A BIOMECHANICAL COMPARISON OF THE RUNNING GAIT OF MATURE AND YOUNG FEMALES
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Running has recently increased in popularity among both genders across all ages, and holds place as the leading sport of choice (Nova-check, 1998). Due to health benefits alongside social advantages, the numbers among one particular sub-group are expanding steadily, mature female runners (Vuori, 1998). However, the incidence of lower extremity injuries, specifically osteoarthritis, is vast among this group (Verbrugge, 2005). Despite this, current literature providing explanation for this injury prevalence is sparse. The purpose of this study was to quantify gait parameters of mature female runners, to assess whether certain running characteristics predispose to injury, specifically osteoarthritis. It was hypothesised that mature female runners would exhibit a gait pattern that differentiates them from younger runners, and that characteristics of their running gait would predispose this specific group to injuries such as osteoarthritis. 16 volunteer females (40-years) performed 10 running trials at 3.5m.s-1 ± 5% over a force platform. Knee dynamics including angles and moments during the stance phase of gait were identified through three-dimensional gait analyses. Comparisons with literature of young runners illustrated mature females to exhibit altered running patterns. High loading rates were demonstrated among the mature females (62.0 BW.s-1) when compared to a study involving females aged 24.4 years (23.3 BW.s-1) (Zifchock, Davis & Hamill, 2006). Additionally, high knee internal rotation angles (4.70 degrees), and large external adduction moments (1.06 Nm/kg) were exhibited by the mature females. Gait parameters have previously been associated with osteoarthritis including high loading rates, and knee internal rotation (Hawley, 2000; Johnson & Pedowitz, 2007). Additionally, knee external adductor moments are correlated with osteoarthritis development (Kaufman, Hughes, Morrey, Morrey & An, 2001). Therefore, the magnitudes characteristic of mature female runners in all three aforementioned variables may provide explanation for high injury rates among this group.

References
THE EFFECT OF CHANGES IN MUSCLE-TENDON UNIT LENGTH ON ACHILLES TENDON SHAPE

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Introduction
Controversy exists regarding extensibility of the Achilles tendon. Previous studies have only looked at lengthwise changes in the tendon, but some studies suggest transverse deformation of the aponeurosis by passive lengthening (Muraoka et al. 2003, Ilibis anterior muscle). The purpose of the present study was to investigate the effect of changes in muscle-tendon unit (MTU) length on the tendon shape (longitudinal and transverse) in vivo.

Methods
Eight healthy males (26±5yrs; 172±4cm; 69±7kg, mean±SD) were tested as subjects. With each subject in a supine position, a series of cross-sectional and longitudinal images of Achilles tendon (slice thickness 3mm, 0mm spacing) were obtained by MRI. The length, width and curvature of the tendon were determined from each image. The knee joint was fully extended and the ankle was kept in position of -15deg (dorsiflexed, DF), 0deg (neutral, AP), and 30deg (plantar flexed, PF). The tendon was divided into two portions (proximal and distal) at the distal end of the soleus muscle.

Results
The Achilles tendon length and width were identical for PF and AP positions, but its curvature was increased in PF. In DF position, the tendon length in DF increased by ~3mm (1.3%) and its width increased by ~3mm (7.6%) compared to AP. There was a difference between positions within the tendon: in the proximal portion it was not lengthened longitudinally but stretched transversely (7.6%), while in the distal portion it showed no significant transverse stretch but tended to elongate longitudinal (3.5%).

Discussion
The Achilles tendon shape in PF was similar to that in AP. Although previous reports indicated slackness in the tendon in a plantarflexed position (Muraoka et al. 2002), our results demonstrate that the tendon length does not change in PF. The tendon curvature, however, was different between AP and PF. In contrast, there was a significant difference in the tendon length between DF and AP. The length change of Achilles tendon was smaller than those of previous studies (Muraoka et al. 2002, De Monte et al. 2006). An increase in tendon width is contrary to previous findings (van Bavel et al. 1996, Muraoka et al. 2003). This discrepancy might be related to the difference of the target muscles, which needs further studies.

References

EMG AND KINEMATICS ANALYSIS OF THE PUSH UP EXERCISE: THE EFFECT OF HAND POSITIONS ON PRE-SELECTED MUSCLES

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The execution of push up exercise is useful to increase the strength of the upper body like chest, arms and shoulders as well as to evaluate the fitness level of a subject. Fitness literature reported that varying the hand positions during the push up can target specific upper body muscles. Previous studies investigated the effect of hand positions by a kinetic and electromyographical point of view ([1,2] considering triceps brachii and pectoralis major). Aim of the present work was to test the theory that hand position changes could induce different muscular recruitment by studying relationship between EMG activities and kinematics analysis. A six cameras stereophotogrammetric system (BTS-Italy) working at 60Hz was employed to record kinematics data. 30 reflective markers were placed on head (3), trunk (3), arms (8), hands (2), pelvis (2 at PSIS and 2 at ASIS), great trochanters (2), knees (4), ankles (2) and feet (2). The surface EMG activity of 12 muscles referred to the right side of each subject was recorded synchronously with kinematics by means of a PDA PocketEMG (BTS-Italy) at a sampling frequency of 1Khz. 5 hands position were chosen: hands at acromions width placed in front of the shoulders, hands 20cm over and hands 20cm below the shoulders, hands under the shoulders at 150% of acromions width and narrow hands base with right thumb and forefinger in touch with the left ones. Six subjects performed a set of 10 repetitions for each of the 5 hand positions with 3 minutes rest between sets. Kinematics data allowed to identify and quantify technical execution parameters as elbow angles displacement and velocity, angles between trunk and arms, time duration of eccentric and concentric phases and alignment between trunk and legs. One way ANOVA for each independent variable (muscle, hand position and phase of push up) was used to analyze differences in the iEMG signal. Differences in levels of muscular activity were assessed for statistical significance (p < 0.05) and then, if appropriate, a Tukey post hoc test was calculated. EMG and kinematics results indicated that hand positions influenced EMG activity of muscles analyzed in such a way that athletes and trainers should select different technical executions to induce a greater and more selective muscle activation.

References

EFFECT OF AGEING ON EQUILIBRIUM: LOWER POSTURAL STABILITY IS CORRELATED WITH GREATER TORQUES AT THE ANKLE LEVEL

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Background: Ageing is generally characterised by a decrease of force production. More particularly, Simonneau et al. (2007) reported a decline of agonist torques at the ankle joint in elderly adults. Ankle muscles are largely involved during equilibration process. It was previously observed a significant increase of Centre of pressure (CoP) displacement with ageing (Amiridis et al., 2003). However, the mechanical contribution of muscle around the ankle joint during postural task using the electromyographic (EMG) activity was unknown.
Thus, the aim of this study is to determine the mechanical contribution of triceps surae (TS) and tibialis anterior (TA) during various postural tasks in young and older adult. We hypothesis that the augmentation of the CoP displacement for older adults necessitates a more important cost in term of force.

Methods: Eight young adults (22.8 ± 2.4 years) were compared with seven older individuals (80.0 ± 4.2 years) during several postural tasks (Normal Quiet Stance (NQS), Romberg (ROM) and One Leg Balance (OLB)). CoP displacement was measured via a force platform during 10s for each condition. The Maximal voluntary contraction (MVC) was measured in two conditions (isometric dorsi- (DF) and plantar-flexion (PF)) via an isokinetic dynamometer. The EMG activity of TS and TA muscles were recorded simultaneously. To determine the EMG / isometric torque relationship, some sub-maximal contractions were produced in randomized order at 5, 10, 20 and 30 % of the MVC in the DF and PF conditions.

Results: Ageing induces an increase of the CoP displacement in the two most complex postural tasks i.e. ROM +38 %, p < 0.05 and OLB +86 %, p < 0.001. A significant decrease in the DF (~ -36 %) and PF (~ -32 %) agonist torques was also observed with ageing (p < 0.01). Excepted NQS, we showed a significant increase of relative torque developed by the both TS and TA muscles for older than young adults in ROM (15 ± 5.1 % vs. 26 ± 4.9 % for YG and OG respectively, p < 0.01) and OLB (23.7 ± 6.1 % vs. 41.9 ± 7.8 % for YG and OG respectively, p < 0.001).

Discussion: Our study showed that ageing induces an increase of the CoP displacement with increment of the postural tasks complexity (Amiridis et al., 2003). Furthermore, a significant decrease of the TS and TA agonist torques was observed for older adults. Moreover, an augmentation of the CoP displacement was accompanied by an increment of torque and RMS of muscles around the ankle for the elderly individuals. Greater torques and RMS activity generated at the ankle level while standing could induce fatigue more rapidly and higher risk of fall.

References:

COMPARISONS OF PLANTAR PRESSURES BETWEEN OBESE AND NON OBESE POSTMENOPAUSAL WOMEN

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The analysis of the influence of fat mass in the plantar pressure turns out to be important given that the persistent overload in the musculo-skeletal system endangers the individual’s mobility and predisposes him to adapt it in a pathological way, increasing the risk of articular injury. The aim of this study was to determine the differences in plantar pressure parameters (peak pressure and absolute impulse) between obese and non obese postmenopausal women.

Subjects included 59 postmenopausal Caucasian women (age, 56.61 (5.81) years old; BMI, 28.3 (3.68) kg/m2), 48 of which were obese (BMI > 25.5 kg/m2) [1]. The Whole-body adiposity was measured by the BMI (weight/height2) and the subjects were evaluated with a footscan pressure plate (RsScan International, 1m*0.4m, 8192 sensors, 250 Hz) with the Footscan software 7.2, walking barefoot in a natural cadence. Mann-Whitney U was used to compare the plantar pressure variables between obese and non obese postmenopausal women.

The obese postmenopausal women presented higher peak pressure values compared to the non obese group in the Metatarsal 4 (p=0.02), Midfoot (p=0.03), Medial Heel (p=0.04) and Lateral Heel (p=0.01). The same group also showed higher absolute impulses in the Metatarsal 1 (p=0.04), Metatarsal 4 (p=0.01) and Midfoot (p=0.02).

Inversely to previous publications [2, 3] where higher plantar pressure was located at the Forefoot level, our data suggest that postmenopausal obese women have higher peak pressure values in the Midfoot and Rearfoot during the walking. However we found higher values of absolute impulse in the forefoot and Midfoot. Therefore we can conclude that in obese postmenopausal women the Metatarsal 4 and the Midfoot are the most overloaded areas, comparing to the non obese women.

INFLUENCE OF GENDER AND FATIGUE ON KNEE JOINT CONTROL LANDING STRATEGIES

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Gender and fatigue are discussed to affect the anterior cruciate ligament (ACL) injury risk. In recent years, the influence of these factors on the knee joint control during critical movements is under discussion. The purpose of this study was to investigate kinematics, kinetics, and active muscle control strategies of the knee joint across gender and fatigue conditions. Nine females and thirteen males performed two-legged landings before and after a fatigue protocol. Knee joint kinematics and vertical ground reaction forces were measured as well as electromyography of the quadriceps, hamstring and gastrocnemius muscles prior and after ground contact. In general, females landed with increased knee flexion velocities and knee joint abduction angles. Compared to males they also showed different muscle activation patterns such as a delayed activation of the lateral hamstring and the m. vastus lateralis in the preparatory phase of the landing. Fatigue led to a reduced pre-activation of the medial and lateral hamstrings and the gastrocnemius muscle both in males and females, whereas the knee joint kinematics in the early phase of the landing was not altered. The gender differences in knee flexion velocity, maximum abduction angle, and muscle activation order suggest that females and males have different strategies and abilities to control the knee joint during dynamic landing movements. These differences as well as the decreased hamstring and gastrocnemius muscle activity due to fatigue provide evidence for an increased ACL loading in females and in fatigued condition.

FUNCTIONAL PRINCIPAL COMPONENT ANALYSIS (F-PCA) FOR THE CHARACTERIZATION OF INDIVIDUAL RACE WALKING PERFORMANCE STRATEGIES

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Introduction
The main task for coaches is to identify and carry out training programs that could determine the athlete's improvement. Therefore, the depiction of athletes' motor behaviours and of their changes over time is needed. The problem of capturing the athlete's actual state is
strongly affected by the presence of motor variability, which occurs not only between but also within individuals (1). Hence, significant information contained in the data has to be summarized and interpreted. Namely, the most representative features of the individual have to be recognized and separated from noise. Conventional data analysis techniques lack in extracting and synthesizing significant information from a large amount of variables. In contrast, multivariate statistical analysis has proved to be a powerful tool to eliminate collinearity, by presenting only the essential structures of data. In particular, functional principal component analysis (f-PCA) has been shown to be effective in the evaluation of human motion. The purpose of this paper was to investigate the use of f-PCA in sports science, for reducing and interpreting data, while accounting for their original variability.

**Methods**

An 8-camera optoelectronic motion analysis system (ELITE2002, BTS, Milan, Italy) and a force plate (AMTI OR-6-1000, Watertown, USA) were used to collect and estimate kinematics and kinetics of seven race walkers (19.7±2.1 y; 1.75±0.10 m; 58.3±8.3 kg) of international level. After a standard 20 minutes warm up routine, each subject was asked to race walk across a 15m walkway. Several (N=20) race walking repetitions were acquired and kinematic and kinetic variables (lower limb angles, GRF, joint moments and powers) were processed. f-PCA2 was applied to data, in order to compare athletes according to their skill level.

**Results**

A general biomechanical description of race walking biomechanics was pursued, in order to get a full comprehension of the movement under analysis. The first four principal components explained more than 95% of data variability for most of the variables. A biomechanical interpretation of functional components allowed a robust and complete characterization of each athlete’s performance strategy. Race walkers of the same skill level were characterized by similar loads on the functional principal components.

**Discussion**

This study showed that functional principal component analysis is an innovative tool for individual motor skills characterization. It could help coaches in designing personalized training programs, by evidencing individual abilities or deficiencies.

References


**CHANGES IN SPONTANEOUS BREATH VOLUME AND INTRA-ABDOMINAL PRESSURE DURING DIFFERENT LOAD LIFTING**

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**Introduction:** Intra-abdominal pressure (IAP) is increased to stabilize lumbar spine during lifting (Hernborg et al., 1985). It is known that development of IAP was influenced by breath volume, for instance, development of IAP tends to be elevated highly when the breath is inhaled before lifting and held during lifting (Hagins et al., 2006). However, it is unknown whether spontaneous breath and development of IAP change according to different load lifting. The purpose of the present study was to examine changes in spontaneous breath and development of IAP during isometric lifting. Methods: Eleven men (22±2years) were postured bending the trunk forward and extending knee joint, and performed isometric lifting tasks using a lifting device attached force transducer at 30%, 45%, 60%, 75%, 90%, 100% of maximal effort each three times at random. Subjects were experienced to lift on each load before actual measurements. IAP was measured using a pneumotachometer attached to a face mask (FM-200, Arco system). The inspiratory volume before just lift-off and expiratory volume just after lift-off were normalized to tidal volume at rest. The development of IAP during lifting was normalized to the maximal IAP obtained during the Valsalva maneuver (%IAP). Subjects were secreted of breathing information to avoid intentional breathing. The significant changes of variables of respiratory volume from tidal volume and development of IAP from IAP at rest on lifting posture were assessed with repeated measures ANOVAs with post hoc Dunnell’s tests (p<0.05). Results: The inspiratory volume significantly increased and expiratory volume significantly decreased in the load magnitude of lifting above 45% and 50% of maximal effort lifting, respectively. During 30% 100% of maximal effort lifting, normalized inspiratory volume was increased to 111.7±16.6%, 143.5±15.5%, 161.1±15.4%, 191.9±19.6%, 206.8±15.2%, 235.7±20.8% respectively, and normalized expiratory volume was decreased to 50.7±12.7%, 27.6±9.9%, 18.2±7.7%, 13.2±6.3%, 7.2±2.1%, 5.1±1.3% respectively (mean±SE). The development of %IAP significantly increased to 13.1±1.8%, 25.2±2.6%, 36.0±3.1%, 51.9±2.8%, 68.8±4.6%, 77.0±4.4% respectively. Conclusion: The spontaneous respiratory volume and development of IAP changed regularly in proportion to the load magnitude of isometric lifting. It is suggested that these changes would be maneuvers to obtain lumbar spine stability based on preprogramming of the central nervous system.

**ANALYSIS OF COVERED DISTANCE AND VELOCITY OF INDOOR BLIND SOCCER PLAYERS OBTAINED WITH AN AUTOMATIC TRACKING METHOD**

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Nowadays blind soccer is practiced in 21 countries and its first event in a Paralympics Games was in Athens (2004). However, scientific research information on this modality is rare in literature, mainly studies about player movement in the court during official games. For this reason, many physical trainers might make mistakes on prescribing physical training to their athletes since there is no study characterizing the requirements of such modality. Then, the aim of this study was to analyze the covered distance and velocities ranges of indoor blind soccer players (excluding goalkeepers) in an official competition. For this study was filmed the final game of indoor soccer of 3rd ISBA Championship and Games 2007. The data acquisition used four digital cameras (30 Hz) standing in the highest bleachers. Each camera recorded one region of the court, in the way of covering the whole court. In this study it was used the Divideo system [I] for automatic tracking of players trajectories through videogrammetry aiming at obtaining data as function of time about players positioning. The data were reconstructed in 2D and afterwards they were smoothed by the digital filter Butterworth of 3rd order, which a cut frequency of 0.4 Hz at Matlab software. The mean covered distances of the players were calculated for the first and second halves and two runoff halves. In case of substitution, it was considered the total distance covered of all players involved. First half: 2275.8 m, Second half: 2289.6 m, First half of runoff: 1034.2 m; second half of runoff: 1067.0 m. A one-sided paired t-test (p<0.05) was performed to verify if the mean distances covered in the first half of the game were greater than in the second half. The t-test result showed that the covered distance in the first and second halves were significantly different (p=0.045). The velocity data were divided into six ranges of velocity: 0-0.72 km/h (standing), 0.72-1.1 km/h (walking and jogging), 1.14-14 km/h (low speed running), 14.19 km/h (moderate-speed running), 19-23 km/h (high-speed running), more than 23 km/h (spinning), and results are presented as the mean of covered distance of all players in Marche, A., Ziskind, F., Misuta, M., Cunha, A., Barros, R.
each velocity range, respectively. First half: 30.64 m, 1737.06 m, 243.74 m, 180.19 m, 20.32 m, 2.11 m. Second half: 64.23 m, 1927.97 m, 220.42 m, 110.13 m, 8.38 m. 0 m. First half of runoff: 16.02 m, 803.3 m, 118.13 m, 82.28 m, 11.29 m, 1.32 m. Second half of runoff: 193.63 m, 761.90 m, 34.5 m, 15.78 m, 3.13 m, 0.18 m. The covered distances and velocities that were obtained in an official competition presented in this paper could be useful for physical trainers to prescribe more specific training activities.

References.

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WHAT IS THE BEST PARAMETER TO QUANTIFY SHOCKS DURING HEEL-TOE RUNNING?

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Repetitive heel-strikes occurring during running have been associated with musculoskeletal injuries (Nigg et al. 1995). Quantifying the impact severity is particularly important for shoe manufacturers wishing to attenuate shocks by cushioning. Different mechanical parameters have been used to quantify heel-strike intensity at impact (Cavanagh 1990). The most common are vertical peak impact force and corresponding loading rate, peak shank accelerations and shock wave propagation speed. However, heel-strike comparisons may differ depending on the parameters used (De Wit et al. 1995), and what is more, for some of these parameters (e.g. peak impact force value), results are contradictory between studies (De Wit et al. 1995, Dickinson et al. 1985). Our aim was to determine, among these various parameters, the one(s) allowing to distinguish heel-strike shock intensity at best between different running conditions.

Thirteen physically active men ran at 3.33 m.s⁻¹ in 8 randomised 5-min conditions inducing various levels of shock intensity: reference condition (freely chosen stride frequency and neutral shoes), barefooted, with soft and hard midsole shoes, with +20% and -20% stride frequency, and with +20% and -20% vertical loading. Vertical ground reaction force and shank accelerations were measured (1000 Hz) on a treadmill dynamometer (HEF Techmachine, France) and using a uniaxial skin-mounted accelerometer (Analog Devices, USA), respectively. Peak impact force (Fz1 in N), time to Fz1 (TFz1 in s), impact loading rate (Rz1 in N.s⁻¹), peak shank acceleration (AS in m.s⁻²) and time to AS (TAs in s) were calculated for each step and averaged over twenty consecutive right steps during the last minute of each condition.

The shock wave speed propagation (SP in m.s⁻¹) was obtained as the ratio of the heel-accelerometer distance to TAs.

ANOVA for repeated measures and Newman-Keuls post-hoc tests, performed for each factor (midsole hardness, stride frequency, body weight), put forward that Fz1 and Rz1 were the parameters showing the highest number of significant differences throughout the proposed running conditions (11 and 8 out of 12 possible differences, respectively). Sensitivity analysis showed important changes in Rz1, SP, TFz1 and TAs with midsole hardness variations, in Rz1 and AS with stride frequency variations, and in Rz1, AS and TFz1 with body weight variations. In light of these results, Rz1 can be considered as the most discriminating mechanical parameter to distinguish heel-strike shocks intensity at best during running. In contrast, Fz1 and AS, widely used in running impact studies, were only slightly influenced by the midsole hardness.

References.

EMG ANALYSIS OF THE OF DELTOIDEUS ACTION DURING FRONT CRAWL SWIMMING ARM RECOVERY USING DIFFERENT NORMALIZATION PROCEDURES

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The electromyography (EMG) normalization process is a fundamental task to be accomplish when comparing EMG signals between muscles, subjects, or even testing sessions. Some studies tried to compare the differences between alternative methods (Burden et al., 2003) but none was carried out in real sport context, specially swimming.

The purpose of this study was to compare the data obtained from two different types of normalization procedures of the Deltoideus muscle (posterior, middle and anterior portions) EMG during the arm recovery phase in front crawl swimming.

A national level male swimmer (24 years old, 68.5 kg, 172.9 cm and 15 years of competitive experience) performed a protocol of 10 x 25 m at 200 m front crawl race pace, for surface differential EMG activity assessment (five repetitions were performed with lateral arm recovery and five repetitions with bend arm recovery). The decomposition of the arm recovery phase into its characteristic sub-phases was performed through qualitative analysis of video records, synchronized with the EMG signals by a light-trigger.

After standard cleaning and shaving procedures, the electrodes were fixed with adhesive tapes, plastic films and silver tape on the epidemnic surface projection of the muscles. The EMG signals were normalized to maximum isometric voluntary contraction (MVC) and to dynamic peak (DP). Independent sample t-test and Anova were used to compare the different types of normalization. Statistical significance was set at p<0.05.

For both recovery patterns, in the middle and anterior portion of Deltoideus, it were found higher values when MVC was used has the normalization parameter. In the comparison between the two types of arm recovery, bend and lateral types, it were found differences in the posterior and middle portions of the Deltoideus muscle when data were normalized to MVC, but no differences were found when normalization with DP value was used. This analysis also allowed the recognition of differences among the sub-phases of the two recovery patterns when normalized to MVC and to DP. The posterior portion, that was the less active during the two types of recovery patterns when normalized to MVC, tended to be the most active when DP was used for normalization.

It is concluded that the EMG analysis procedures of Deltoideus muscle during front crawl swimming is influenced by the type of normalization used, which can lead to miss understandings of the real actions and muscle participation on dynamic sport movements.

References.
Electromyography (EMG) has been used in swimming to describe and analyse muscle participation in swimming technique. However, studies aiming to observe the implications of the different variants of a specific swimming arm or leg action are scarce. The purpose of this study was to analyse the superior, middle and inferior portions of the Trapezius muscle in the lateral (LRP) and bend (BRP) arm recovery patterns in front crawl, taking into account the occurrence of breathing and non-breathing cycles (BC and NBC, respectively).

A trained male swimmer performed a front crawl protocol of 10 x 25 m at 200 m race pace, alternating the LRP and BRP. Active differential electrodes were positioned according standards after skin shaving and cleaning, and fixed with adhesive tapes. The EMG-data were assessed by a surface EMG system developed for aquatic use (Gonçalves et al., 2006), with a sample frequency of 1000 Hz and subsequent emission to an external receiver and an analogical/digital conversion plate that allowed the download of the signal to a PC for following assessment by a surface EMG system developed for aquatic use (Gonçalves et al., 2006), with a sample frequency of 1000 Hz and subsequent processing.

The only significant differences were found for the EMG intensity (%MVC) of the superior portion of the Trapezius muscle. In this variable it was possible to observe higher values for the BRP compared with the LRP when BC were considered. The swimmer also achieved higher values of EMG intensity (%MVC) of the superior portion of Trapezius muscle during the NBC compared with the BC, both during BRP and LRP. Both effects may be explained considering the main function of this portion of the muscle - the elevation of the scapula - which is very important in both recovery patterns and in breathing or non-breathing cycles, but mostly required in the BRP and in the NBC due to the higher hand/water proximity.

For NBC no significant differences were found between recovery patterns for any of the studied variables. Non significant differences were obtained for any of the comparisons conducted for the middle and inferior portions of the muscle, and also for the superior portion when AT and iEMG results were considered. It is concluded that, based on the evidence provided in this pilot study, there are not a better pattern of arm recovery in what muscular activity is concerned.

References.

**ANGULAR KINEMATICS OF HIGH LEVEL LONG JUMPERS IN COMPETITION**

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The aim of this study was to analyze angular kinematics of high level long jumpers in competition. The data were collected in the GOLD MEETING RIO OF ATHLETICS 2007, a competition included in the calendar of the International Association of Athletics Federation (IAAF).

Seventeen jumps of nine male athletes ranging from 7.26m to 8.53m were analyzed. The winner of this competition was also the 2007 world champion in the modality (8.57m). Two digital video cameras (60 Hz) positioned inside the field along the runway were used to reconstruct the movement from the last touch-down to the takeoff (support phase). The DVideo system was used for the 3D kinematical analysis (Figueura et al., 2003). Eighteen anatomical landmarks were manually digitized throughout both video sequences. The body was represented according to the model of ten segments proposed by Zatsiorsky (1989). The data were filtered with a zero-phase forward and inverse Butterworth digital filter of 3rd order with a 6 Hz cut-off frequency. Using the 3D coordinates the following joint angles were calculated: neck, trunk, shoulders, elbows, hips, knees and ankles. Three ways of analyses were applied to the joint angles during the support phase. 1) The graphical analysis of mean (+SD) curves in function of the percent of the support phase. 2) The average of maximal angles of knee flexion and ankle dorsi-flexion during the support phase. Analyses 1 and 2 were performed in order to characterize the angular motion patterns of the jumpers in this competition. 3) The last analysis consisted of a t-test of the percents of the support phase in which occurred the peaks of knee flexion and dorsi-flexion of the support limb. The results were 1) curves of the central tendency and variability for all angles. 2) The average maximum knee flexion (+SD) and ankle dorsi-flexion angles of the support limb were (37.8°±6.8°) and (8.3°±5.3°) and to the swing limb were (138.5°±9.0°) and (38.4°±6.6°). 3) Statistical differences (P<0.05) were verified comparing the mean maximal knee flexion percent (46.2±8.2%) and the mean maximal ankle dorsi-flexion percent (53.1±7.3%).

In this study provided an useful description and analysis of a high level long jumpers in competition.

References.


**ADDED MASS IN HUMAN SWIMMERS: AGE AND GENDER DIFFERENCES**

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INTRODUCTION: In unstationary swimming (changing velocity), some of the water around the swimmer is set in motion. This can be thought of as an added mass (AM) of water. Previously only one other study (Klauck, 1999) has investigated added mass on swimmers during passive gliding, and reported added mass values in a range of 30-70kg. The purpose of this study was to find added mass on human swimmers and the effects of age and genders on added mass.

METHODS: 31 subjects between the ages of 12 to 36 years were included. They were recruited into three groups, boys (aged 13.7±1.1years), women (21.8±3.4years) and men (25.2±4.9years) with body mass of 52.6±10.6kg, 63.9±5.3kg and 78.2±6.3kg, respectively. The subjects were connected to a 2.8m long bar with handles, attached with springs (stiffness k=318N/m) and a force cell. By...
oscillating this system vertically and registering the period of oscillations it was possible to find the added mass of the swimmer, given the known masses of the bar and swimmer.

RESULTS: Added mass for the three groups were 14.5±3.1 kg, 15±1.2 kg and 21.1±2.5 kg for boys, women and men, respectively. This corresponds to relative added mass (AM%) of, respectively 27.8±2.9%, 23.6±1.5% and 27±2.2% of the subjects' body mass. This study reported significant difference in AM (p<0.01) and AM% (p<0.01) between men and women. In boys and men significant differences were found for AM (p<0.01), but not for AM% (p>0.01).

DISCUSSION: The added mass in this study seems to be lower and within a smaller range than previously reported (Klauck, 1999). An added mass of about 27% of body mass will influence inertial forces during passive gliding phases in a swimming race, but must also be considered in intracyclic velocity fluctuations. The subjects’ lack of experience to hold the optimal and best position on the bar during oscillation, could lead to increased AM. Boys and men reported similar values for AM%. This indicates that AM is in some way dependent on body mass. Lower AM% values for women could mean that they are influenced by other effects of body size such as height, CD, frontal surface area or % body fat compared men. This study indicates an effect of gender between men and women, but no effect on AM by age between boys and men. If age can be viewed to represent experiences [and skill], added mass seem not to be reduced by swimming training or skill enhancement.

References


VALIDITY OF A VELOCITY DECAY METHOD FOR ESTIMATING PASSIVE DRAG IN SWIMMERS

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INTRODUCTION: Passive drag can be measured by towing swimmers passively through the water. This requires expensive and often inaccessible equipment and can be a time consuming process. The velocity decay test has previously been used as an indirect method for estimating passive drag (Kjendlie & Stallman, 2008). The aim of this study was to test the validity of the velocity decay method by comparing the passive drag coefficient (D) calculated from the velocity decay test with D from towing tests. To estimate passive drag from the decelerating phase correctly, the added mass effect was taken into account.

METHODS: 24 subjects (6 women, 9 boys and 9 men) performed the velocity decay test twice on the same day. They were all familiar with the testing procedures. A rotating wheel. The swim-meter counts the rotations and thereby calculates the instantaneous velocity over the decay period. The added mass effect was taken into account by adding 27 % to the body weight in the calculations.

RESULTS: The oscillation decay test resulted in an average added mass of 26.3 (2.9%) of body weight. The average D values from the velocity decay test and towing tests were 24.4 and 18.1, respectively. A paired t-test revealed a statistically significant difference in D values calculated from the towing procedure and estimated from the velocity decay method (t=5.27 and p<0.01).

DISCUSSION: The added mass in this study seems to be lower and within a smaller range than previously reported (Klauck, 1999). An added mass of about 27% of body mass will influence inertial forces during passive gliding phases in a swimming race, but must also be considered in intracyclic velocity fluctuations.

REFERENCES


RELIABILITY OF A VELOCITY DECAY METHOD FOR ESTIMATING PASSIVE DRAG IN SWIMMERS

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INTRODUCTION: Observing the velocity decay after swimmers push off from the wall has previously been used as an indirect method for estimating passive drag (Kjendlie & Stallman, 2008). This method is based on the assumption that when a swimmer slides passively through the water, the water resistance is the only force retarding the swimmer and causing the velocity decay. The aim of this study was to test the reliability of the velocity decay method by measuring the consistency of the data from repeated tests under the same conditions.

METHODS: 21 trained swimmers aged 16.4±2.0 performed the velocity decay test twice on the same day. They were all familiar with the method due to previous testing. In prone position with arms above their head, the subjects pushed off from the wall before passively gliding to a stop. The gliding velocity decay was measured. A Matlab routine seeking the least sum of squares was run through the velocity data, v(t), and estimated the highest velocity immediately after push off (v0) and passive drag coefficient (D) from: v(t) = v0 / ((Dv0t/mv) +1), where mv is the virtual mass [the sum of the mass of the subject and the added mass]. Mean D values from the five towing velocities and D values estimated from the velocity decay test were compared by a paired t-test.

RESULTS: The oscillation decay test resulted in an average added mass of 26.3 (2.9%) of body weight. The average D values from the velocity decay test and towing tests were 24.4 and 18.1, respectively. A paired t-test revealed a statistically significant difference in D values calculated from the towing procedure and estimated from the velocity decay method (t=5.27 and p<0.01).

DISCUSSION: The added mass in this study seems to be lower and within a smaller range than previously reported (Klauck, 1999). An added mass of about 27% of body mass will influence inertial forces during passive gliding phases in a swimming race, but must also be considered in intracyclic velocity fluctuations.

REFERENCES
through with experienced swimmers. Results from an unpublished study with students (non-swimmers) performing two velocity decay tests showed less reliability (cronbach’s alpha=0.889, \( t=-2.12 \), p=0.089) and average difference from the mean =14.1%.

References.

ACCURACY OF A NOVEL THREE-DIMENSIONAL UNDERWATER KINEMATIC ANALYSIS SYSTEM

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This work aimed to analyze the accuracy in a novel three-dimensional underwater kinematic analysis system. The system consisted of up to five Basler cameras (k602A) enclosed in housings specially designed and connected to a single desktop PC for online data acquisition. Software interfaces were developed for acquisition, camera controls, measurements and three-dimensional reconstruction starting from a previously proposed system Dvideo (Figueroa, et al. 2003). The reconstruction accuracy was determined in two tests, both out of the water and underwater. Four cameras were used (50 Hz) to record the images, positioned up and down at the right and left side. In the first test, the accuracy was determined by calculating the root mean square (RMS) for the reconstruction of nine points with known coordinates. For the second test, a rigid body with four black markers (2.5 mm) fixed on it was used. The rigid body was moved in front of the system out and underwater. The accuracy in this test was defined by the mean absolute errors (MAE) obtained from the curves of distances between markers obtained in function of time from their three-dimensional coordinates. The RMS error values obtained out of the water (2.4mm ±0.03) and underwater (2.9mm ±0.0) were similar and they were lower than the values found in (Gourgoulis, et al., 2008) (4.6±0.5 out of water, 5.9 ±1.5 underwater). The results regarding the two distances between markers out of the water and underwater were compared using a robust estimate of uncertainties in relation to the medians with 5% level of significance. The results revealed no significant differences among the distances calculated out (median=273.8) and underwater (median=276.4mm). The absolute mean error was 1.0mm out of the water and 2.8mm underwater, which are in accordance to the values found in literature (from 0.5mm to 11.6mm) (Chiari, et al. 2005). The results showed the reliability of the system for the underwater three-dimensional kinematic analysis.

References.

Acknowledgement
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THE SIGNIFICANT EFFECT OF APONEUROSIS ON TISSUE STAIN AMONG TRICEPS SUARAE MUSCLES DURING ECCENTRIC CONTRACTION

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INTRODUCTION: It has been recognized that amplitude of induced tissue damage in both muscle and tendinous (tendon + aponeurosis) tissues is a function of experienced lengthening strain. The objective of the present study was to investigate the effect of existence of aponeurosis on tissue strain among triceps surae muscles during eccentric (lengthening) contraction with computer simulation. We hypothesized that aponeurosis influences considerably to magnitude and distribution of tissue strain in contracting muscles. METHODS. A large deformation non-linear finite element analysis was used. A hexahedral constitutive mesh model of triceps surae muscles, with muscle, aponeurosis and tendon tissues, was constructed based on cross-sectional MR images. As mechanical parameters, Young's modulus and Poisson's ratio of each tissue during maximal eccentric contraction were estimated from our experimental data and previous reports. Then, two settings, with and without aponeurosis were prepared: 1) normal model with aponeurosis (AP) and 2) model in which the mechanical properties of aponeurosis in AP converted into that of muscles' (NAP). Anatomical origins of muscles were fully fixed as a boundary condition. A 10mm lengthening was applied to simulate eccentric contraction by displacing the end point of Achilles tendon. RESULTS AND DISCUSSION: In AP, the first principal strain (FPST) by 10.3% was concentrated on the portion with smallest cross-sectional area in Achilles tendon. Muscle tissues in distal portion of soleus muscle (SOL) and around muscle-tendon junction between Achilles tendon and SOL (MTJ) experienced 4.0% and 4.9% FPST, respectively. FPST in proximal muscle tissues of both SOL and gastrocnemius muscle was less than 3.0%. In NAP, on the other hand, FPST was concentrated on muscle tissues around MTJ by 22.3%. FPST was slightly larger than that of AP for muscle tissues in distal portion of SOL (6.4%), but smaller for the tendon tissues with smallest cross-sectional area in Achilles tendon (11%). These results indicate that the existence of aponeurosis could reduce the experienced strain among muscle tissues, especially around MTJ. This suggests the role of aponeurosis in the reduction of muscle damage by decreasing the amplitude and distribution of sizable strains in muscle tissues. Moreover, it is considered that reduction of muscle belly elongation by the existence of aponeurosis could result in large Achilles tendon elongation in AP, implying high risk for tendon tissue damage but possibility that aponeurosis enables Achilles tendon to storage effectively its elastic energy. CONCLUSION: The present study demonstrated the significant effect of aponeurosis on tissue stain among triceps surae muscles during eccentric contraction. Aponeurosis in triceps surae muscles would have functional significance for 1) decrement of muscle tissue damage and 2) effective storage of elastic energy in tendon tissues.
Introduction. Activity of the motor cortex in one hemisphere reduces the maximum motor outflow of homologous parts of the contra-lateral hemisphere, resulting in a reduction in the maximum torque a muscle can produce when the contralateral homologous muscle is activated simultaneously. If this statement is true, then bilateral deficit (BLD) should exist during voluntary isometric contraction. However, if the BLD is caused by the inhibition in the motor cortex, BLD cannot exist during eccentric contraction, because the force enhancement due to muscle stretch caused by the increasing resistance of the passive elastic element and/or the stretch reflex. The aim of this study was to test this hypothesis.

Methods. Six physically active males were recruited in this study. The subjects were seated in a computerized dynamometer (MultiCont II) and were instructed to perform isometric and eccentric contractions with the knee extensor muscles. Unilateral (UL) and bilateral (BL) knee extensions were carried out randomly. Maximum isometric torque (MIT) was measured at 60 and 90 degrees of joint angle. The eccentric contraction started at 60 degrees and terminated at 90 degrees using 30 degrees/s or 300 degrees/s constant velocity. Maximum torque enhancement (MTE) was determined from torque-time curves. Percentile ratio was calculated dividing the summed torque of left and right knee extensors produced in UL and BL contractions. Mean and SD was calculated and the means were compared by using independent Students t-test.

Results. MIT was 13.8 % lower during BL as compared with UL at 60 degrees, on the contrary at 90 degrees MIT was 10.6 % greater during BL than during UL. The percentile ratio of BL/UL was 87.9 % and 108.9 %, respectively. MTE was 3.1 % and 3.3 % greater for BL as compared with UL applying 30 degrees/s or 300 degrees/s velocity, respectively. The ratio of maximum eccentric and isometric torque ranged between 1.23 and 1.58 when the knee was flexed with 30 degrees/s velocity. The ratio was greater when 300 degrees/s velocity was applied (1.36 and 1.79). The BL/UL percentile ratio was significantly greater during isometric than during eccentric contraction.

Discussion. Our results are somehow controversial. We found bilateral deficit during isometric contraction measured maximum torque at 60 degrees of knee joint angle that may strengthen the idea that BLD can be attributed to the reduced neural drive originated from motor cortex. We hypothesized that if there is no BLD during eccentric contraction then it indirectly supports the idea that BLD caused by the disturbances between the motor cortex of the homologous muscles at the two hemispheres. We found no BLD during eccentric contraction that could prove our hypothesis. However, the bilateral facilitation during isometric contraction at 90 degrees does not allow us to draw this conclusion. It is difficult to explain why the motor cortices affect each other with different way at different joint a
Ten elite male kayak paddlers, all members of the Portuguese sprint team, volunteered for the study (age 22.0±3.2 yrs, height 177.1±5.8 cm, mass 77.7±5.4 kg). Written informed consent was obtained from each subject. All subjects were required to perform two trials, using each a type of seat (RS and SS), which were conducted in random order (7 d apart). A maximal incremental test, with five steps, was conducted in each trial, for this analysis we analysed the 1st, 3rd and 5th steps. The test steps work load was calculated based on the mean power of a 4 min maximal test performed on the KE prior to the beginning of the study. All trials were conducted on a calibrated KE (Dansprint). Five complete cycles were analysed. The cycle was divided by two paddle positions: immersion and water exit (phase I) and water exit and immersion (phase II) (Begon et al. 2003). In each trial the kinematics data (phases duration, entry and exit 2D shaft angle) were recorded by two synchronized cameras.

Amplified at 25Hz. Nine marks (7 anatomic and 2 on paddle) were digitised using the AnaMovH system. The DLT method was used to convert digitised points to real 2D coordinates. A low pass Butterworth filter at 12Hz-4th order was used to smooth data. The percentage variance accounted (VAF) was computed as the normalized error between the paddle path using different seats. Differences in dependent variables between trials were analysed for statistical significance with paired samples Student's T-test (p<.05).

Results/Discussion

When compared the phases duration, entry and exit 2D shaft angle between the RS and SS, no statistical significant differences were found (p<.05). The horizontal paddle path was significantly different between conditions (RS and SS) for the three steps of the test, but it was at high intensity (5th step) where higher differences were found (p<.01).

Conclusion

The results suggest that the RS brought some modifications on paddling technique on KE, further research is required to fully understand this influence on kayak performance.

References


RELATIONSHIP BETWEEN VELOCITIES OF BODY SEGMENTS AND THROWING PERFORMANCES DURING SOCCER THROW-IN MOVEMENT

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In recent years, the use of the throw-in during a soccer game has changed from a simple restart to an offensive weapon, especially in the offensive one-third of the pitch. It has been reported that the sequence of segment rotations from the trunk to the forearm during throw-in movement. However, the relationship between throw-in movement velocities of body segments and throwing performance is not yet clear. The purpose of this study was to clarify the relationship between velocities of body segment and throwing performances during soccer throw-in movement.

The subjects were twenty-seven male university students. Their mean (SD) values of age, height, weight and FFM were 22.0(1.8) yrs, 175.9(6.1) cm, 72.5(8.4) kg and 57.1(4.9) respectively. These subjects performed using two types of throw-in movement were parallel and run-up. Maximal ball distance was determined by a tape measure. The maximal throw-in ball velocity in the distance of 5m was measured by a Radar Gun (Mizuno, Japan). Maximal throw-in movement velocities on body segments for whole body, upper body and upper limb were obtained a custom-made movement velocity measurement system connected to the Speed Meter (VI NE, Japan). The throw-in movement on the sitting position was performed from a custom-made chair, the subjects were tied up with a strap in order to avoid the participation of lower limb during the upper body throw-in movement. And same as lower limb and trunk were tied up in upper limb throw-in movement. Relative value of throw-in movement velocity (PBSV) was calculated as whole throw-in movement velocity compare to each body segment throw-in movement velocity.

Ball distance and velocity in run-up throw-in were significantly higher values than that of parallel throw-in (p<.01). Run-up throw-in movement velocity was significantly higher values than that of parallel throw-in movement velocity (p<.01). PBSV of upper body and limb in run-up throw-in movement were significantly lower values than that of parallel throw-in movement (p<.01). PBSV of lower limb in run-up throw-in movement was significantly higher values than that of parallel throw-in movement (p<.01). Upper body throw-in movement velocity was closely related to ball distance and velocity in two types of throw-in. Upper limb throw-in movement velocity was closely related to ball distance and velocity in two types of throw-in. On the other hand, significantly correlation coefficients were not obtained between PBSV of upper body and ball distance and velocity in two types of throw-in. And also, significantly correlation coefficients were not obtained between PBSV of upper body and ball distance and velocity in two types of throw-in. From these results, it was considered that effect of each body segment throw-in movement velocity to throwing performances has individual character.

References


Poster presentations (PP)
PP-HF01 Health and Fitness 1

AEROBIC EXERCISE TRAINING-INDUCED WEIGHT LOSS IMPROVES ARTERIAL FUNCTION IN OVERWEIGHT AND OBESE MEN

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Background: The prevalence of overweight and obesity has been increasing worldwide. Obesity is an independent risk factor for cardiovascular morbidity and mortality. On the other hand, the reduced arterial function, including central arterial distensibility and endothelial function, implicates in the pathophysiology of cardiovascular disease. It has been well established that regular aerobic exercise is available on weight loss in overweight and obese humans. However, the effect of regular aerobic exercise-induced weight loss on central...
arterial distensibility and endothelial function in overweight and obese subjects has not yet been clarified. Accordingly, the present study was to examine whether weight loss by 12-week aerobic exercise training affects central arterial distensibility and endothelial function in middle-aged overweight and obese men. Methods: Healthy middle-aged overweight and obese men (body mass index >25 kg/m²) completed a 12-week aerobic exercise training program (walking or jogging at 75% of heart rate max for 40-60 min, 3 days/week). Before and after the exercise program, we measured carotid arterial compliance (via simultaneous B-mode ultrasound and arterial tonometry on the common carotid artery) in overweight and obese men. We also determined plasma endothelin-1 (ET-1), a potent vasoconstrictor peptide produced by vascular endothelial cells, and nitric oxide (NO) (measured as the stable end product nitrite/nitrate), a potent vasodilator produced by vascular endothelial cells, concentrations before and after the exercise training in overweight and obese subjects. Results: The aerobic exercise training significantly reduced body weight and resulted in a significant decrease in body mass index. After the weight reduction program, carotid arterial compliance significantly increased. The plasma ET-1 concentration significantly decreased and the plasma NO concentration remarkably increased with aerobic exercise training-induced weight loss. The decreased ET-1 and increased NO suggest the improvement of endothelial function, since ET-1 and NO are implicated in the regulation of vascular tonus. Thus, weight reduction by aerobic exercise training in healthy overweight and obese men not only increased central arterial distensibility, but also improved their endothelial function. Conclusions. Twelve-week aerobic exercise training-induced weight reduction improved arterial function, as evidenced by increased carotid arterial compliance and altered vascular endothelium-derived factors (ET-1 and NO), in middle-aged healthy overweight and obese men. Therefore, our findings suggest that regular aerobic exercise in overweight and obese humans produces beneficial effects on the vasculature, i.e., arterial function, with weight reduction. Supported by grants from the Ministry of Education, Culture, Sports, Science and Technology of Japan (18300215, 18650186).

**BODY COMPOSITION AND PSYCHOLOGICAL FACTORS IN HUNGARIAN GIRLS (3-YEAR FOLLOW UP)**

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It has been revealed that menarche has significant influence on psychological functions in children (Brooks-Gunn and Ruble, 1983). They tend to be embarrassed by the fact that their bodies are more womanly in shape than those of their female classmates that emphasize a lean look.

The aim of this study was to analyze differences in anthropometric variables and psychological factors among Hungarian teenage girls. All together 183 girls were included in the analysis. The mean of their calendar age was 14.98±0.35 at the time of first measurement. The subjects were divided into three groups by tertiles according to the onset of menarche (G1, n=65 early matured; G2, n=62 normal matured; G3, n=56 late matured). Anthropometric measurements were carried out 10 times every 4th month during 3 years observation. Body mass related body fat was estimated by the caliper metric method of Pařízková (1961). Self-administered questionnaires were used to describe state and trait anxiety (Spielberger et al., 1973) and self-efficacy towards physical activity (Schwarzer, 1998). Distribution of the data was checked by Shapiro-Wilk’s W test, and to test homogeneity Levene test of homogeneity has been used. Differences among the groups were analyzed by one-way ANOVA or Kruskal-Wallis ANOVA depending on respective distributions and measurement scales. Significant differences were found in body height, body mass, and body mass related body fat percentage among the groups (p < 0.05). Early matured group was significantly taller until age 13, significantly heavier and they had significantly more body fat in proportion at all measurements. No differences were found in state and trait anxiety and in self-efficacy towards physical activity among the groups at any measurement.

Our conclusion is that the differences among anthropometric characteristics are the consequences of the process of biological maturation, but the pace of their social maturation is not the same. Other factors (family background, type of the settlement where they live) may influence the social behavior. It is important to state that although differences had disappeared in body height after age 13, the significant differences in body mass and body fat percentage still existed. Furthermore, the general statement that early matured children are more anxious is unjustified by our sample. Future investigations should focus in this phenomenon whether this is a sample specific result or the sign of change in the maturation.

**THE EFFECTS OF A WALKING PROGRAMME ON BODY COMPOSITION AND BLOOD PRESSURE OF ELDERLY WOMEN**

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Numerous studies (Rose et al., 2007; von Huth Smith, 2007) have indicated that physical activity is inversely related to the incidence of cardiovascular disease and mortality. Endurance training, in particular, seems to be able to favourably affect cardiovascular risk factors (CRF) (Fagard, 2006). Walking is considered as one of the most accessible and feasible ways to improve physical activity. So, the aim of the present study was to evaluate the effect of a walking program on elderly’s total and central body fat and resting blood pressure as CRF. Fourteen old women (71.4±5.9 years; BMI= 27.7±2.9 kg/m²; SBP= 142.8±11.1mmHg DBP= 75.1± 4.8mmHg) without habitual exercise practice were evaluated in three distinct moments: baseline (M1), after four months with no exercise (M2) and, finally, after participated in a four month walking program (M3). Three times per week at progressive duration (12-30 min.) and moderate intensity (50-70% of HRreserve) were analyzed 4-5 of Borg scale. Body composition (DXA) and blood pressure were assessed at each moment. Despite the fact that there were no significant alterations after walking program on body composition variables, data demonstrate a significant reduction on women’s sitotic (124.1±12,4mmHg - M3 vs. 136.1±14,0mmHg - M2; p=0.04) and diastolic (65,3 ± 4,8mmHg M3 vs. 70,5 ± 3,9mmHg M2; p=0,015) blood pressure after training (M3-M2). Furthermore, there were significant differences between M3 and M1 both in systolic (124,1± 12.4mmHg - M3 vs. 142.8±11.1mmHg - M1) and diastolic (65,3 ± 4,8mmHg - M3 vs. 75,1 ± 4,8mmHg M1) blood pressure. These findings suggest that a walking program with progressive duration and intensity can be able to improve elderly’s blood pressure and therefore their cardiovascular health.

*Supported by FCT References*


MOTOR ABILITIES AND ACTIVITY BEHAVIOUR OF NAMIBIAN AND GERMAN CHILDREN

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Introduction
One of the main topics in Germany is the increasing rate of children with overweight and the risk involved for cardiovascular diseases. Several studies verified the reasons for overweight in a lack of exercise and unhealthy nutrition behaviour. Motor abilities like balance, endurance or speed-strength are decreasing (Bös et al. 2006). The BMI, the fast food consumption and the time children are watching television or playing video games are rising (Kurth, Schaffrath 2007). On the other hand children living in African countries are said to be more active unless there are no available studies about the motor abilities of African children. The aim of the study was to compare the motor abilities and the daily activity behaviour of school children in those different countries, societies and cultures like Namibia and Germany.

Methods
A sample of 191 school children (average 12.81 years, + 1.53) in Namibia (N=93) and Germany (N=98) were tested with a motor ability test battery (jump&reach, long jump, site-to-site, catch&throw, high jump, sit-ups, push-ups, 20m sprint, shuttle run, 1000m run, obstacle course. With every single class the tests were carried out at three days and the classes were split up into girls and boys groups and tested simultaneously. In addition the children filled out questionnaires about their personal data and their activity behaviour (distances to school, membership in a club, leisure time activities). All data were transferred from test result papers to Excel and analysed by SPSS.

Results and discussion
In average the German children had significant better results in the motor abilities: sit-ups, push-ups and site-to-site. The Namibians able was the participation of the subjects running 1000 m (Namibia: 84.95%, Germany: 65.31%). Namibian pupils had more problems solving the obstacle course. A reason might be lack of gymnastic elements in physical education at school. The first questionnaire results indicate that the Namibian children are more active during the day, have lower BMI values (Namibia 16.72, Germany 20.19) and less multimedia consume.

Acknowledgement: Sarah Fullick and Chris Morris are funded by the National Prevention Research Initiative (http://www.nprini.org.uk). The information from these mixed-methods will be useful in informing the design of future physical activity interventions administered to individual shift-workers.

SHIFT-WORKERS PHYSICAL ACTIVITY: A MIXED-METHOD APPROACH

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Accurate measurements of shift-workers’ leisure time physical activity (LTPA) are important for reliable estimations of energy balance in this relatively unhealthy cohort (Atkinson et al., 2008). Information is needed not just on mode, duration and intensity of exercise but also when exercise is taken in relation to a specific shift schedule, so that any time-based barriers to exercise are recorded. A mixed-method approach, that combines quantitative and qualitative strategies and cross-sectional and longitudinal designs, is preferable to answer such complicated questions. Using such an approach, our aim is to provide the first detailed account of LTPA in shift-workers.

Shift-workers (46 females and 105 males), with median (inter-quartile range - IQR) age of 39 (14) years, completed the Standard Shift-work Index (SSI) together with a LTPA questionnaire. Gender, job type, age and shift-work experience were explored as correlates of LTPA. Five females and 5 males, with median (IQR) age = 44 (10) y, also completed a 7-day diary and wore an accelerometer for assessment of activity counts during work, leisure, and bed-time when working each shift-type (days, nights and rest). Participants also completed a semi-structured email interview. A transcript-based analysis of interviews was used to identify emerging themes related to LTPA.

The median (IQR) energy expenditure during LTPA was 16.0 (23.4) MJ in males compared to 8.4 (16.3) MJ in females (P=0.002). Firefighters recorded the highest LTPA of 19.1 (23.1) MJ (P<0.0005). Midwives recorded extremely low LTPA, although females are prevalent in this occupation. No significant correlations were found between LTPA and age or shift-work experience (P>0.05). No significant differences in LTPA, work-time and bed-time activity counts were found between shift-type (P>0.05). The number of hours before bed during night shift days was 17.4 (3.5) h compared to 14.6 (2.5) h on rest days (P=0.004). Participants stated that sleep-related disturbances affected their desire to take part in LTPA and increased their need to recover on rest days. The amount of time participants could spend socialising with friends, family, domestic activities and LTPA was also stated to be limited by shift-work.

In conclusion, male shift-workers within the fire and rescue services participate in the most LTPA, with female midwives having the lowest levels of LTPA. Job-type and gender were much more influential on the LTPA of shift-workers than age or experience. Shift-workers spend more of their time on rest days in bed, in an attempt to rectify a perceived sleep debt, which is emphasised more than LTPA. Such information from these mixed-methods will be useful in informing the design of future physical activity interventions administered to individual shift-workers.

References.
Acknowledgement: Sarah Fullick and Chris Morris are funded by the National Prevention Research Initiative (http://www.nprini.org.uk).

PHYSICAL ACTIVITY, FITNESS AND OVERWEIGHT IN CHILDREN AND ADOLESCENTS: THE MADEIRA GROWTH STUDY

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The purpose of this study was to compare the physical activity and fitness levels of overweight and non-overweight Madeira children and adolescents. The sample included 507 subjects which participated in the Madeira Growth Study, a mixed longitudinal study with five cohorts followed at annual intervals during three consecutive years. A total of 1505 subjects, 761 boys and 744 girls, 7-18 years old, was used in a cross-sectional analysis of the data. Somatic characteristics include stature and body weight. Physical activity was estimated via questionnaire and interview. Physical fitness was measured with the Eurofit test battery. Body mass index was used as overweight indicator. The sam-
EFFECT OF COMBINING LACTOTRIPEPTIDE SUPPLEMENT WITH REGULAR EXERCISE ON CENTRAL ARTERIAL COMPLIANCE AND VASCULAR ENDOTHelial FUNCTION

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BACKGROUND: Central arterial compliance and vascular endothelial function play an important role in the functional abilities of the vasculature, whereas these functional abilities of the vasculature decline with aging. Indeed, the reduced arterial compliance and endothelial function implicate in the pathophysiology of cardiovascular disease. Two tripeptides, valine-proline-proline (Val-Pro-Pro) and salseucine-Pro-Pro-Pro-Pro-Pro), were isolated from the sour milk and were referred to lactotripeptide (LTP). LTP had an antihypertensive effect. Regular exercise can improve functional abilities of the vasculature, i.e., central arterial compliance and vascular endothelial function. We hypothesized that combining these lifestyle modifications (i.e., LTP supplement with regular exercise) might be more effective than either treatment alone. OBJECTIVE: We examined the individual and combined effect of LTP supplement and regular exercise on central arterial compliance and endothelial function. METHODS: Twenty-nine postmenopausal women (51-60 years old) volunteered to participate. The subjects were randomly assigned to one of the following interventions: LTP, placebo (control), LTP and exercise (LTP+Ex), or placebo and exercise (Placebo+Ex). LTP (6.8 mg/day) or placebo was administered orally for 8 weeks. The exercise group performed regular aerobic exercise (primarily walking) 4 day/week for 45 min at 75% peak heart rate. Before and after an 8-week intervention program, we measured blood pressure, carotid arterial compliance (via simultaneous B-mode ultrasound and arterial applanation tonometry on the common carotid artery), and endothelial function (assessed with flow-mediated dilatation [FMD]). RESULTS: After 8 weeks intervention, systolic blood pressure, carotid arterial compliance (via simultaneous B-mode ultrasound and arterial applanation tonometry on the common carotid artery), and endothelial function (assessed with flow-mediated dilatation [FMD]) significantly increased after an 8-week intervention of LTP, Placebo+Ex and LTP+Ex. There were no significant differences in carotid arterial compliance and FMD before and after placebo intervention. Carotid arterial compliance and FMD significantly increased after an 8-week intervention of LTP, Placebo+Ex and LTP+Ex. There were no significant differences in carotid arterial compliance and FMD before and after placebo intervention. The change of carotid arterial compliance was markedly higher in LTP+Ex group than other groups and the change of FMD was significantly higher in LTP+Ex group than Placebo and LTP groups. CONCLUSIONS: LTP supplement or regular exercise improves the functional abilities of the vasculature, i.e., central arterial compliance and endothelial function. The combining LTP supplement and regular exercise are more effective than either treatment alone.

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SIGNIFICANT MODIFICATIONS IN BODY COMPOSITION AND CARDIO-RESPIRATORY FITNESS INDUCED BY A SPECIFIC INDOOR CYCLING PROTOCOL

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Indoor cycling (IC) has been suggested as a physical activity for losing weight; however these studies have never been published in peer-reviewed scientific journals. Moreover, despite its worldwide popularity incomplete studies aimed at assessing the IC effects on metabolic and cardiovascular functions are present. The aim of our study was to evaluate whether IC is suitable for decreasing fat mass and improving cardio-respiratory fitness (CRF) in ten sedentary overweight women. The subjects (22.6±2.1 yr, 25-29.9 BMI) were trained for 12 weeks by a speciﬁc indoor cycling protocol (ICP) that follows the guidelines of Schwin® Cycling program. The training consisted of 3 sessions/week (each session length: 53min and 03sec) carried out from 7 to 8 pm in ﬁtness room at the University Campus of Palermo. Body circumferences (arm, chest, abdominal, thigh and leg) were measured according to Lohman et al. Body composition was evaluated by bio-impedance analysis. Heart rate (HR) and oxygen uptake (VO2) were monitored by a HR monitor and a wireless portable ergospirometer system respectively. Triangular incremental test created by Mac Dougall et al. was modiﬁed and used for evaluating cardio-respiratory performance after ICP sessions. The data were acquired before the beginning of the protocol and after 12, 24, 36 ICP sessions. Repeated analysis of variance (ANOVA) and linear regression test among the continuous variables and single values were performed. Statistical signiﬁcance was set at P < 0.05. The initial body weight (70.8±8.8 kg) showed a reduction by 2.6% and 3.2% after 24 and 36 Indoor Cycling Sessions (ICS) respectively. Moreover, we observed a signiﬁcant reduction by 4.3% and 5.0% in fat mass after 24 and 36 ICS respectively. Lean mass signiﬁcantly increased by 2.3% and 2.6% respectively after 24 and 36 ICS. All circumference measures signiﬁcantly diminished in response to ICS. Resting heart rate (70.2±10.1 beats•min−1) decreased by 6.5% and 9.0% after 24 and 36 ICS respectively. Training Heart Rate (HRt) and Training Oxygen Uptake (VO2t) gradually increased during warm up step and reached the peak in the middle part of training period. Instead, they gradually decreased during cool down step. The results of incremental test showed a signiﬁcant increase in HRmax, Wattpeak and VO2max after ICP sessions. The signiﬁcant decrease in the body weight suggests the efﬁciency of our protocol for losing weight in overweight women. ICP intensity might induce a high energy expenditure as suggested by HR and VO2 values recorded during ICP sessions. The proﬁles of HRt and VO2t were strongly dependent on the selected technique, hand position and music tracks and therefore the instructor may modulate the workload according to the individual features. The presence of cardiac adaptations associated with the results from incremental test suggests that our protocol may improve CRF and be used to prevent cardiovascular diseases.
MAXIMAL OXYGEN UPTAKE IN A NATIONALLY REPRESENTATIVE SAMPLE OF NORWEGIAN 9- AND 15-YEAR OLDS

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In children low aerobic fitness has been associated with cardiovascular disease risk factors (1). Moreover, aerobic fitness seems to track from childhood into adulthood (2). Even though direct measurement of VO2peak is the preferred method to assess aerobic fitness, it is rarely used in large epidemiologic studies due to expensive equipment and its time consuming nature. Population based studies where VO2peak has been measured directly are scarce. Aim: The aim was to assess aerobic fitness in a population based sample of Norwegian 9- and 15-year olds. Methods: The study was carried out in 2005-2006. A total of 2,299 9- and 15-year-olds participated, giving an adherence rate of 82%. Oxygen uptake was measured directly using a maximal cycle ergometer test. Expired gas was measured with a portable MetaMax III X oxygen analyser. Differences between groups were analysed using independent-sample t-test. P-values ≤ 0.05 were considered statistically significant. Results: Mean values for VO2peak were the following: 9-year old boys, 48.2±7.1 ml/min/kg; 9-year old girls, 42.9±6.7 ml/min/kg (12.4% sex difference, p<0.0001); 15-year old girls, 41.1±6.0 ml/min/kg, 15-year old boys 51.9±8.0 ml/min/kg (26.3% sex difference, p<0.0001). Furthermore, 15-year old boys had 7.7% higher VO2peak than 9-year old boys (p<0.0001), whereas 9-year old girls had 4.4% higher VO2peak than 15-year old girls (p<0.001). Conclusions: This study indicates that sex differences in aerobic fitness are present in prepubertal children as well as in adolescents. The least fit subjects had VO2peak of 30-36 ml/min/kg. These values are below the considered criterion standard for health related aerobic fitness. Low aerobic fitness is of concern, due to the strong association that has been reported between low aerobic fitness and clustering of risk factors for cardiovascular disease. Since aerobic fitness seems to track into adulthood, interventions should be targeted especially at these groups.

References:

EFFECTS OF A LIFESTYLE-BASED PHYSICAL ACTIVITY PROGRAM ON METABOLIC SYNDROME IN JAPANESE MALE OFFICE WORKERS

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PURPOSE: Among Japanese middle-aged workers, enhanced individual with metabolic syndrome is a significant problem because of the possibilities of more cardiovascular disease occurrence and more health care expenditure. There is a need for effective preventative health promotion program against metabolic syndrome, designed to be accessible to more people and support to long-term adherence. This study investigates the effects of a lifestyle-based physical activity intervention program on metabolic abnormalities in Japanese middle-aged male office workers. METHODS: Data collected on healthy sixty-nine males (aged 45.7±7.8 years) participating in a lifestyle-based physical activity intervention program delivered to employees from a single corporation were analyzed at baseline and after 3 months. Components of the intervention include supervised low-to-moderate intensity physical activity including combined aerobic activity, 8,000-10,000 steps/day and resistance-training (seven weight-bearing resistance exercises, for an estimated 30 min completed 5 days/week), and dietary education (delivered via group seminars). These training were performed at the time and location that would suit their lifestyle. Metabolic syndrome-related factors (waist circumference, blood pressure, blood glucose level, and lipid profile) and physical fitness, as well as energy intake and expenditure were measured. The metabolic syndrome was assessed using the Japanese definition, launched in 2005. RESULTS: After 3 months, the prevalence of metabolic syndrome was markedly lower (19%, 13 subjects) than at baseline (45%, 31 subjects). Body weight, waist circumference, blood pressure, fasting blood glucose level, and triglyceride level, and LDL cholesterol level were significantly decreased after 3 months (p<0.05). The increase in energy expenditure and physical fitness had a significant correlation with changes in metabolic syndrome-related factors. CONCLUSION: These results suggest that a lifestyle-based physical activity intervention can improve and prevent metabolic syndrome over a short-term period in middle-aged office workers.

VALIDITY OF HEART RATE AND ACCELEROMETRY TO ASSESS PHYSICAL ACTIVITY ENERGY EXPENDITURE WITH AND WITHOUT INDIVIDUAL CALIBRATION IN FREE-LIVING ADOLESCENTS

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Introduction
The strength of the relationships between physical activity energy expenditure (PAEE) and disease remain uncertain. This is at least partly because PAEE is difficult to measure accurately in young people. Combining heart rate monitoring (HR) and movement sensing (ACC) has improved the accuracy of PAEE prediction over either method used alone in laboratory settings in youth, but not yet during free-living. Both HR and ACC have limitations, including the need for individual calibration of HR. The aim of this study was to determine the validity of HR+ACC to assess free-living PAEE in adolescents, with and without individual calibration of HR.

Methods
Fifty-four adolescents (12 to 18 years-old) were recruited from schools in Cambridgeshire, UK. Energy expenditure (EE) was measured during rest and incremental treadmill activity by indirect calorimetry. Subsequently, combined HR and ACC monitoring was carried out over 11 consecutive days concurrent with EE measurement using the doubly labelled water method (DLW). Five combined and separate HR+ACC prediction models were derived, and PAEE subsequently predicted, using either group (GC) or individual (IC) HR calibration:

- a. Cubic ACC model
- b. Flex HR model with GC of HR
- c. Flex HR model with IC of HR
- d. HR+ACC with GC of HR
- e. HR+ACC with IC of HR

Acceleration and/or beats per min above sleeping HR (HRaS) and sex were included in GC models. The individual slope and intercept of the HR-EE relationship derived during the treadmill calibration was included in the IC models. The models were derived using repeated
**Results**

Mean bias was highest for the ACC model (-46.8 kJ/kg/day; p<0.001) and lower for the Flex HR (10.8 and 9.6 kJ/kg/day, p=0.007 and 0.071) and HR+ACC models (-7.7 and -10.5 kJ/kg/day, p=0.04 and 0.01). The root mean square error was also highest for the ACC model (55.9 kJ/kg/day) compared to the HR (30.1 and 39.1 kJ/kg/day) and HR+ACC models (27.4 and 30.6 kJ/kg/day). Systematic error was present for models a, c, and d, with correlations ranging from r=-0.28 to r=0.44 (p=0.04 to p<0.001) between the difference and the mean of estimated PAEE. There was no difference in mean bias between the estimates from the group- or individually-calibrated Flex HR or HR+ACC models (p=0.75 and p=0.31, respectively).

**Conclusion**

The Flex HR and HR+ACC models provided more accurate predictions of PAEE than the model based on ACC alone. There appears to be little benefit in using HR+ACC over HR alone for the prediction of PAEE in these adolescents. Our results also suggest that individual calibration of HR does not appear necessary for the prediction of PAEE over the use of sleeping heart rate and sex for the group calibration of HR.

**HOW DOES EXERCISE FREQUENCY BEFORE AND DURING PREGNANCY AFFECT THE RISK OF DELIVERING HIGH BIRTH WEIGHT INFANTS. THE NORWEGAN MOTHER & CHILD HOJT STUDY**

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**Introduction**

Mean birth weight has increased during the last decades (1) with an increased proportion of infants weighing above 4000 g, which is associated with an increased risk of adverse pregnancy and maternal outcomes. Although recreational exercise (RE) during pregnancy has been considered an important determinant of birth weight, the literature on the relationship between RE during pregnancy and birth weight is equivocal. Whether the differences in birth weight are dependent upon the physical conditioning of the mother previous to pregnancy, exercise frequency or timing of exercise during pregnancy remains unknown. Hence, the aim of the present study was to investigate, in the same cohort of pregnant women, the association between exercise frequency before and during pregnancy-week 17 and 30, and the risk of giving birth to high birth weight (>4000 g) infants. Methods: Using data from the Norwegian Mother and Child Cohort study (MoBa), 36869 pregnancies enrolled between 2001 and 2005 were included. Multiple pregnancies and pregnancies ending before week 37 were excluded. Information on recreational exercise was based on answers from two questionnaires distributed in pregnancy-week 17 and 30. Linkage to the Norwegian Medical Birth Registry (MBR) provided data on birth weight. Recreational exercise level was defined in terms of frequency. Outcome variable was delivery of a high birth weight infant (>4000g). We used logistic regression analysis to estimate the associations, and the results are presented as adjusted odds ratios (aOR) with 95% confidence interval (95% CI). The following covariates were included; maternal age, BMI prepregnancy, maternal height, prepregnancy exercise frequency, smoking, hypertension, Preecampsia, Preexising Diabetes, and Preexisting/GDM. Results: The proportion of infants with birth weights above 4000 g was 24.4% (n=8991). Exercising 3 1 pr week or more in week 17 was negatively associated with giving birth to high birth weight infants in nulliparous women, aOR=0.81 (95% CI 0.71-0.93). In week 30, both nulliparous and multiparous women exercising 1-2 t a week were less likely to deliver high birth weight infants, aOR=0.87 (0.77-0.97) and 0.91 (0.84-0.995), respectively, with the greatest protective effect in nulliparous exercising 3 1 pr week or more, aOR=0.78 (0.69-0.88). Prepregnancy exercise frequency did neither affect the probability of delivering high birth weight infants in nulliparous nor in multiparous women. Conclusion: A protective effect of exercise frequency in week 17 was observed in nulliparous women, only. Exercise frequency in late pregnancy may have a greater impact on excessive birth weight compared to prepregnancy and week 17, both in nulliparous and multiparous women. The probability of delivering high birth weight infants was not affected by exercise frequency prepregnancy.

**VARIABILITY IN LIMB MUSCLE SIZE IN 633 JAPANESE MEN AGED 18-39 YR**


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**Introduction**

Muscle size is related to the force production capability, and changes with training, growth and aging. Kawakami et al. (2) have measured muscle thicknesses in 711 women and men aged 3-94 years and found that the inter-individual variability in muscle sizes was different among the triceps brachii, vastus lateralis and medial gastrocnemius muscles. They indicated that the muscle-dependent variability in size reflected inter-muscle differences in hypertrophic response to training and/or growth. However, their measurement is varied muscle thicknesses in 711 women and men aged 3-94 years and found that the inter-individual variability in muscle sizes is dependent on muscle groups. The elbow extensors were highly variable in size, and the lower leg muscles had lower variability. Since the present data were obtained from the men aged 18-39 yr, the observed differences in the variability cannot be ascribed to either of gender, growth or aging. The subjects included college athletes of various sports. The muscle thicknesses were determined by ultrasonography at each of 12 sites: upper arm anterior (12.2%), upper arm posterior (12.1%), lower leg anterior (9.4%) and lower leg posterior (9.4%). The differences in CVs between measurement sites were significant in all cases except for those of upper arm anterior-thigh posterior and lower leg anterior-posterior. The results were the same even when each of the muscle thickness was normalized to the limb length to account for the variation in body size.

**Discussion**

Our main finding is that the inter-individual variability in muscle thicknesses was dependent on muscle groups. The elbow extensors were highly variable in size, and the lower leg muscles had lower variability. Since the present data were obtained from the men aged 18-39 yr, the observed differences in the variability cannot be ascribed to either of gender, growth or aging. The subjects included college athletes of various sports.
athletes (e.g., baseball, volleyball and sumo wrestling) with various training history and routines. Thus, the results suggest muscle-related differences in hypertrophic response to training. These differences may be related to the muscle architecture (fiber length/muscle length (2) and pennation angle), duration and level of activation during daily living (3) and function (extensor or flexor). The differences in hypertrophic responses between muscle groups should be taken into account when one evaluates the effects of resistance training.

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EFFECTS OF BODY COMPOSITION ON SWAY
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INTRODUCTION
Alterations in the type of foot can be produced by physical activity (Nagel, Fernholz et al. 2008), and have as a result in a predisposition to suffer injuries (López, Albuerqueque et al. 2005). The study of plantar pressures is taking a great importance and Platforms Pressures (PP) are being used to obtain stabiometric and podometric measures (Dowling, Steele et al. 2004). PP gets faster, cleaner and more accurate data, as type of foot (although there are studies which criticize it) (Urry and Wearing 2001) or displacement of Gravity Center (IGCsway). Furthermore, sway can be conditioned by body composition (Bernard, Geraci et al. 2003).

OBJECTIVES
To study the influence of body composition in displacement of GC in physical healthy subjects.

MATERIAL AND METHODS
Subjects: 42 subjects (mean age = 22.42±5.14 years; height = 180±9.03 cm; weight = 80.74±13.72 kg).

Instruments: It was used a PP with a surface area of 60x58 cm (Footwork-Pro), with a sampling frequency of 300 Hz. Anthropometric measurements were used a Seca system, with a sensitivity of 1mm, and body composition was analyzed by bioelectrical impedance (Inbody720).

Protocol: data were carried out on three consecutive days. First, height, weight and body composition were analyzed. Then, a test with the PP consisting of a static bipodal, fundamental position.

Statistical Analysis: It was carried out using SPSS 15.0 program and averages and standard deviations were taken. The correlations were found with Pearson’s test for variable parametric and Spearman for nonparametric. The distribution of variables were analyzed with Sahpiro-Wiklks test. Finally, Student’s test was used, considering p value <0.05 as significant and U Mannwhitney.

RESULTS
In the population study were found correlations between displacement of Gravity Center with the skeletal-muscle mass (r left foot = - 0.721); (r body = -0.939) and (r right foot = -0.636).

CONCLUSIONS
The increased in body fat means a decrease in the ability to balance (Goulding, Jones et al. 2003; Paillard, T. Lafont C et al. 2004), and the type of foot is not linked to body composition.

References.

PHYSICAL ACTIVITY, SPORTS PARTICIPATION, AND PHYSICAL FITNESS OF CHILDREN WITH VISUAL IMPAIRMENTS
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Low physical fitness levels have been found in children with visual impairments (VI), and it has been suggested that this is partly related to low physical activity levels (Lieberman & McHugh, 2001; Kozub & Oh, 2004). Reported data which might indicate whether there is a relationship between physical activity and physical fitness in children with VI are scarce. Therefore, the aim of this study was to investigate the physical activity level of children with VI and its association with physical fitness performance.

A sample of 48 children with VI, ages 6 to 12 years, participated. Physical activity was assessed by the GT1M accelerometer, sports participation by a self-report measure (see Houwen et al., 2007), and physical fitness by the Eurofit (see Houwen et al., 2006). BMI was also determined. Partial correlation analyses corrected for age, sex, BMI, and degree of VI were used for statistics. The following accelerometer outcome variables were calculated: (1) total physical activity (counts per minute), (2) number of minutes spent in sedentary activity per day, (3) number of minutes spent in light activity per day, and (4) number of minutes spent in moderate-to-vigorous activity (MVPA) per day.

The results of the self-report measure indicated that a large percentage (80%) of the children with VI participated weekly in sports activities. Children with VI participated primarily in individual sports with a closed (= stable, predictable) character. Despite their reported sports participation, none of the children with VI met the recommendation of being physically active for at least 60 min/day on every day of the week according to the accelerometer data (Kemper et al., 2000). With regard to associations between physical activity and fitness, it was found that total physical activity was significantly associated with sit-and-reach, standing broad jump, sit-ups, and modified 5x10-m shuttle run, indicating that children who were more active reached farther, jumped farther, performed more sit-ups, and were faster on the shuttle run than children who were less active. Percentage of time spent in sedentary activity was inversely associated with sit-and-reach, standing broad jump, sit-ups, and positively with the 5x10-m shuttle run. Percentage of time spent in MVPA was positively associated with sit-and-reach and sit-ups.

Physical activity needs to be promoted in children with VI. Focusing on reducing time spent in sedentary activities and enhancing participation in MVPA may be successful means of promoting physical fitness in children with VI.

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PATTERNS OF PHYSICAL ACTIVITY IN 9 AND 15 YEARS-OLD CHILDREN IN ICELAND

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Lack of physical activity is hypothesized to be an important factor in the development of childhood obesity. This places children and adolescents at increased risk of significant health problems, both during their childhood and adult life. At the same time, physical activity has been shown to decrease by age and be less among girls than boys. The purpose of this study was to compare physical activity patterns of weekdays and weekend days and examine whether these patterns are influenced by age and gender. In this study, 435 randomly selected 9 (9YO) and 15 (15YO) year-old children from 18 primary and/or secondary schools in Iceland participated. Physical activity was measured with Actigraph activity monitors over 3-5 days. Total counts per day were used as objective measure of physical activity. Statistical analysis was done with factorial ANOVA for repeated measures in SPSS, using Greenhouse-Geisser correction for sphericity. Using weighted average of weekday and weekend physical activity, 9YO (girls= 528±166 kcounts/day, ±SD), boys= 620±186 kcounts/day) were significantly more active than 15YO (girls= 425±130 kcounts/day, boys= 543±195 kcounts/day, F= 37.2, df= 1,334, p<0.001), and boys were significantly more active than girls (F= 33.0, df= 1,334, p<0.001). Physical activity was lower during weekend days (F= 253.3; df= 1,334, p<0.001), and the difference was independent of age and gender. The physical activity pattern was not the same on weekdays and weekend days (F= 27.4, df= 10.6,3535; F= 0.001), but this difference was both moderated by age (F= 12.6, df= 10.6,3535; p<0.001) and gender (F= 2.30; df= 10.6,3535, p=0.009). The 9YO were most active in the morning and around noon during weekdays but on weekend days they were most active from noon to 6:00 pm. The 15YO were most active in the afternoon on both weekdays and weekend days. However, on weekend days they were much more active in the evening and during the night than during weekdays. Whereas the activity pattern is similar for boys and girls on weekend days, on weekdays it differs. For boys it peaks around noon but in the late afternoon for girls. In conclusion, the difference in physical activity patterns both between different age groups and between gender should be considered when intervention strategies to increase physical activity are planned and implemented.

THE WHOLE-BODY VIBRATION IS USEFUL TO IMPROVE THE DYNAMIC BALANCE IN WOMEN WITH THE SYNDROME OF FIBROMYALGIA

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Introduction:
Recently it has been demonstrated that there is a usual deficit in balance in people with fibromyalgia. In some studies it has been seen that balance can be improved with different programs of vibratory exercise in different risk population as older people.
Objective:
The purpose of this study is to assess if a whole-body vibration exercise program from 12 weeks to 12.6 hertz of frequency. It will begin with repetitions from 30 seconds to 1 minute. The aim is to check if those are useful, safe and applicable in women with FM syndrome for the improvement of the dynamic balance.
Material and Method:
36 women with fibromyalgia syndrome have participated in this study. They were randomly assigned in two groups. 18 in the control group and 18 in the exercise group. The isometric force has been moderate using the isocinetic dynamometer system 3, the dynamic balance through the platform of balances Biodex Balance. The training program lasted 12 weeks, three weekly sessions were offered. Each session consisted of 6 repetitions to 12.5 Hertz with an initial duration of 30 seconds that was increased monthly, in 15 seconds. Between each repetition a rest of a minute existed.
Results:
The exercise group in relation to the control group, has improved in a significant way his dynamic balance improving the more those who had a smaller level of isometric force and those that had a greater weight because of the relative load of training was greater.

ASSOCIATION BETWEEN SPORT PARTICIPATION AND THE DEGREE OF SEVERITY OF OBESITY IN CHILDREN AND ADOLESCENTS

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Introduction: Nowadays, due to the dramatical change in people’s lifestyles and the physical environment, children have few opportunities for active playing and spontaneous physical activity. Therefore, participation in organized physical activity such as physical education (PE) and sport teams are probably the major source for total activity. The increasing prevalence of childhood obesity in the last decades has been a growing concern, and it has been associated with low levels of physical activity. The aim of the present study was to determine the association between sport participation and the degree of severity of obesity.
Methods: The sample comprised 465 children and adolescents, from public schools and sport clubs in Funchal. (Autonomous Region of Madeira) with a mean age of 13.72±1.64 years. According to their level of sport participation, subjects were classified in two groups: 1) only attending PE classes (Gp1), and 2) attending PE classes as well as playing sport in school and/or club sport teams (Gp2). Based on their body mass index (BMI), subjects were classified according to Cole et al. (2000) percentiles. Similarly, for percent body fat, subjects were classified according to the Lohman’s (1987) health risk categories. Sport participation was assessed by self-report questionnaire.
Results: Subjects who only took PE classes (Gp1) presented a higher risk of being overweight (OR 0.7, 95% CI 0.4-1.2) and obese (OR 1.2, 95% CI 0.4-3.1) than that of Gp2. Similar results were found with subjects in Gp1, showing a greater risk of being in the moderately high
EVIDENCE OF THE RELATIONSHIP BETWEEN CARDIOVASCULAR DISEASE, OBESITY, AND METABOLIC SYNDROME

INTRODUCTION

The purpose of this study is to determine the relative importance that several international certifications, recognized as the most prestigious (1), grant to different knowledge fields. It seems that, to be certified is very related with outstanding knowledge for the P.T. professional practice (2). The certifications studied are under NCCA accreditation, required by IHRSA since 2005 in order to recognize any PT certification (3).

MATERIAL AND METHODS

Contents of 5 international PT certifications programs were analyzed: NSCA, ACSM, NASM, ACE and The Cooper Institute. Distribution of the contents in 8 categories that include all KSAs that should have a PT, according to these organizations. A national panel of experts validated the election and definition of the categories, afterwards we distributed the contents of each certification in these categories. When any content didn't agree exactly with those owned to this study, an interpretation was carried out, assigning the relative importance based on researchers criteria.

Statistical analysis used measures of central tendency (mean and standard deviations), as well as coefficient of variability (C.V.).

RESULTS

The categories resulted from the analysis are: exercise programming and prescription (EPP), exercises technique (ET), applied sciences (AS), physical fitness testing and interpretation (PFT), nutrition (N), marketing and business issues (MB), safety and emergency management (SEM), legal issues (LI). The most relevant category is EPP, with an average of importance among all certifications of 34.6%. It's followed by ET, AS and PFT, all of them with an importance higher than 19%. Resting categories (N, MB, SEM and LI) have an importance average lower than 10%. The relevance of the M category is the most heterogeneous, data that indicates a great disagreement among the studied certifications in relation to this aspect of PT competence.

CONCLUSIONS

EPP is the most important content, followed by ET, AS and PFT. On the other hand, N, MB, SEM and LI are the categories considered as less relevant.

PRACTICAL APPLICATIONS

PT educational programs should distribute their contents and schedules in a similar way to the results obtained in this study. References.


METABOLIC SYNDROME AND OBESITY IN CHILDREN AND ADOLESCENTS (3-15 YEARS) FROM MADEIRA (PORTUGAL)


Cardiovascular diseases (CVD) are the first cause of morbidity and mortality at world level. CVD appears mostly associated to a group of factors such as hypertension, dyslipidemia, elevated plasma glucose and obesity, whose constellation has been named the metabolic syndrome (MetS). The purposes of this study were: a) to determine the prevalence of MetS in a sample of Portuguese children and adolescents living in Madeira Island, and b) which components are the best predictor(s) of MetS in this sample.

Methods:

Participants in this study were 1496 children and adolescents ranging from 3 to 15 years of age from the public school system in the island of Madeira. Measures taken for each subject were: body composition (weight, height and waist circumference), blood pressure, triglycerides, glucose and C-HDL. MetS was diagnosed using the criteria established by Cook et al. (2003). Prevalence of obesity and overweight was determined according to the Cole et al. (2000) classification.

Results:

Results show that 17.6% of participants were overweight and 6.5% were obese. The prevalence of MetS was 4.5% (3.4% in girls and 5.7% in boys), and it raised with the increasing severity of obesity (11.1% in normal weight, 11.8% in overweight and 22.9% in obese subjects), as well as the increasing school level (4.0% in preschool, 4.8% in 5-6th grades, and 5.5% in 7-9th grades). Logistic regression analysis showed that abdominal obesity was the MetS component that presented more risk for the diagnose of that condition (OR: 1.185; ICC 95% 1,062-1,251), followed by systolic blood pressure (OR:1.063; ICC 95% 1,016-1,112) and triglycerides concentration (OR:1.048; ICC 95% 1,035-1,062).

Conclusions:

The prevalence of the MetS was higher in boys than in girls and it increases with the severity of the obesity and school level. The best predictor of MetS was the waist circumference.

References


HEALTH CLUB CLIENTS: A STUDY OF THE SEGMENTATION CRITERIA

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Health Club Clients: a study of the segmentation criteria

Teixeira, Mário & Correia, A.

This study segments the clients of fitness centre on the Portuguese island of Madeira, based on cluster analysis. A questionnaire with 121 observations is used to examine the motivation profiles. The findings reveal that there are three segments in the data: the first is denominated the 'happy consumer' segment. The second segment consists of the 'unhappy consumers' and the third are composed of unmarrried, unattached consumers. The managerial implications of the results are derived.

Biographical notes:

Mário Coelho Teixeira currently teaches Sport Management in the Department of Sport and Health at the University of Évora, Portugal. He is a PhD student and has a Master's degree in Sports Management from the Technical University of Lisbon.

Abel Correia has a PhD in Human Kinetics, specialising in Sport Sciences at the Human Kinetics Faculty of the Technical University of Lisbon (FMH-UTL). As an associate professor working in the Sport Sciences Department, he teaches Sports Organisation and Sports Marketing on the FMH-UTL's degree course in Sports Management. His interests include sports organisational strategy and sports marketing management.

INFLAMMATORY PROTEINS ARE ASSOCIATED WITH MUSCLE STRENGTH IN ADOLESCENTS; THE AVENA STUDY

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Objective: to examine the associations between inflammatory proteins and muscle strength, and to determine whether this association varies between overweight and non-overweight adolescents.

Main exposures: A total of 416 Spanish adolescents (230 males, and 186 females) aged 13-18.5 yrs participated in this study. Muscle strength score was computed as the mean of the handgrip and standing broad jump standardized values. The adolescents were categorized as overweight and non-overweight according to body mass index. Body fat and fat free mass were derived from skinfold thickness. Inflammatory markers measured: C-reactive protein, complement factors C3 and C4, ceruloplasmin and transthyretin.

Results: The results of the regression analysis showed that C-reactive protein, C3 and ceruloplasmin were negatively associated with muscle strength after controlling for sex, age, pubertal status, weight, height, socioeconomic status, and cardiorespiratory fitness. Moreover, C-reactive protein and transthyretin were associated with muscle strength in overweight adolescents after controlling for potential confounders, including body fat and fat free mass.

Conclusions: Low-grade inflammation is negatively associated with muscle strength in adolescents. The patterns of these associations seem more relevant in overweight adolescents, suggesting that having high levels of muscle strength may counteract the negative consequences ascribed to body fat.

INFLUENCE OF PHYSICAL ACTIVITY ON RADIUS AND TIBIA QUANTITATIVE ULTRASOUND MEASUREMENTS IN PERIPUBERTAL GIRLS

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The purpose of this study was to investigate the influence of physical activity on radius and tibia quantitative ultrasound measurements in peri-pubertal girls. Participants were 174 peri-pubertal girls ages 9.2 to 13.1 yrs, divided into three groups according Tanner stage of puberty, namely, group II (age:10.8+/-0.9 yrs; bone age:10.5+/-1.1 yrs; height:145.5+/-9.5 cm; BMI:16.4+/-3.1 Kg/m²; fat mass:18.4+/-6.5 %), group III (age:11.3+/-0.9 yrs; bone age:11.3+/-1.1 yrs; height:149.5+/-7.6 cm; BMI:18.3+/-3.1 Kg/m²; fat mass:20.5+/-6.3 %), and group IV (age:12.5+/-0.5 yrs; bone age:13.6+/-1.2 yrs; height:149.0+/-6.0 cm; BMI:19.0+/-2.0 Kg/m²; fat mass:20.1+/-5.0 %).

Evaluation of radius and tibia was conducted with quantitative ultrasound [Sunlight Omnisense] and physical activity [PAI] with the Actigraph accelerometer (GT1M) over seven days. The outcome PA variables were the number of minutes the child engaged in activity of different intensities. Cut points of 100 and 1952 counts/min represent sedentary, light, and moderate plus vigorous PA. Pubertal maturation was assessed according secondary sex characteristics (Tanner, 1962). Body composition was estimated through Slaughter et al. (1988) and Lohman (1986) equations. The % body fat was obtained using the mean value of the two equations. Bone age was determined by the Tanner-Whitehouse III Method. Energy and calcium intake were calculated from a semi-quantitative Food Frequency Questionnaire assessing regular intake of a wide set of typical Portuguese foods. Results: ANOVA demonstrated that girls on the group IV have higher radius and tibia speed of sound than girls on the group III and II (radius: IV:3827+/-101 vs. III:3779+/-87 vs. II:3763+/-91 m/s, p=0.004, tibia: IV:3720+/-122 vs III:3677+/-97 vs II:3648+/-108 m/s, p=0.008). Inversely, girls on the groups II and III showed higher levels of light and moderate plus vigorous physical activity and lower time spent on sedentary than girls on group IV (light: II:318.3+/-40.1 vs. III:300.3+/-51.0 vs. IV:267.7+/-53.2 min/d, p<0.001; moderate plus vigorous: II:46.2+/-18.5 vs. III:39.8+/-16.4 vs. IV:33.1+/-22.0 min/d, p=0.004, sedentary: II:1003+/-77 vs. III:1043+/-84 vs IV:1093+/-64 min/d, p<0.001). Despite chronological and bone age differences between groups (chronological age: II:10.8+/-0.9 yrs vs. III:11.3+/-0.9 yrs vs. IV:12.5+/-0.5 yrs, p<0.001), bone age: II:10.5+/-1.1 vs. III:11.3+/-1.3 vs. IV:13.6+/-1.2 yrs, p<0.001), they were similar in fat mass %, energy and calcium intake. Partial correlation adjusted for bone age and body weight revealed a negative association between tibia speed of sound and moderate plus vigorous PA (r=-0.189, p=0.018). Conclusion: During puberty girls demonstrated higher tibia and radius speed of sound at Tanner stage IV (11.2+/-0.5 yrs) than in previous stages in a time period where there is also a significant PA decrease. Contrary to others bone studies conducted with DXA measurements, in this research moderate plu
CALCULATION OF HUMAN ENERGY BALANCE TO CONTROL WEIGHT REDUCTION PROGRAMS

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Background: With increasing prevalence of overweight and obesity, new and efficient strategies are needed to control body weight. There is no doubt that overweight and obesity emerge from energy imbalance and that we can predict the magnitude of weight change over time if we know the daily energy balance (EB).

Objective: Therefore the purpose of this study was to determine the effect of a negative energy balance of 2.093 kJ/day (500 kcal/day) on body composition in free living conditions.

Materials and methods:
In this controlled field trial 40 healthy adult subjects (age: 43.5 ± 9.7 y; BMI 29.0 ± 3.0 kg/m²) served as an intervention (n=30) and a control group (n=10). Energy intake (EI) was estimated with a 5 day food record. Total energy expenditure (TEE) was calculated from a simultaneous 5 day assessment with the FLEX-heart rate (HR) method. Energy balance (EB) was defined as the difference between EI and TEE. The intervention program (IP) lasted 12 weeks and included nutritional advice and two structured training sessions per week. At baseline there were no statistical differences between groups for anthropometric characteristics, EI and TEE.

Results: The IP resulted in a negative EB of 1825 ± 595 kJ/day (436 ± 142 kcal/day) compared with controls (p < 0.001). These changes were caused by a reduction in EI of 946 ± 967 kJ/day (226 ± 231 kcal/day) and an increase in TEE of 879 ± 934 kJ (210 ± 223 kcal/day). Regression analysis showed that these changes in EB induced equivalent changes in body fat mass (r = 0.84). Participants of the IP lost approximately 6.7 ± 3.6 % (p < 0.001) of body weight and reduced their percent body fat by 3.8 ± 1.7 % (p < 0.001).

Conclusion: It is possible to calculate human energy balances in free living conditions using heart-rate-monitoring and diet records. This approach provides valid results and is suitable for population studies. Additionally, it is an efficient way to control IPs targeting weight loss and the prevention of weight regain for adults.

Keywords: Energy balance, energy expenditure, energy intake, overweight, weight change.

PHYSICAL ACTIVITY, FUNCTIONAL CAPACITY AND QUALITY OF LIFE IN OLDER PEOPLE

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Introduction: Evidences show a positive relationship between regular physical activity and a high physical fitness on reduction of anxiety and depression levels, improving older people’s quality of life. Maintenance of motor skills is critical to the preservation of an independent lifestyle and quality of life in elderly. The aim of the present study was to evaluate the relationship between physical activity levels, physical fitness and quality of life among institutionalized and non-institutionalized older people. Methods: Data was collected from fourteen non-institutionalized elderly (mean ± SD) age 81.43 ± 6.51 (years) dwelling in their own homes and nine institutionalized elderly (mean ± SD) age 83.89 ± 4.01 (years) living in community-residing houses for older people. Physical activity levels in a normal week were assessed in a total of 16 hours per day during two week days and weekend with the Actigraph GT1M accelerometer. Accelerations were registered every 15 seconds. Physical fitness was assessed by The Functional Fitness Test on strength, aerobic endurance, flexibility, agility, and balance variables. People’s quality of life was measured by WHOQOL-Bref. This questionnaire evaluates physical domain, psychological domain, social relations and environment. Mann-Whitney test was used to determine the differences between groups and Spearman’s rho test was used to determine correlations between variables. Results: Non-institutionalized individuals had higher light (moderate) activity levels (p = 0.008), higher aerobic endurance capacity (p = 0.000) and higher agility/dynamic balance (p = 0.007) than institutionalized people. Similar results were found on physical domain, social relations and environment (p = 0.002), (p = 0.003), (p = 0.005) of the physical activity questionnaire. Significant correlations were observed between physical activity levels and physical domain (r = 0.470, p = 0.023) and social relations (r = 0.437, p = 0.029). Physical fitness was positively correlated with physical activity for several variables as strength (r = 0.499, p = 0.018), aerobic endurance (r = 0.783, p = 0.000), flexibility (r = 0.616, p = 0.001) and agility/dynamic balance (r = 0.636, p = 0.001). Conclusion: Older people with institutional community dwelling had lower physical activity levels than non-institutionalized similar individuals. Physical activity influences older people’s functional capacity especially aerobic capacity, and quality of life in several domains. The above results suggest that caring elderly in their own homes seems to provide higher activity patterns, functional capacities and quality of life.

Poster presentations (PP)

PP-HF02 Health and Fitness 2

EFFECTS OF AN EIGHT-WEEK AEROBIC TRAINING PROGRAM ON BLOOD LIPIDS IN HYPERTENSIVE MEN EMPLOYEES

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Introduction
Overweight and hyperlipidemia is accepted as risk factors for CHD, especially in high-stress and low-activity jobs. Therefore, in this study, we investigated the effects of an eight-week aerobic training program on blood lipids in hypertensive men employee.

Methods
Sixty employees, with age range of 35-55 years, who had hyperlipidemia (LDL, TG) and hypertension (SBP > 140, and DBP > 90 mmHg) participated in this study. Subjects were divided in experimental and control group in a random manner. Subjects in the experimental group performed an eight-week moderate aerobic training program (5 days/week-1, 45 min per day); while, subjects in the control group received no training. Blood samples were taken before and after treatment in both groups to measure blood lipids. All statistical analyses were done using SPSS for windows. Statistical significance was accepted as p<0.05.

Results and Conclusion
In the experimental group, blood lipids (TC, TG, and LDL) decreased significantly; however, the levels of HDL were not increased significantly. The changes in these factors were not significant before and after treatment for the control group. The results of this study suggest that a moderate aerobic training program could decrease the levels of blood lipids in low-activity men employee.
EFFECTS OF CONTINUOUS AND INTERMITTENT PHYSICAL EXERCISE ON ENERGETIC EXPENDITURE: COMPARISON BETWEEN OBSESE AND NON-OBESE ADOLESCENTS

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This study aimed to compare, regarding to energetic expenditure (EE), continuous (CE) and intermittent exercise (IE) methods. From these results it will be possible to discuss strategies of body weight loss or maintenance. Non-obese adolescents (NO-16.8 +/- 1.1 years old) and obese ones (OB-15.5 +/- 0.8 years old) were submitted to two bouts of both methods of exercise. They were evaluated: oxygen consumption (VO2), carbon dioxide production (VCO2), respiratory quotient (IRQ), blood lactate and blood glucose. These values were evaluated at baseline, before and after the exercise bouts. CE and IE were performed at thresholds 1 and 2, respectively. To identify group differences, the adolescents were compared from body composition (bioelectric impedance) and anthropometric variables (BMI and waist circumference). The variables were compared by independent student t-test, ANOVA for repeated measures and Pearson correlation, adopting p value <0.05. The main results pointed that: obese had higher body fat and waist circumference; non-obese ones had higher aerobic power. In response to exercise, CE meant energetic expenditure 8% and 24% higher in EU, and 24% in OB, from absolute and relative values; - OB showed absolute energetic expenditure from CE 13% higher than EU, but in relative values, EU showed values 18% higher than OB. EU group presented higher EE in IE (5% absolute and 32% relative). EU presented more efficient recuperation from IE intervals. It can be concluded that CE means higher EE, but EPOC turns these values similar. From these results, both methods of exercise could be good options to prevent and treat obesity.

THE COMPARISON OF SUPEROXIDE DISMUTASE (SOD) ENZYME ACTIVITY AND LIPOPROTEIN STATUS OF ATHLETES AND NON-ATHLETES

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The enzyme superoxide dismutase (SOD, EC 1.15.1.1) catalyzes the dismutation of superoxide into oxygen and hydrogen peroxide. It is therefore, an important antioxidant defense in nearly all cells exposed to oxygen. Ancient (Zourkhaneh) sport is a very traditional and national sport in Iran, therefore, the purpose of this study is to compare plasma and hemoglobin SOD enzyme activity and lipoprotein status of ancient (Zourkhaneh) athletes and non-athlete individuals. SOD activity and lipoprotein status is determined through inhibiting pirogalol auto-oxidation and CHOD-PAP methods, respectively. Kruskal-Wallis and Mann-Whitney U tests were used to compare groups; and statistical significance was also considered where P<0.05. Based on the results, the hemoglobin SOD of karatists was significantly higher than ancient (Zourkhaneh) athletes and non-athlete individuals (P<0.05), but their plasma SOD was only significantly higher than non-athletes (P<0.05). It is observed that there was not a significant differences between the three groups regarding their lipoprotein status including low density (LDL) and high density (HDL) lipoprotein cholesterol, total cholesterol and triglyceride concentration (P>0.05). In addition, the maximal oxygen uptake (V02max) of karatists was significantly higher whereas their body mass index (BMI) was significantly lower than ancient (Zourkhaneh) athletes and non-athlete individuals (P<0.05). Generally, performing karate special trainings caused Karatists to obtain beneficial antioxidant system, V02max, and body composition, but it seems that the ancient (Zourkhaneh) athletes need to modify some of their training patterns for higher achievement.

EXERCISE HABITS IMPROVE PHYSICAL, COGNITIVE AND PSYCHOLOGICAL FUNCTIONS IN THE ELDERLY AT HOME

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Purpose.
We surveyed the influence of exercise habits on physical, cognitive and psychological functions in elderly inhabitants in the community, and evaluated their association.

Material and Methods.
The subjects were 181 elderly residents, aged 65 years or older, in a rural area. The subjects who answered that they regularly performed exercise for more than 30 min per week were defined as having an exercise habit, and those who answered that they did not regularly perform exercise once a week were viewed as having no exercise habit. As measurements of physical functions, we evaluated the grip, lower limb muscle strength, flexibility of the body and walking ability. As measurements of cognitive functions, we evaluated intellectual function and attentional function. As measurements of psychological functions, we evaluated subjective well-being and the degree of satisfaction with life. Statistical analysis of group measurements with and without an exercise habit was performed by analysis of covariance with adjustment for age.

Results.
Exercise habit: Eighty-one subjects performed regular exercise, and 100 did not. There was no significant difference in the male-female ratio between the 2 groups, but the difference in age was significant (p<0.01). The age of subjects in the group with was significantly lower in that without an exercise habit. With regard to physical function, 6 parameters, such as the grip strength (p<0.01), strength of the lower limb muscles (p<0.01), and walking ability (p<0.01), were significantly higher in the group with than without an exercise habit. There were significant differences in ANS (p<0.01) and TMT (p<0.01) of cognitive function between the groups with and without an exercise habit, and these parameters were higher in the former than the latter. With regard to psychological function, the subjective sense of well-being (p<0.01) and degree of daily-life satisfaction (p<0.01) were significantly higher in the group with than without an exercise habit, but there were no significant differences in the feeling of having a worthwhile life and degree of satisfaction in human relationships between the 2 groups.

Conclusion.
These results suggest an association between regular exercise and health promotion in the elderly. In particular, regular exercise may improve physical functions such as lower limb muscle strength and walking ability and inhibit an age-associated decrease in attentive function, which is useful for the prevention of falling. Regular exercise, which may also have inhibitory effects on the development of dementia and increase the mental health state, is expected to be an effective measure for care prevention.
MARKERS OF INSULIN RESISTANCE, FATNESS AND FITNESS IN GREEK PRIMARY SCHOOLCHILDREN

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Introduction.
Childhood obesity has been correlated to markers of insulin resistance later in life (Srinivasan et al. 2002). Obesity in children is also strongly associated to low cardiorespiratory fitness (Tokmakidis et al. 2006). Research evidence from cross-sectional studies indicates that markers of insulin resistance are negatively associated with high cardiorespiratory fitness in children and adolescents (Guitin et al. 2004, Ruiz et al. 2006). However, the relationship between insulin resistance and cardiorespiratory fitness appears to be largely mediated by body fatness (Ball et al. 2004). Studies examining the interaction of markers of insulin resistance and fatness and fitness in Greek schoolchildren are scarce. Thus, the aim of the present study was to investigate the independent associations among markers of insulin resistance, fatness and cardiorespiratory fitness in Greek children.

Methods:
This was a cross-sectional study of 65 children (31 males, 34 females) aged 11.4±0.4 years, from ten randomly selected primary schools in North Attica, Greece. Weight, height and waist circumference were measured. Body fat was expressed as the sum of three skinfold thicknesses (i.e., triceps, subscapular and medial calf, average of two measurements). Cardiorespiratory fitness was estimated by the 20m. shuttle run test. The studied markers of insulin resistance were fasting insulin and homeostasis model assessment (HOMA).

Results:
Bivariate correlation analyses revealed that HOMA and fasting insulin were positively associated with body fat (r=0.489 and r=0.481, respectively, p<0.005) and negatively associated with cardiorespiratory fitness (r=0.380 and r=0.362, respectively, p<0.005). In multivariate regression analyses, after adjustment for age and gender, cardiorespiratory fitness explained a significant proportion of the variance in HOMA (Beta=-0.38, SE=0.03, p<0.002) and fasting insulin variance (Beta=-0.36, SE=0.09, p<0.004); however, after additional adjustment for fatness the coefficient for cardiorespiratory fitness decreased considerably and was no more significant (p>0.05). In contrast, body fat remained independently associated with HOMA (Beta=0.335, SE=0.01, p<0.019) and fastin insulin (Beta=0.331, SE=0.03, p<0.021).

Discussion/Conclusion.
The present data indicate that in Greek children the mechanisms linking insulin resistance and low cardiorespiratory fitness are largely affected by obesity, suggesting that the metabolic consequences of excessive body fat are detectable early in life. Intervention strategies aiming at the prevention of excessive weight gain and the improvement of cardiorespiratory fitness in childhood might contribute to the prevention of the insulin resistance syndrome and its consequences later in life.

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CHARACTERISTICS OF PHYSICAL PREPAREDNESS OF MILITARY PERSONNEL

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Introduction
Physical activities are essential from providing and keeping physical preparedness and endurance. Physical working capacity is the basement of profit service and carrier of military personnel. Military personnel individually take compulsory standard physical tests. Material and methods
The target of research was giving characteristic of physical preparedness of military personnel. 120 persons were included into the examined group. The group is divided into two sub-groups: cadets (n=60) and military personnel (n=60). We analyzed harmful habits, anthropometric data, physical tests results in each group.

Results
The questionnaire data revealed that 51 person from 120 were smokers, from them 30 were cadets and 21 other military personnel. Annual physical test results were interconnected to nicotine consumption. Push-up test results in smokers group decreased over 15.4 %. Sit-up test results in non-smokers group were over 23 % higher than in smokers group. General endurance test (country cross race) was over 12 % lower in the smokers group. Analysis of anthropometric data shown that about 30 %of persons in cadets group have a body mass index above standard level: about 65 % of the military personnel group had body mass index above standard level. We have revealed correlation between body mass index and general physical endurance (cross country race), r=-0.40, p<0.006. There were 70% of persons of the examined group demonstrated a height-weight index over standard level. The pull-up physical tests results showed a negative correlation to data of the height-weight index, r=-0.40, p<0.006. Significant correlations between push-up test results and height-weight index, r=-0.27, p<0.06, cross country race and body mass index r=-0.30, p=0.043 were found. Also smoking has negative impact over physical preparedness and physical endurance. The physical tests results decreased over 13 - 22% in different tests. Smokers have worse results in pull-up test (p=0.022), in push up test (p=0.161) and in cross country race (p=0.096). There were tendencies to increasing body mass index and height-weight index over standard level for 30 % of cadets and 65 % of military personnel.

PHYSICAL PERFORMANCE AND BODY MASS INDEX IN TURKISH CYRIOT ELEMENTARY SCHOOL CHILDREN

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Physical fitness and overweight are both important health-related and skill-related parameters. Reference data from a population is important for comparisons of children with impairments, different diseases, in habilitation or rehabilitation after injuries or for talent identification. 560 children in an Elementary School in Turkish Republic of Northern Cyprus were invited and 414 subjects participated. Testing procedures were similar to the Eurofit tests, but with some modifications. The survey aimed to obtain reference data on physical performance in Turkish Cypriot children aged 9, 10 and 11. In addition, height and body mass were assessed and body mass index (BMI)
was calculated. Results show that performance increases with age both for males and females, BMI increased with age with only small differences between genders. Large variations were found within age and gender groups. The present study has provided reference data on physical performance and body size of Turkish Cypriot children.

DETERMINATION OF FACTORS THAT MOTIVATE OUTDOOR & RECREATIONAL SPORTS CONSUMER

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Introduction: In the last decade, outdoor and recreational activities, including white-water rafting, gained more attention in the sport market. One of the important issues in outdoor and recreational sports was clarification of possible factors affecting consumers to participate in outdoor and recreational sports. However, little research has been done on different aspects of outdoor and recreational sports participants in Turkey.

Purpose: Considering the importance of the improvement in sport participation, particularly in outdoor and recreational sports, this study was aimed to determine motivational factors for consumers, who involved in daily rafting trip.

Method: For the purpose of study the “motivations of the sport consumer” survey, which was originally developed by McDonald and Milne (1999), was adapted to Turkish population. The novel survey instrument included 43 items representing 13 motivation factors. It was modified in an attempt to define and portray the Turkish whitewater rafting consumers by analyzing the thirteen constructs. After application of required valid and reliable translation procedures, the survey instrument was applied to 517 (296 male, 221 female) white-water rafting trip participants during their daily rafting trip.

Results: An exploratory factor analysis was performed to determine the dimensional structure of the items and to assess the adequacy of motivational factors of rafting consumers. Maximum likelihood factor analysis was used to extract possible factors, and also oblique rotation was used to identify stable factor loadings for each item. Results of exploratory factor analysis indicated that nine dimensions (self actualization and self esteem, aggression, physical fitness, social facilitation, achievement and competition, stress release, affiliation and aesthetics, risk taking, value development) existed in 43-item and explained 56.7% of the common variance among items. Second factor analysis was performed to define the 4 sub-factors. Results demonstrated that first factor, which was “Mental well being needs”, defined 26.13 % of the common variance. The second factor under the label of “Sport based needs” defined 6.57 % of the common variance. The third factor, which included “physical fitness” construct, defined the 6.52% of the common variance and labeled as “Fitness needs”. Finally the fourth factor which was labeled as “Social well being needs” defined 5.12% of the common variance and contained the “social facilitation and affiliation” constructs.

Conclusion: The factor analysis results identified nine dimensions while the original study had 13. Additionally, the results of the second factor analysis were remarkably consistent with those observed the original form which included 4 sub factors.

References.

DROPOUT MOTIVES IN EXERCISE

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Introduction
One of the main actual concerns in Public Health is the adherence to healthy behavior exercise. Improving compliance to exercise is know as decreasing death and disability and as having many benefits in health an in fitness condition (Balady et al., 2006). The propose of this study was to identify the dropout motives in exercise and compare those motives in the variables: gender, age, marital status, professional situation, economic condition and family dimension (number of sons). Perhaps, this can allowed create strategies to light those motives, preventing the dropout and increasing exercise adherence.

Methodology
The sample was 94 subjects (46 male and 48 females) that had dropout of exercise in Lisbon’ Gyms. They answers to an interview that was developed based on the variables that we want to study. This had one specific open answer question about the dropout motives of exercise. Motives answered in the interview were grouped (5 groups) based in the literature (Fernandes, Lázaro & Vasconcelos-Raposo, 2005; Silva & Silva, 2003; Weinberg & Gould, 2001). To compare the variables of this study Chi-square test were used.

Discussion
Analysis reveals that the most frequent dropout motive was “No time to practice because of many causes”, like other studies (Fernandes, Lázaro & Vasconcelos-Raposo, 2005; Silva & Silva, 2003, Weinberg & Gould, 2001). Motives “Don’t like the instructor”, “Training schedule are not compatible with schedule work”, “No time to practice because of work”, “Don’t have economic conditions”, “There are not specific activities” and “Because of an injury” have also had one of the biggest frequencies, also like other studies Silva & Silva, 2003, Weinberg & Gould, 2001).

There were significant differences in the dropout motives between subjects of different economic conditions. Concerning the other independent variables gender, age, marital status, professional situation and family dimension (number of sons) there were not significant differences in the dropout motives.

Gyms must develop strategies to avoid dropout, for example have a large and flexible training schedule, know the activities that clients want to training and try to have those, and have quality instructors.

References.
RELATIONSHIP BETWEEN PHYSICAL FITNESS WITH ANXIETY AND DEPRESSION OF MALE STUDENTS IN THE GUIDANCE SCHOOLS

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Adolescence in Reason to Mutative Specific Problems and Family, Study and Social Problems have been more Exposed to Nervous Pressure Such as Anxiety and Depression. Psychological and educational researchers always like to discover new ways for Prevent and Reduce Psychological Disorders among Students.

The Purpose of this study was survey Relationship between Physical Fitness with Anxiety and Depression of Male Students in the Guidance schools.

Statistical Population Includes Students in the Guidance schools and 350 of them were participated in this Research. The Research method was based on correlation. Data Analysis Includes descriptive statistical and Pearson Coefficients Correlation. The Value of (P<0.01) was Considered as Significant.

The Results of Descriptive Statistics showed that:
1. Students had been Similar Physical Fitness and their Situation was Sub norm of Province. Thus, they hadn't Favorite Situation.
2. at Anxiety, Average Score showed that there were Rates of Anxiety and they hadn't Favorite Situation.
3. at Depression Factor, Average Score showed that there was a Little Depression in them.

Hypothesis tests Results showed that:
1. There were Significant Relationship between Physical Fitness with Anxiety and Depression in the Male Students at Guidance Schools.
2. There were Significant Relationship between Anxiety and Depression in Male Students at Guidance Schools.

EFFECTS OF TWO DIFFERENT EXERCISE PROGRAMS ON LIPID AND LIPOPROTEIN PROFILES IN OLDER WOMEN

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It is generally accepted that cardiovascular diseases (CVD) are one of the major causes of death in industrial countries. Therefore, CVD prevention is of high concern in industrialized societies. Physical activity is widely recognized as a means for the primary prevention of CVD as well as in patients' treatment and rehabilitation. However, the accurate type and amount of exercise necessary to induce positive alterations on lipid and lipoprotein profile, as important CVD risk factors, is still a matter of debate. The purpose of this study was to compare the possible effectiveness of two physical training programs on plasma lipid and lipoprotein profile in older women.

Ninety-seven sedentary, healthy 60 to 79 years old women were randomly assigned into multicomponent training - MT (n= 49) or resistance training - RT (n= 48). The interval training program was two times per week, 45-min exercise per session, at moderate intensity during 8 months. Modified Baecke Questionnaire for Older Adults was used in order to control the activities of daily living and the 6-minutes-walk test to assess cardiovascular fitness. Plasma concentrations of total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), and triglycerides (TG) were determined after an overnight. LDL-cholesterol (LDL-C) and atherogenic coefficient were also calculated. All the aforementioned biochemical and functional variables were assessed before and after 8 months of training-based interventions.

No significant changes were observed in the amount of daily physical activity in both groups after training interventions. Both MT and RT induced significant improvements on 6-min-walk test. However, only after multicomponent training, TG, TC/HDL-C and LDL-C/HDL-C decreased significantly (3.76 ± 5.31 mg/dl, p<0.05) and no significant changes were observed in any plasma lipid and lipoprotein variables after RT.

Therefore, the main findings of the present study suggest that 8 months of MT may be more effective than RT in the induction of favorable changes in plasma lipoprotein and lipid profiles.

RELATIONSHIP BETWEEN PHYSICAL FITNESS, BODY FAT MASS AND CORONARY RISK FACTORS IN MILITARY BRAZILIAN MALES

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Coronary heart disease (CHD) is the primary cause of premature mortality in most modern societies. Brazil, like as the developed countries, has experienced this situation over the last years. Risk factors for CHD are influenced by physical activity and body fat mass in the general population. PURPOSE: To assess the influence of cardiorespiratory fitness (CRF) and percentage of body fat in coronary risk factors for active duty 35+ years of age Brazilian army males. METHODS: The sample analyzed consisted of 78 military men. Blood lipid profile, glycerina, lepton, adiponectin and insulin were measured after 12 hours fasting. CRF was assessed by VO2max measured by ergospirometry using the treadmill ramp test. Percentage of body fat mass (%FM) was obtained using hydrostatic weight. RESULTS: Average age was 40.0 ± 3.1 years, weight was 83.2 ± 15.6 kg, height was 176.1 ± 6.6 cm, %FM was 20.1 ± 6.0 % body mass index was 26.7 ± 4.2 kg.m-2 and CRT was 40.6 ± 9.5. CRF showed a significant and inverse correlation between serum fasting insulin concentrations (-0.580, p<0.01), lepton (-0.538, p<0.01), total cholesterol (-0.494, p<0.01), HDL-C (-0.563, p<0.01) and significant positive correlation between HDL (0.381, p<0.01). %FM showed significant positive correlation with serum fasting insulin (0.491, p<0.01), total cholesterol (0.264, p<0.05), LDL (0.293, p<0.05), triglyceride (0.268, p<0.05) and HOA-beta (0.466, p<0.001) and inverse correlation with HDL (-0.247, p<0.05). The present study also demonstrated an inverse association of CRF with %BF (0.646, p<0.01) CONCLUSION: CRF and %FM showed relationship with several coronary risk factors. Data suggest that CRF was significantly protector for coronary events even in this sample of active males. Otherwise, fat mass loss is indicated to promote protection of those events.

CARDIOPULMONARY FITNESS OF CHILDREN WITH DEVELOPMENTAL COORDINATION DISORDER IN TAIWAN

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Background: The importance of physical fitness to general health and well-being is well documented. In particular, physical fitness of children in the world are increasingly concerned. Examination of children with developmental coordination disorder (DCD) has recently
However, the level of physical fitness in this group has not been examined in any depth. Purpose: The purpose of this study was to examine cardiorespiratory fitness of 9 to 11 year-old children with DCD in Taiwan, and also to compare with their age-matched peers. Methods: The Movement Assessment Battery for Children (MABC) test was used to identify whether children have the problems in movement coordination. 250 children aged from 9 to 11 years were recruited in this study. The cardiopulmonary tests included using the KoKo spirometry for the pulmonary functional test, 800-m run test, and the Bruce treadmill protocol. Spirometry was used to compare pulmonary function between children with DCD and non-CD. In addition, 41 children (20 children with DCD and 21 children without DCD) took part in the Bruce treadmill protocol to measure maximum oxygen consumption. Results: There were significant differences on the pulmonary function and cardiopulmonary fitness between children with DCD and non-CD. The results showed that pulmonary functions were significantly lower in children with DCD. A significantly high correlation was found between the ability of movement coordination (MABC test) and pulmonary functions. However, the correlation between pulmonary function and maximum oxygen consumption was low and there was not a significant difference. Conclusion: Pulmonary function and cardiopulmonary fitness in children with DCD were significantly lower than that of children with non-CD. However, due to the small sample size in this study, the results may not directly apply to the whole DCD population. Further studies may need to increase the sample size to examine the topic in greater depth.

**Efficacy of Physical Activity Prescription for Active Subjects Who Exercise in a Public Park**

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Introduction - Public parks are commonly used by people who want to exercise for health. However, in these facilities, physical activity is usually performed without orientation and, might be performed in a wrong way. Taking into consideration the benefits that might be provided by adequate physical activity, this study analyzed the efficacy of an individualized physical activity prescription on cardiovascular health and physical fitness of subjects who already exercise in a public park in Brazil.

Methodology - Participants were initially evaluated by: a) a questionnaire about the presence of cardiovascular symptoms, diseases and risk factors; b) measurements of weight, height, waist, hip, glycemia, cholesterol, blood pressure, and heart rate; and c) measurement of aerobic fitness (stationary march), and lower body strength (vertical jump). Participants received an aerobic prescription (walk/run, 3 to 5 times/week, 30 to 50 min at moderate intensity), which was individualized based on subject’s physical fitness and time availability. After 3 to 6 months, volunteers were reevaluated, and classified as the ones who followed (F) or did not follow (NF) the prescription.

Results - None of the parameters was altered in the NF group (10 subjects, 60 +/- 2 years, 3 men), except by diastolic blood pressure that tended to decrease. On the other hand, in the F group (26 subjects, 64+2 years, 5 men), diastolic blood pressure decreased (83 +/- 2 vs. 79 +/- 2 mmHg P<0.05), total cholesterol increased (193 +/- 4 vs. 210 +/- 4 mg/dl P<0.05) and aerobic fitness increased (104 +/- 4 vs. 112 +/- 4 steps, P<0.05). With a more detailed analysis, it was observed that diastolic blood pressure decreased only in the sub-group of subjects whose values were > 90 mmHg, total cholesterol increased in the subjects with values lower than 200 mg/dl and, aerobic fitness increased in the subjects who had high initial levels. Moreover, lower body strength, even not increasing in the group as a whole, also increased in the subjects with low initial levels.

Conclusion - Based on the results, it was possible to observe that individual prescription of walk/run to subjects who already exercise without orientation was effective to improve aerobic fitness and lower body strength in subjects with low initial values of these variables, probably due to an ineffective previous training program.

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**The Relations Between Gender, Age, BMI and Physically Active and Passive Cultural Attendance**

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Social cultural activities may be effective as fitness activities by lowering the risk of death. When studying cultural attendance among adolescents, it can be illuminating to study current research on adolescent’s participation in cultural activities is limited (Biddle et al. 2004; Glass et al. 1999). Aim of the study: The aim of the study was to investigate adolescents in physically active versus passive cultural attendance, the associations between physically active and passive cultural participation and furthermore the distribution of gender, age and BMI.

Method: Students from two municipalities and four high schools in the county of North-Troendelag, aged 13-18 year (n=71) completed a self-administered questionnaire concerning sport, physical activity and passive cultural attendance. Analyses of variance (One-way ANOVA) and Multiple linear regression assessed differences of means and values of correlation. Result: Five passive cultural activities ranked highest among adolescents including TV watching, using cell phone, listening to music, doing homework and using PC. Active cultural activities ranked sixth on the list. Mean values of the active cultural activities and the passive cultural activities associated significantly with age. Junior high school students ranked the active cultural activities highest. Senior high school students gave priority to the passive cultural activities. Students with low BMI seemed to prefer the active cultural activities. Students with high BMI preferred the passive cultural activities. The study revealed no significant association between gender and the active or the passive cultural activities. Conclusion: There was no clear opposite character between passive and active cultural attendance. Physically active high school students also attended more passive cultural activities illustrating that adolescents participate in a broad speckter of activities.

References


WHY PHYSICAL ACTIVITY IS NOT THE PRIORITY BEHAVIOUR IN THE LEISURE TIME OF HUNGARIAN YOUTH?

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Inactivity became part of our modern age with a huge development in informatics and computer technology and that process developed the “homo sedens” human type. Physically passive, inactive and sedentary lifestyle correlates with the increase of the weight and the body composition. The link between the prevalence of obesity and the change in lifestyle is considered to be evident (Biddle et al., et al., 2003; Bicsérdy, 2002; Aszmann, 2000).

In this study the connection between sedentary behaviours and regular physical activity is analysed in the lifestyle context of young Hungarian people. The structure of youngsters’ leisure-time schedule is examined, in order to reveal, what is essential for the latter active lifestyle. Students free time physical activity, organized sport activity, and sedentary behaviours, like TV, video watching, using internet, playing computer games, listening to music, telephoning and reading are investigated.

Participants (N=301) were randomly selected of 13-18 year old Hungarian primary school and secondary school male (n=121, 40.2%) and female (n=180, 59.8%) students. Eastern Hungarian and Western Hungarian settlements’ and Budapest’s educational institutions were randomly and equally included in the sample.

An ecological momentary assessment, a self-report free-time diary was used for data collection (EMA; Stone & Shivman, 2002; Marshall and et al., 2003) It comprised two parts, one with participant-level variables, family-level variables and environmental-level variables. The other part of the diary included questions of the behaviour, the location and the company of students. Data was collected in 15-minute time intervals before and after school on three weekdays and one weekend day.

According to the survey of the Hungarian National Statistical Office (2003) the dominant behaviour is TV/video viewing, furthermore either listening to music and reading or socialising behaviours respectively occupy the same volume of the daily schedule as physical activity and sports altogether.

Our results show similar figures with the dominance of TV/video viewing, and other sedentary behaviours, as sitting and talking, cognitive hobbies, motorised transport, as well as computer use and phoning. These key sedentary behaviours occupy weekdays 219.2 and weekend 346.2 minutes of free time, in contrast with sports, behavioural hobbies, unstructured play, and active transport walking cycling, which take weekdays 51.4 and weekend 71.7 minutes altogether.

The Hungarian society’s contemporary surveys of physical activity show that the inactivity increased significantly among the Hungarian young people (Aszmann, 2000; Mészáros and et al., 2002; Táárf, 2004). Hoffmann (2000) also confirmed that the sport “consumption” is not a natural part of the families’ need, which also explains, why physical activity is not a priority these days in the lifestyle of the Hungarian youth. However, further investigation is suggested by analysing the daily.

BLOOD PRESSURE REDUCTION IN MEDICATED HYPERTENSE AFTER PHYSICAL TRAINING PROGRAM DEVELOPED IN ESPAÇO BEM-ESTAR OF CENPES/PETROBAS

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Petrobras is a big company from Brazil who works with oil, gas and several new sources of energy. Security, environment and health care are constant concerns from Petrobras Company and because of that new programs were created to develop these areas. Espaço Bem-Estar (EBE) located in CENPES Unit (Rio de Janeiro) promotes health care through regular physical fitness programs in workers with some physical conditioning disabilities, like hypertension. The physical activity is indicated in hypertensive treatment and cardiovascular disease (CHOBANIAN et al., 2003; PESCATELLO, 2005). The aim of this study was to verify the blood pressure (BP) behavior after four months training on hypertensive individual medicated. Forty sedentary or untrained individuals at least one year, divided in two groups: training group (TG) (96.7±8.3 kg; 25.2±5.3% BF; 0.96±0.05 RC/Q; 31.4±4.5 ml.kg.m-1; 32±3.7 kg.m-2) and control group (CG) (97.1±8.6 kg; 26.2±5.8% BF; 0.98±0.08 RC/Q; 33.3±6.8 ml kg.m-1; 32.3±5.3 kg.m-2). All subjects did physical evaluation and the TG did three sessions together realized on Espaço Bem-Estar (EBE) in CENPES/Petrobras. The BP was measured in rest by auscultatory method pre and post-training and the days was treated by ANOVA two-way with Scheffe post hoc when necessary (p<0.05) to comparison intra and intergroups. The results showed that TG had a BP reduction of 9% in systolic BP (SBP) (P<0.05), 2.2% in diastolic BP (DBP) (p>0.05) in intra-group analyses. In comparison between CG and TG, there was significant difference in SBP in post-training, but not in DBP. We conclude that EBE program realized in CENPES/Petrobras during four months promoted reductions in BP after a training program in hypertensive medicated individuals. Our results are in agreement with previous meta-analysis (WHELTON et al., 2002) studies.


COMPARATIVE ANALYSIS BETWEEN TRAINING PROGRAMS (STRENGTH TRAINING VERSUS HIDROGYMNASTIC) IN INCREMNTING THE PHYSICAL FITNESS IN MIDDLE-AGE INDIVIDUAL OF BOTH GENERS

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Nowadays, there is an increase of people practising Physical Activity (PA). Its practise provides increase of Physical Fitness (PF) in the quality of life. In this scope we carried out a study that aimed to the improvement of the PF, after the application of training programs, during a period of 10 weeks. The main objectives of this study were the following ones: 1) to improve the parameters of PF; 2) to inquire about specificity in the applied programs; 3) to get multiple effects with the application of Hidrogymnastic (Hg) programs. The sample was 24 people of both genders, with an average age of 44 (12 of strength training and 12 of Hg group). The load sessions varied from 3 days of activity with 60’ duration. The evaluation of the physical fitness was in two moments. For each one of the studied components a test was used, thus: to evaluate the endurance an ergonomic bicycle was used for 10’, in flexibility the Sit & Reach; in the explosive
strength of power of upper and lower limbs the horizontal jump and medicinal ball throws tests, for the dynamic force the Leg-Press for the lower limbs and the Bench-Press for the upper limbs; for the muscular endurance the Partial up’s test and the IMC was estimated.

The analysis of the results showed the clear superiority of the ST group. However, in the Hg group were verified the gains between the two evaluation moments. There were significant gains in the two groups in the endurance test, 23.2% in the group of ST and 10.6% in the Hg group, being the latter, which presented greater gains, as expected, since this activity aims at the development of the cardiorespiratory capacity. With respect to the strength tests; it was also the Hg group that evidenced more gains, concretely in the Leg-Press where it was observed a 16.1, in the Bench-Press 8.9 and the resistant strength a 14.3% increase. The ST group only evidenced gains in the Bench-Press, with 8.9%. These higher gains can in part be justified by the imposition made in the program of Hg, in carrying out exercises with the intention of developing the strength and using appropriate equipment. We can thus conclude that the applied programs improve the PF in the majority of the tests. In what respects the specificity of the programs we can conclude, that although ST are more oriented towards the strength and the sessions of Hg towards the development of the endurance, it was the latter that evidenced more substantial gains in both capacities after training period. Such fact could be explained because this group started from very lower levels of performance. It was also possible to observe, that program of Hg trainings, using aquatic material of additional resistance with intention of developing in parallel, it was possible to get multiple effects, since after the weeks of trainings were observed improvements at the level of the resistance and the strength. This confirms that it is possible the development of these two capacities simultaneously, at least in the group that started from a relatively lower performance.

**STUDY-PROTOCOL FOR THE PILOT STUDY: PREVENTION IN THE SAND FOR PEOPLE 50+**

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Due to the demographic change, which will extend people's working lives, it is necessary to lay the physical and psychological foundations. Various physiological changes during the aging process occur, which can lead to functional deficits and illness. One sided working loads and stress increase the risk of working related illnesses. The peoples motivation for behaviour modification and health prevention in leisure time is unclear.

On the basis of the BASE concept, which was designed as an university project for workplace health promotion (Wollesen et al, 2007), a new intervention program is going to be trialled on a sandy surface with the aim of preventing working related illnesses. This health promotion program integrates (1) cardiovascular training, (2) body awareness, (3) agility, (4) strength (5) social and (6) relaxation elements aiming to evaluate its efficiency under the special circumstances in the medium sand.

Methods: From April until the end of June 2008 a pilot study of the health promotion program will be undertaken. 40 participants of the age group 50+ (20 treatment, 20 control group) will be supervised during the period of 12 weeks/90min per week. Using a pre-post-design, the following tests will be undertaken: (1) Questionnaires to collect basic data and sports biography, work-related stress, physical and psychological well-being (SF 12), (2) data collection of the heart rate variability, rest, systolic blood pressure (sBP), diastolic blood pressure (dBPI and heart rate (HR) at rest using a TASK FORCE® (CNS-Systems, NEDIS). Muscle strength and flexibility of the back and trunk muscles will be tested with the CTT Pegasus® (measure and movement simulation system). The outcomes of the intervention group vs the control group will be presented and discussed.

After another 12 weeks a sustainability test will support the long-term outcome.

Expected findings: Utilising the health promotion program on the sandy surface positive effects are expected in regards to the cardiovascular system, strength of the back and trunk muscles, flexibility and physiological and psychological wellbeing.

The advantages of the sand as a focus for the prevention program is inadequately examined. The first research revealed merely publications of beach volleyball studies. The examination by Stick & Mende (2002) shows that walking in the sand provokes a proven higher cardiovascular load than walking on asphalt, whereas walking in the sand subjectively felt less demanding. The stimulative nature of the medium sand should advance the motivation of the subjects of this study to participate in the prevention programs. Participants individual deficits can be positive effected by this program.

References.


CHANGES IN THE BODY COMPOSITION IN OVERWEIGHT AND OBESE PEOPLE FOLLOWING EXERCISE TRAINING PROGRAM AND RESTRICTED DIET

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The overweight is widely spread in developed countries. Obesity has reached epidemic proportions in the United States and EU. More than 60 percent of U.S. adults for example are overweight or obese (1). In Europe between 40 and 50% of males are overweight and between 10 and 20% are obese. In females these percentages are respectively 10-20 and 25-35 (2). Most of the people with a Body Mass Index over 25 are under health risk of many diseases and health conditions, including hypertension, dyslipidemia, type 2 diabetes, coronary heart disease, stroke, gallbladder disease, osteoarthritis, sleep apnea, some cancers etc. (3). The aim of this study was to evaluate the changes of some parameters of body composition in a group of 33 subjects (28.9±5.8 ys old) with overweight (BMI between 25 and 30) following a special training program and restrictive diet for a period of 8 weeks. The body mass (BM), body fats (BF), body water (BW), visceral fats (VF), and 10 skin folds were measured at the beginning of the study and at the end of each week until the end of the investigation. All the data were processed statistically by using paired t-test and were presented as mean±SD. During the study, the subjects practiced moderate training - 4 days a week, 2 hours each session. The restrictive diet was elaborated individually in accordance with the individual BW and basal metabolic rate. It was found out a 6.8% BM reduction during the eight-week period (p<0.01). The stepwise reduction of this parameter was significant in each measurement: from 84.50±20.58 kg starting BM to 80.21±19.30 kg at the end of the first week, to 79.06±16.10 kg - at the end of the eight week. BF were reduced 13.6% (p<0.001) at the end of the experiment, and the BW increased 3.6% (p<0.001). The VF which were also reduced significantly. The subcutaneous skin fold decreased 51.5% (from 27.28±11.50 to 18.00±8.10 mm at the end of the study, p<0.001) and the abdominal skin fold - 41.3% (from 30.91±12.32 to 21.86±7.26 mm, p<0.001). As a result of these changes we can conclude that the overweight people require individual managing using appropriate training program and restricted diet. This gives positive results on the body composition parameters even at the first week of dietary manipulation and applying adequate training program.

References.

ENERGY COST AND ENERGY SOURCES DURING SIMULATED FIRE-FIGHTING ACTIVITY

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Introduction
Fire-fighting is considered as an at risk job (Bos et al., 2004) implying variable working conditions and unpredictable and heavy physical demands (i.e., rescues, structural collapses, car accidents, water accidents, fire accidents, etc.). Although the protective clothing defends fire-fighters from injuries, it imposes a 23-kg extra weight (11-23 kg) and decreases the rate of heat exchange (McLellan and Selkirk, 2004). Since in the literature (Smith et al., 2001, 2005) only the high cardiac load during simulated fire-fighting tasks has been reported, this study aimed at evaluating the energy cost and energy sources of a simulated fire-fighting task.

Methods
Twenty Italian fire-fighters (age: 32±6 yrs; BW: 24.7±2.1, VO2max: 46.5±7.7 ml.kg.min-1) performed a simulated fire-fighting task (i.e., climb a firemen’s ladder and descend a 3-floor building rescuing a 20 kg child dummy, RD; run for 250 meters, R1; complete a maze in a dark chamber, DC; run for 250 meters, R2) during which their heart rate (HR; Polar, Kempele, Finland) and respiratory gases (K4, Cosmed, Italy) were continuously recorded. Blood lactate accumulation (La, Accumet, Roche, Switzerland) was evaluated at rest and at 3, 6, 9 minutes after completing the task. The overall energy requirement (VO2eq) of the task was obtained by adding the amount of VO2 during exercise above resting (VO2ex) and to the energy equivalent (1mM=3 ml.kg-1) of peak La (VO2La).

Results
During the 12.1±2.15min,s (RD: 1.22±0.25 min,s; RI: 1.33±0.25 min,s; DC: 7.3±0.31 min,s; R2: 1.32±0.24 min,s) simulated task HR increased (RD: 145±21 b.min-1, R1: 166±9 b.min-1, DC: 165±10 b.min-1, R2: 170±14 b.min-1), with the highest frequency of occurrence (80%) of peak values (184±9 beat.min-1) registered during R2. Peak La values (9.2±2.9 mM) were observed between 3 (57%) and 6 minutes of the resting period (33%). A VO2eq of 467.3±270.0 ml.min-1kg-1 VO2ex: 412.1±272.4 ml.min-1kg-1, 94±3% of total, VO2La 19.5±18.8 ml.min-1 kg-1, 6±3% of total was measured.

Conclusions
According to the literature (Smith et al., 2001, 2005), the fire-fighting task imposed a high cardiac load on fire-fighters. The high energy cost measured during the simulated fire-fighting intervention indicates that fire-fighters need an adequate fitness level to meet the requirements of their work, which especially taxes the aerobic source. Despite an appropriate fitness level is recommended (Gledhill and Jamnik, 1992), at present Italian fire-fighters do not undergo any specific training. Finally, it is imperative that fire-fighters periodically undertake fitness screenings to prevent injuries (Ide, 1998).

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**BENEFICIAL IMPACT OF PUBLIC SHORT-TERM AEROBIC INTERVAL TRAINING ON MAXIMAL EXERCISE IN SEDENTARY ELDERLY SUBJECTS**

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Aging is known to be associated with a decrease in peak oxygen consumption (VO2peak) and maximal tolerated power (MTP). Regular physical exercise is most appropriate for improving aerobic capacity, but its effect in older people is still debated. The aim of this study is to determine whether a short interval training session is associated with improvements in exercise efficiency in elderly of both genders. 19 women and 16 men (65.4 ± 4.9 years) performed an incremental exercise test before and after a 9-week period of aerobic interval training (biweekly, 30 min session where 6 x 4-min at the first ventilatory threshold alternated with 1-min at the second ventilatory threshold) on a cycle ergometer. Minute ventilation (MV), O2 uptake (VO2) and CO2 output (VCO2) were breath-by-breath measured by an open-circuit metabolic cart. Before training, maximal values of MV IMWV, VO2peak, heart rate (HR), systolic blood pressure, MTP, blood lactate at MTP recovery and power at the first (pVT1) and second ventilatory thresholds (pVT2) were higher in men compared to women. Nine weeks of interval training induced a significant increase in MVV, VO2peak, MTP, pVT1 and pVT2 and decrease in systolic blood pressure in men as in women, without any significant effect on VO2peak HR values. These findings suggest that the age-related declines in aerobic capacity are attenuated by a short exercise interval training sessions in both elderly females and males.

**RETROSPECTIVE ANALYSIS OF PHYSICAL ACTIVITY PATTERNS IN PREGNANT WOMEN: EXPLORATORY STUDY**

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The benefits of physical activity during a regular and healthy pregnancy are well documented and there are general guidelines for exercise prescription based on scientific research. Exercise prescription is adapted to the different phases of pregnancy. Few specific activities have been promoted by the Fitness industry. However there is a lack of information on the specific guidelines of a large group of recreational activities such as aerobics-step and strength training, which might be adapted to healthy pregnant women. Particularly, little technical documentation exists related to the real strategies of adaptation of the same activities. In practice we have been observed that the pregnancy period is a reason for the abandonment of the physical activity, including the quotidian activity. In order to better develop safe and effective exercise programs it is necessary to understand the physical activity patterns of pregnant women; the motivations for exercise during pregnancy; the reasons for the abandonment; the expectations concerning the benefits of exercise; and the characteristics of exercise. The aims of the present exploratory study was to analyse the physical activity pattern, the motivations for practising and reasons for abandonment of 150 physically active women of 30-40 years that have been pregnant before. A retrospective study was conducted in Castelo Branco region, Portugal, using an exploratory questionnaire. Subjects were pregnant 1x (61%), 2x (25%), 3x (11%), and 4x (3%), at the age of 22-26 years (46%). 44% of the subjects were physically active before getting pregnant. Concerning the participation in physical activities during pregnancy, 29% of the subjects reported a professional orientation and 62% of the subjects exercised without orientation. During pregnancy the practice of the following activities was reported: treadmill walking (18%), cycling (17%), aerobics-step (17%), stretching (16%) - 1st trimester, stretching (25%), cycling (21%), aerobics-step (15%), and walking (19%) - 2nd trimester, "preparation for the childbirth” (47%), stretching (21%), walking (15%), and strength training (13%) - 3rd trimester, postpartum recovery exercise (25%), treadmill running (13%), strength training (13%), aerobics-step (11%), and cycling (9%) - postpartum. These activities were attended 2x (56%), 3x (40%) or more times per week (4%). 30% of the subjects reported the participation in physical activities during the 1st trimester, 31% during the 2nd trimester, 20% during the 3rd trimester and 19% during the postpartum. The subjects reported that the main benefits of oriented exercise are the reduction of stress and anxiety (28%) and to improve well-being (18%). 83% of the women that participated in the study abandoned exercise during the 1st trimester and the main reasons pointed were: they were not participants before getting pregnant, they were concerned about baby health, the risk pregnancy and the inexistence of accessible resources.

**A COMPARISON OF PHYSIOLOGICAL VARIABLES BETWEEN AEROBIC DANCE AND TREADMILL RUNNING**

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Background: Among women, aerobic dance is one of the most popular fitness activities in the world. However, there is surprisingly scant knowledge about the physiological responses to aerobic dance, and there seem to be disagreement between researchers about training intensity and the effect of aerobic capacity, energy consumption and role of lactic acid metabolism. The aim of the present study was to compare physiological variables between aerobic dance and treadmill running in female instructors.

Methods: 14 well trained female aerobic dance instructors, mean age 31 yrs (range 20-47) and BMI 21.0 (range 17.9-23.3) underwent treadmill exercise testing for determination of maximal oxygen uptake (VO2max), maximal heart rate (HRmax) and establishment of the relationship between oxygen uptake (VO2), heart rate (HR) and blood lactate concentration (L-lactate) at different sub maximal workloads. Additionally, all participants underwent a modified lactate profile in aerobic dance corresponding to the procedure from the treadmill with and without arm work. In the end, each subject tried to reach VO2max in aerobic dance, exercising at 100% of HRmax.

Results: There was no significant difference in VO2, HR and L-lactate between aerobic dance and treadmill running at 65-95% of HRmax. There was a linear relationship between HR and VO2 from low to maximal work loads in aerobic dance, identical with running. VO2max was significantly lower (p<0.03) in aerobic dance (mean 51.1 ml kg-1 min-1) compared to treadmill running (mean 55.2 ml kg-1 min-1). Use of arm work below or above shoulder level in the aerobic dance routine did not affect the relationship between HR, VO2 and L-lactate at 65-95% of HRmax.

Conclusion: If the goal is to increase VO2max, aerobic dance seems to be as good as treadmill running for well trained advanced aerobics dance instructors. However, reaching VO2max in aerobic dance at the same level as in running seems difficult, and may result in a total lower working load during maximal interval training.

**HIGH-SENSITIVITY C-REACTIVE PROTEIN, BODY FAT AND PHYSICAL EXERCISE AMONG OLDER PEOPLE**

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Introduction
Most risk factors for cardiovascular disease, like high lipid levels, hypertension, diabetes or obesity have a pro-inflammatory action and high-sensitivity C-reactive protein (hs-CRP) has been associated with increasing risk of vascular disease.

The aim of this study is to analyse how specific physical exercise programs, an enhancing cardiovascular and a strength exercise programs, are able to promote chronic adaptations in hs-CRP and the effects in global cardiovascular risk, in an elderly population.

Methods
60 women (77.53±7.99 years old) and 44 men (75.43±6.64 years old) volunteered for the study. They were evaluated in the beginning, after the exercise programs and at follow up, with an interval of 16 weeks between evaluations. Participants were subdivided into three groups: control, aerobic exercise, and strength exercise. Blood samples were collected after a 12h fasting. Hs-CRP was determined by immunonephelometry. For statistical analysis the bivariate Pearson’s correlation coefficient and MANOVA for repeated measures were used.

Results
Significant differences were identified between the three evaluations, not only for the aerobic group [F(2, 17)=4.43, p=0.03], but also for the strength group [F(2, 15)=4.13, p=0.04]. The control group did not show any significant changes between the three evaluations. Regarding the interaction between the evaluation and sex, no significant values for the aerobic, strength or control groups were identified.

The Bonferroni test did not identify significant differences between evaluations. However, when the LSD test was used, it was possible to identify a decrease between first and third evaluations in aerobic and in the strength group.

A direct relationship between hs-CRP and body mass and with body mass index was found for the women’s group. Waist circumference, waist to hip ratio and waist to stature ratio did not correlate with hs-CRP. In the men’s group no correlations were obtained.

Discussion
In the present study, hs-CRP concentration was positively associated with body mass and body mass index in the women’s group, which did not occur in the men’s group. The higher adiposity levels attained by females (88% of central adiposity against 67% of the males) could partially explain this correlation.

The physical exercise programs seemed to have had a chronic anti-inflammatory effect that was common to both sexes. The hs-CRP values decreased in both exercise groups (aerobic and strength) which did not occurred in the control group.

Current results are in accordance with other studies (1, 2) since hs-CRP concentration decreases have also been found after exercise programs. However, the fact that differences have not been visible from the first to the second but only in the third evaluation, points to a delay of the exercise effect that calls for additional research.

References.

EFFECTS OF AEROBIC AND STRENGTH EXERCISE PROGRAMS IN THE FUNCTIONAL FITNESS OF ELDERLY PEOPLE

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Introduction
When analyzing the recommendations of physical activity for healthy community-dwelling older adults, or for those who are institutionalized, the primary objective consist in maintaining functionality and independecne, with the compression of morbidity or decrease risk of chronic disease as a secondary goals (1).

The aim of this study is to characterize and analyze the way how specific physical exercise programs (cardiovascular enhancing and strength) are capable of promoting chronic adaptations in functional fitness, in an elderly population.

Methods
70 women (77.53±7.99 years old) and 44 men (75.43±6.64 years old) volunteered for the study. They were evaluated in the beginning, after the exercise programs and at follow up, with an interval of 16 weeks between evaluations. Participants were subdivided into three groups: control, aerobic exercise, and strength exercise. The Senior Fitness Test battery (2) was used to evaluate upper and lower strength, upper and lower flexibility, aerobic endurance and, agility and dynamic balance. Bivariate Pearson’s correlation coefficient and MANOVA for repeated measures were used.

Results
A statistical significant increase of lower and upper body strength between 1st and 2nd evaluations for the aerobic and the strength group was found. In the aerobic group, only men increased lower flexibility in the 2nd evaluation while in the strength group both women and men showed an improvement. The upper flexibility showed an increased from the 1st to the 3rd evaluation in the aerobic group and an increased from the 1st to the 2nd evaluation in the strength group. The velocity, agility and dynamic balance improved between 1st and 2nd evaluation for the aerobic and the strength groups. In relation to the cardiorespiratory fitness, both exercising groups showed an improvement during the exercise period, followed by a decrease after exercise cessation.

Discussion
Our data indicates that differences between genders occurred only in upper and lower flexibility, with women attaining a higher performance. Upper and lower body strength, aerobic endurance and, agility and dynamic balance were similar for both sexes. Between the 1st and the 2nd evaluation, the control group did not register any changes in the 6 functional fitness parameters evaluated. Contrarily, the strength group improved all of these during the same period as did the aerobic group, with exception for upper flexibility, in both sexes, and lower flexibility, in women. These data support the idea that cardiovascular and strength exercise, can clearly promote improvements in several functional fitness components in elderly people. These gains imply changes in the senescence process and increased in quality of life considering the importance of the physical dimension on the multiple components of the quality of life model.

References.
THE EFFECT OF LOW-INTENSITY AEROBIC TRAINING WITH SKIN SURFACE COOLING IN HEALTHY SEDENTARY SUBJECTS

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(Introduction) Regular physical activity and good physical fitness are widely accepted as factors that reduce all-cause mortality and improve a number of health outcomes including weight-loss. A recent study showed that low maximal aerobic capacity is closely related to an increase in untoward cardiac events. Therefore, physical aerobic training has been proposed to reduce these events by improving aerobic capacity. In addition, the level of resistance training intensity is an important factor for skeletal muscle hypertrophy and strength gain. However, high-intensity resistance training can increase the risk of injury, especially for frail and elderly populations. Previous studies have shown that low-intensity resistance training with skin cold stimulation in target muscles causes muscle hypertrophy and strength gain. This study aimed to investigate the effect of aerobic exercise training with ergometer combined with skin surface cooling on aerobic capacity and muscle strength. (Methods) Five sedentary subjects (age 52.2 ± 2 yrs, height 165.3 ± 7.8 cm, body mass 60.2 ± 3.1 kg) participated in aerobic cycling exercise training with leg skin surface cooling. The training period was 6 wk long, including three 30-min sessions per week at an intensity of 80% AT with skin surface cooling. Maximum VO2 during ergometer cycling was measured on separate days. A skin surface cooling was applied to the quadriceps femoris muscle by circulating 5 degree water through the cooling-pads (Japan Sigmax Co.). The mean skin temperature was maintained at 25-26 degrees during exercise. (Results and Discussion) The HR during aerobic exercise was within 101-105 beats/min. Weight and weight/hip ratio decreased after low-intensity cycling training with skin surface cooling. Leg muscle volume increased by 4-8% and maximum isometric strength increased by 14-16%. Moreover, aerobic capacities seemed to improve after training in all subjects. However, there was no change in body fat % and serum total cholesterol and leptin concentrations. The combination of leg skin surface cooling with short aerobic training induces muscle strength gain and oxygen uptake, despite the low level of exercise intensity. Low intensity aerobic training with skin surface cooling may be a potentially useful method for promoting neuromuscular function and improving aerobic capacity, covering a wide range of the population, including the frail and elderly.

EFFECT OF VIBRATION IN AGONIST MUSCLES ON AUTONOMIC NERVOUS MODULATION IN ELDERLY NOVICE TAI CHI PRACTITIONERS

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Introduction
Tai Chi is a remarkably effective prescription exercise for the decreasing the risk of falling in senior citizens. If we could attain this effect of this exercise in a short time, it would be of great benefit in improving the health of elderly people.

We hypothesized that the quadriceps muscle vibration, when not exercising but with a stimuli of illusionary exercise, the proper accommodation of respiratory-circulation response at the time of exercise would arise.

The primary aim of this study was to examine the effect of tonic vibration stimuli, before Tai Chi Hachidannishiki (Eight Movement Tai Chi: TC8), on autonomic nervous modulation in elderly novice Tai Chi practitioners.

This study was performed with the approval of the ethics committee of Toho University.

Methods
Seventeen elderly people who regularly train in novice Tai Chi classes were recruited for this study. They were divided into two groups, nine subjects were vibration group (TVS), aged 67.8±1.9 yr. and eight subjects were control group (CONT), aged 68.3±5.1 yr.

TVS was given a stimuli (60 Hz) on each quadriceps muscles alternatively twelve times, 5 seconds per time. This protocol was performed once a day, six days a week for four weeks. Before and one month after TC8 training, ECG was measured during five minutes rest time. Also, ramp load exercise was performed in all subjects. Hemodynamics, HRV (time and frequency domain), VO2, VCO2, VE and EMG were measured during ramp pedaling exercise.

Time-frequency spectral analysis was used to analyze heart rate. P<0.05 was considered statistically significant.

Results
There was no significant difference between TVS and CONT expiration gas before and one month after TC8 training during ramp pedaling exercise. However, in TVS there was a significant increase in %VC and %FEV one month after the experiment (p<0.05). No correlation was observed in CONT. HRV-frequency domain total power (TP) and low frequency power (LFP) increased in both groups one month after the experiment. High frequency power (HFP) increased in CONT but decreased in TVS. HFP/TP ratio increased in CONT and also increased significantly in TVS (p<0.05). Also, HFP/TP ratio increased in CONT but decreased significantly in TVS (p<0.05) under quiet condition.

Conclusion
Vibration Stimuli in quadriceps muscle before exercise enhanced balance of sympathovagal modulation and decreased parasympathetic activity during exercise in elderly novice Tai Chi practitioners. These results suggest that TC8 and tonic muscle vibration stimuli might be an effective way to the properly accommodate respiratory-circulation response at the time of exercise in elderly people in a short time.

SLOW SQUAT TRAINING HAS UNFAVORABLE EFFECTS ON MUSCLE ACTIVATION AND FORCE GENERATION PATTERNS DURING CYCLING MOVEMENTS

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It has been reported that resistance training at intensities lower than 60-65% 1RM is virtually ineffective for increasing muscle size and strength. However, the concept of enhancing exercise movement variation was not explored in these studies. When exercise movement is designed to place muscles under continuous tension throughout the exercise movement, resistance training, even with low-intensity loads of less than 60-65% 1RM, promotes muscle hypertrophy and increases strength. We previously reported that relatively low-load (~50-60%) one repetition maximum (1RM) resistance training with slow movement and tonic force generation (LST) significantly increased muscle size and strength, and the increase was comparable to that achieved with traditional high intensity (~80-85%) 1RM resistance training at a normal speed. Therefore, LST can be proposed as an effective method of resistance training to increase muscle mass and
strength without large mechanical stress. However, the movement style of LST seems much different from the dynamic sports movement. In LST, the movement speed is intentionally reduced to elude inertia action and to place muscles under continuous tension throughout the exercise movement. However, natural movements in sports and daily life use inertia effectively. LST movement is considered very specific and uncommon in natural movement in sports and daily life. Therefore, LST might have some sort of effects on dynamic sports movement.

In the present study, we investigated the effects of LST on muscle activity and force generation patterns during cycling movement as a representative dynamic sports movement. Twenty-four healthy young men without a habit of bicycle riding or regular resistance training were randomly assigned to the LST (60% 1RM load), 3s lifting and 3s lowering movements without a relaxing phase: n=8), HN (85% 1RM load, 1s lifting, 1s lowering and 1s relaxed movements: n=8) or sedentary control (CON, n=8) groups. Subjects in the training groups performed machine squat training by the assigned exercise method. Exercise sessions consisted of three sets and were performed twice a week for 13 wk. Pre and post training, muscle activation and force generation patterns during cycling movements were evaluated by the coefficient of variation (CV) of the rectified electromyographic wave (EMG) from the vastus lateralis (VL) and CV of pedaling force. Both the CV of rectified EMG and that of pedaling force were significantly decreased in the LST group (-21% and -18%, respectively), whereas there were no significant changes in either HN or CON. Such a decrease in CV in the LST group could mean that muscle activity and force generation during cycling movement have become more tonic following LST squat training intervention. It cannot be confirmed with certainty, but it is highly possible that LST training may have an unfavorable effect on dynamic sports movements.

RELATIONSHIPS AMONG ARTERIAL STIFFNESS, DAILY PHYSICAL ACTIVITY AND OTHER RELATED FACTORS IN OLDER JAPANESE MEN

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Recent studies have demonstrated that regular aerobic exercise could reduce the age-related increase in arterial stiffness, which is a serious risk factor for cardiovascular disease (Seals, 2003). Although detailed mechanisms by which increased physical activity levels modify arterial stiffness have not yet been shown, reducing the risks of atherosclerosis by improving blood lipoprotein profiles and oxidative stress (Shimomitsu and Takanami, 1999), and/or changes in endothelium-derived vascular dilating and constricting factors such as nitric oxide, angiotensin II and endothelin-1 (ET-1) are suggested to be candidates for these mechanisms (Thijssen et al., 2008). The present study investigated the relationship between arterial stiffness (pulse wave velocity) and daily physical activity level (accelerometer), considering individual contributing factors, blood pressure, serum lipoprotein profiles (total cholesterol, low density lipoprotein cholesterol, high density lipoprotein cholesterol and triglyceride), indices of oxidative stress (malondialdehyde-modified LDL and 8-iso-prostaglandin) and ET-1 level in 84 middle-age to elderly Japanese males (61.7±12.4 years, 41-80 years). Arterial stiffness, systolic blood pressure and serum ET-1 level increased with age (P<0.01). Daily physical activity level did not correlate with either arterial stiffness or blood pressure. Arterial stiffness, systolic blood pressure and serum ET-1 level were strongly correlated with each other (P<0.01), but there were no relationships among arterial stiffness, any component of serum lipoprotein profiles or indices of oxidative stress. The elderly subjects (>60 years) in this study showed higher daily activity levels than middle-aged subjects (≤59 years) (9165±3999 steps/day, 6717±2202 steps/day, P<0.01), but the levels of body mass index (elderly: 24.3±2.9, middle-age: 24.4±3.3), percentage of fat (elderly: 23.3±7.0%, middle-age: 22.8±4.4%), and serum lipoprotein profiles in the elderly were not different from those in middle-aged subjects. These results demonstrated that although elderly Japanese men with a relatively high level of daily physical activity maintain a preferable body composition as well as serum lipoprotein profiles, they also show a higher blood pressure and greater arterial stiffness than middle-aged males. Furthermore, endothelium-derived vascular-constricting factor ET-1 showed a strong correlation with the age-related increase in arterial stiffness in this population.

References.

COMPARISON OF A 12-WEEK THREE HOME BASED EXERCISE PROGRAMS ON PHYSIOLOGICAL CHANGES IN UNTRAINED MIDDLE-AGED AND OLDER WOMEN

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The aim of the present study was to compare the effect of three home based exercise programs, which one could carry out by themselves at their home, on physiological and psychological variables in the females. Forty-four middle-aged and older women (66±5 yrs), without an exercise habit were randomly assigned to a resistance exercise group (RT, n=11), step exercise group (ST, n=12), the balance board exercise group (BT, n=11) and no exercise control group (CN, n=10). Body composition, VO2peak, physical fitness, bone health status, geriatric depression score (GDS), and subjective happiness were measured before and after the intervention period. Three days diet record also obtained especially intake of calcium. RT group performed five exercises for 30 min, ST group performed step exercise with the cadence of 30 times per min for 30 min, BT group performed 30 min per day using balance trainer, and all exercise groups participated two to five days per week at their home for 12 weeks.

No significant inter-group differences were recorded for pre-training physiological, physical and psychological variables. After training, a significant improvement in RT, ST and BT groups were seen in body composition variables. The % body fat significantly decreased (p<0.05) in all training groups, however, the increases were not significant across groups. In addition, the thickness of abdominal and thigh decreased (p<0.05) significantly from 15.2 mm to 14.3 mm, from 6.9 mm to 12.5 mm, respectively, in the training groups. Significant increases in estimate VO2peak were observed in only RT group (4.7±1.4 %, p<0.05) and ST group (5.7% ± 3.3%, p<0.01), and from 15.2 mm to 14.3 mm, respectively, in the training groups, however, the increases were not significant across groups. A small improvement in all exercise groups were seen in regard to bone health status (% YAM and % age matched), while no change was seen in CN group in regard to all items. A significant improvement in RT, BT and ST groups were seen in regard to subjective happiness. Subjective health degree (8.8 to 10.2%, p<0.05), everyday feeling (9.7 to 12.1%, p<0.01), human relation (7.9 to 10.8%, p<0.05) and life satisfaction degree (8.4 to 12.5%, p<0.01) were increased significantly in the training groups. GDS decreased only in RT group. No change was seen in the CN group in regard to all items.

References.
It was suggested that low-load home-based resistance exercise, step exercise and balance exercise would maintain body composition and increase muscle strength and bone health level which may be beneficial in terms of risk for and health-related diseases and osteoporosis of middle-aged and older women, and that it an available method of improving psychological items such as subjective health and degree of life satisfaction.

**FACTORS ASSOCIATED WITH EXERCISE IN THE 3RD TRIMESTER - PREGNANT WOMEN'S SOCIAL SUPPORT AND ATTITUDES**

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Background: The current American College of Obstetrics and Gynecology (ACOG) and the Canadian Guidelines for Exercise in Pregnancy, advise the continuation of pre-pregnancy exercise activities, and recommend regular exercise for at least 15 minutes three times per week. However, studies have indicated that healthy pregnant women are insufficiently physically active and that progressively more women exceed the optimal weight gain. To date there is scant knowledge to explain why pregnant women stop exercising regularly.

Objective: To investigate characteristics associated with participation in recreational exercise in the 3rd trimester and pregnant women's social support, attitudes and barriers towards exercise. Methods: Healthy pregnant women (N=467), Oslo, Norway, answered a questionnaire at gestation week 36. Results: The most common barriers to pregnancy exercise were pregnancy complications, lack of time and practical problems due to childcare. Factors negatively associated with regular exercise in the 3rd trimester were being multiparous, high weight gain, sedentary exercise habits pre-pregnancy, urinary incontinence, lumbopelvic pain and to be on sick leave. A positive impact on health complaints and increase fitness were the most important motivational factors for regular exercise. Additionally, women who were encouraged to exercise by their physician were more likely to exercise than those who were not. Exercise habits of family and friends were not related to exercise in the 3rd trimester. Conclusion: Prevention of health complaints and pre-pregnancy exercise habits were stronger motivators for regular exercise than social support from family and friends. Physicians and midwives may play a valuable role in encouraging exercise with their patients.

**Poster presentations (PP)**

**PP-MB01 Molecular Biology 1**

**INFLUENCE OF THE COMBINATION OF BETAZ2-ADRENERGIC RECEPTOR AND ENDOTHelial NITRIC OXIDE SYNTHASE (eNOS) GENE POLYMORPHISMS ON THE RISK FOR HYPERTENSION**


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**BACKGROUND:** Hypertension is recognized as one of the major risk factors for cardiovascular disease. The beta2-adrenergic receptor (ADRB2) gene and endothelial nitric oxide synthase (eNOS) gene polymorphisms are associated with clinical cardiovascular phenotypes. Recently, the Gly16Arg of ADRB2 gene and Glu298Asp of eNOS gene polymorphisms have been reported to be related to hypertension (1,2). We hypothesized that the combination of gene polymorphisms in Gly16Arg of ADRB2 and Glu298Asp of eNOS increase a risk for hypertension. Accordingly, we determined the influence of the combination of these single-nucleotide polymorphisms (SNPs) on the risk for hypertension. **METHODS:** Four hundred and two middle-aged and older human subjects (66±7 years) participated in a cross-sectional study. We determined the genotypes of SNPs at Gly16Arg in exon 1 of ADRB2 and Glu298Asp in exon 7 of eNOS, using a TaqMan-polymerase chain reaction method. We also measured resting blood pressure. The present study determined the relationship between the blood pressure and the gene polymorphisms in Gly16Arg of ADRB2 and in Glu298Asp of eNOS. RESULTS: In gene polymorphism in Gly16Arg of ADRB2, the odds ratio for the presence of hypertension in the Gly/Gly genotype of ADRB2 compared with other genotype (Arg/Arg+Arg/Gly) was 2.87 (95%CI: 1.60-5.15, p<0.01). In gene polymorphism in Glu298Asp of eNOS, the odds ratio for the presence of hypertension in Glu/Glu genotype of NO33 compared with other genotype (Asp/Asp+Asp/Glu) was 2.79 (95%CI: 1.32-5.89, p<0.01). Interestingly, the odds ratio for the combination of Gly/Gly genotype of ADRB2 and Glu/Glu genotype of eNOS compared with the combination of Arg/Arg+Arg/Gly genotype of ADRB2 and Asp/Asp+Asp/Glu genotype of eNOS was 7.64 (95%CI: 2.88-20.29, p<0.01). CONCLUSIONS: The present study demonstrated that the combination of gene polymorphisms in Gly16Arg of ADRB2 and Glu298Asp of eNOS remarkably increase a risk for hypertension in middle-aged and older humans. These polymorphisms may be important in the health and clinical care of hypertension in middle-aged and older subjects.

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**EFFECTS OF AN IRONMAN TRIATHLON ON THE DNA AS DETECTED BY THE SCGE AND CBMN CYT ASSAY**

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Background: Regular moderate physical activity is associated with various health benefits including decreased risk of cardiovascular diseases and diabetes. However, the enhanced formation of reactive oxygen species during acute and strenuous exercise can induce damage to lipids, proteins and nucleic acids. Currently there are no data available dealing with the influence of an Ironman triathlon or an exercise load of comparable duration on genomic stability. Thus, the major aim of the present study was to investigate the effect of an Ironman triathlon race (3.8 km swim, 180 km cycle, 42 km run), as a prototype of ultra-endurance exercise, on genomic stability.
DHEA ACTIVATES THE GLUCOSE METABOLISM-RELATED SIGNALLING PATHWAY IN SKELETAL MUSCLE

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Background: Circulating dehydroepiandrosterone (DHEA) is converted to testosterone or estrogen in the target tissues. Recently, we demonstrated that skeletal muscles are capable of locally synthesizing testosterone and estrogen. Furthermore, testosterone is converted to dihydrotestosterone (DHT) by reductase, and exerts biophysiological actions through binding to androgen receptors. However, it remains unclear whether skeletal muscle can synthesize DHT from DHEA and whether these hormones affect glucose metabolism-related signalling pathway in skeletal muscles. We hypothesized that locally synthesized DHT from DHEA activates glucose transporter-4 (GLUT4) -regulating pathway in skeletal muscles. The aim of the present study was to clarify whether DHT is synthesized from DHEA in cultured skeletal muscle cells and whether these hormones affect the GLUT4-related signalling pathway in skeletal muscles.

Methods: Myoblasts of skeletal muscle were isolated from 2- to 3-day-old Sprague-Dawley rats. Muscle cells were exposed to either skeletal muscle cells and whether these hormones affect the GLUT4-related signalling pathway in skeletal muscles.

Results: The number of BN cells with MNi decreased (p<0.05) after the race, remained at a low level until 5 d post exercise and declined further to 19 d post race (p<0.01). The frequency of NPBs and Nbuds did not change immediately after the triathlon, but the number of NBP significantly declined from 2 d pre race to 19 d post exercise (p<0.05). The number of Nbuds increased after the triathlon, reaching a maximum 5 d post race (p<0.01) and decreased to basic levels 19 d after the race (p<0.01). The DNA migration (tail moment) decreased significantly (p<0.05) after the race, then increased (p<0.05), reaching a maximum 1 d post race and declined below basic levels 19 d post race (p<0.05).

Conclusion: The present study suggests that an Ironman triathlon race does not cause DNA damage as detected by the CBMN Cyt assay, but leads to increased DNA migration 1 d post race as shown in the SCGE assay; however, this marker decreased to the basic levels 5 d post race. Thus, it seems that adaptive mechanisms including the upregulation of repair mechanisms and increased capacity of the endogenous antioxidative system may prevent severe oxidative stress and long lasting DNA damage after strenuous exercise in well trained athletes.

HAPLOTYPY ANALYSIS OF A CANDIDATE GENE AS A RISK FACTOR FOR ACHILLES TENDON PATHOLOGY

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There is evidence to suggest the existence of a genetic susceptibility to tendon pathology and injuries in some individuals. Recently, the COL5A1 and TNC genes have been shown to be associated with Achilles tendon pathology and the aim of this study was, therefore, to investigate other genetic risk factors associated with Achilles tendon pathology within a South African population. A candidate gene X was identified and selected based on its chromosomal location and its biological function. Ninety three patients diagnosed with Achilles tendinopathy (TEN) and 131 control (CON) subjects were genotyped for six single nucleotide polymorphisms (SNP) within this gene using the amplification refractory mutation system (ARMS) PCR method. Individually, none of the six SNP’s genotyped in this study were significantly associated with Achilles tendon pathology (SNP 1 967,2=0.16, p=0.922; SNP 2 967,2=5.50, p=0.056; SNP 3 967,2=1.44, p=0.048; SNP 4 967,2=2.46, p=0.293; SNP 5 967,2=2.39, p=0.303; SNP 6 2=0.327). The GG genotype of SNP 2 was however significantly over-represented in the TEN group (37.6%) when compared to the CON group (23.7%) (OR=2.0, 95% CI 1.1-3.5, p =0.026). In addition, preliminary data suggests that a particular haplotype within gene X is associated with Achilles tendinopathy. In conclusion, these preliminary results suggest that variants within gene X are associated with Achilles tendinopathy and, that gene X may be a third gene involved in the aetiology of this condition. We are currently in the process of securing a patent for several aspects of our research and, therefore, are unable to reveal the name of the gene used in this study.

STRONGER AND SLIMMER WITH ECCENTRIC ERGOMETER TRAINING: FUNCTIONAL, STRUCTURAL AND MOLECULAR ADAPTATIONS IN OCTOGENARIANS

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Introduction
Sarcopenia is characterized by the loss of muscle mass and strength as a consequence of aging. Intense Physical strength training counteracts sarcopenia. Eccentric ergometer training (EET) allows for high-load muscular training with low cardiovascular stress due to the low metabolic costs of eccentric (lengthening) contractions. Stress on single joints is minimized in EET as it is carried out at relatively high angular velocities in a closed muscle chain including multiple joints (hip, knees, ankles). Due to these unique features, EET is particularly convenient for elderly, characterized by frailty and a restricted aerobic capacity [1]. We hypothesized EET to be more effective than conventional resistance training (RET) to improve leg strength and body composition in octogenarians. Additionally we expected different adaptations on the level of muscle structure and gene expression.

Methods
Sixty-two elderly subjects (80.6±3.5 years) were randomized to one of the three training regimes (2x45 minutes per week) for three months: EET was carried out on a motor driven eccentric cycling ergometer where the appropriate matching of the eccentric target load had to be self-monitored on a screen by the subjects. RET consisted of four classical exercises for the lower extremity while control subjects (CT) did a non-physical computer based cognitive training. Subjects were tested before and after the training for functional parameters and body composition. Muscle biopsies were collected from M. vastus lateralis for the analysis of ultrastructure, fiber type composition and muscle specific quantitative gene expression.

Results
Significant improvements in maximal isometric extension strength of the legs (+8.4±1.7%), loss of body fat (-5.0±1.1%) and thigh fat content (-6.9±1.5%) as well as changes in type IIX/type II muscle fiber content (-22±14%) could be recorded exclusively for EET subjects. Relative thigh lean mass was increased with EET (+2.5±0.6%) and RET (+2.0±0.3%). EET resulted in a pronounced muscle transcriptome adaptation with an increased expression of repair/remodelling genes along with a consistent decrease of metabolic and mitochondrial genes. RET resulted in a small overall increase of most gene-transcripts.

Conclusions
EET is applicable for elderly in order to effectively improve leg strength and body composition. Gene expression analysis of thigh muscle biopsies showed a shift in mRNA expression from metabolic towards remodelling and repair genes upon EET. This result is consistent with the high mechanical and low metabolic stimulus executed by EET.

References

PLASTICITY OF SINGLE HUMAN SKELETAL MUSCLE FIBERS
Frese, S., Boelck, B., Pesta, D., Sailer, J., Bloch, W.
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Human skeletal muscle is characterized by an enormous plasticity for adaptation to several stimuli. During exercise there are different perturbations induced in recruited muscle cells due to mechanical, metabolic, neuronal and hormonal factors that lead to load-dependent skeletal muscle fiber type specific alterations.

The aim of this dissertation is to investigate single cell-specific gene expression with regard to the existence of different chimera of myosin heavy chains (MHC) and plasticity of single human skeletal muscle fibers.

Using Laser Microdissection and Pressure Catapulting (LMPC) several muscle fibers from vastus lateralis muscle were precisely excised without contaminations. Subsequently, quantitative RT-PCR was performed and the MHC-I, -IIA, -IIX, as well as the developmental MHC-embryonic and -perinatal genes were analysed in fast twitch fibers (FTF; IIA, IIX) and slow twitch fibers (STF; I) resulting from ATPase-staining.

However the analysis of MHC gene expression in single FTFs and STFs shows that existence of a heterogenous distribution of MHC genes.

In conclusion, single cell-specific gene expression analysis demonstrates the existence of MHC-gene chimera. Thus, LMPC in combination with Real-Time PCR offers a reliable and reproducible way for fiber type specific skeletal muscle research.

ANGIOTENSIN CONVERTING ENZYME GENE I/D POLYMORPHISM IN ELITE PORTUGUESE ATHLETES
University of Beira Interior, Portugal

Several recent works studied the genetic influence on athletic performance. ACE catalyzes the conversion of angiotensin I to angiotensin II and has an important role on heart cells promoting arterial vasosconstriction. Most published data concern to a polymorphism in the presence (insertion, I allele) or absence (deletion, D allele) of a 287-bp in intron 16 that determines ACE levels in serum and tissues, heart cells included. The insertion I allele has been reported amongst elite endurance athletes and a higher D allele frequency among those engaged in a more power-orientated sports. There have been no studies on the possible link between the ACE polymorphism and athletic performance in elite Portuguese athletes.

The aim of this research was to study the association between ACE I/D genotype and allele frequency of elite Portuguese athlete’s and athletic performance.

Forty-one (n=41) truly elite Portuguese athletes (swimmers, triathletes and track-and-field participants) were stratified by the duration of their event (short duration (<2 minutes); long duration (>20 minutes) and long and short distance athletes respectively. We compared ACE genotype and allele frequencies to eighteen (n=80) individuals representative of the general Portuguese population. Genotype determination was obtained by PCR-RFLP methods. A value of P<0.05 was considered statistically significant.

The results were grouped and analyzed statistically. Genotype frequencies (I/I versus I/D versus D/D) differed significantly between the two athlete’s groups (P=0.027) but was no different to that among sedentary controls (P>0.05). I allele frequency was 0.20 for the shorter distance athletes and 0.48 for the endurance participants. These data are consistent with an association of ACE genotype frequencies and athletic performance in different event durations.
THE SMALL HSP ALPHA B-CRYSTALLIN MEDIATES THE RESISTANCE TO APOPTOSIS INDUCED BY VEGF IN SKELETAL MUSCLE MYOBLASTS

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A growing number of studies has shown that VEGF is expressed at appreciable level in non-vascular cells such as neuronal cells, bone, and skeletal muscle, where it can exert autocrine effects on survival and regeneration of the tissue cells. Indeed, it is well known, that under physiological stress condition, such as hypoxia and exercise, skeletal muscular cell expresses and releases VEGF. We have previously shown that myogenic cell line, stably transfected with hVEGF165 cDNA (C2C12VEGF), had an enhanced mitotic index, cell survival and resistance to apoptosis after exposure to cytotoxic concentrations of H2O2 (100-700 µM). Moreover, we identified alpha B crystalline (αBCry), a member of the small Hsp family, as possible mediator of the anti-apoptotic effect exerted by VEGF.

The main goal of this study is to clarify the role of αBCry in the modulation of apoptosis determined in the myogenic C2C12 cells by VEGF, and to define the molecular pathways involved in this process.

To this aim, we first analysed the cellular and molecular response towards H2O2-induced apoptosis in C2C12 myoblasts exposed to different concentrations of exogenous VEGF (0-10ng/ml), and then we verified if the specific silencing of αBCry by RNA interference (RNAi) could modify the apoptotic response of the C2C12VEGF cell line, expressing and releasing high amount of VEGF165 in culture medium.

The presence of VEGF in the culture medium determined a decrease of susceptibility to apoptosis induced in C2C12 myoblasts by cytotoxic concentration of H2O2. The analysis showed a reduction in cell death up to 50% in respect to control culture, with an increase in the expression of the αBCry protein, but not of the anti-apoptotic proteins Bcl-2 and Bcl-XL, which levels were not significantly modified. In addition, after specific αBCry silencing, the anti-apoptotic effect of VEGF disappeared, with a rescue of apoptosis susceptibility back to control levels.

Together, our data confirm the protective effect of VEGF on skeletal muscle cells and strongly suggest a role for this factor in muscle cell survival, beside its angiogenic activity. Moreover, we demonstrate that the small Hsp αBCry plays a key role in the molecular mechanism underlying the anti-apoptotic effect of VEGF in myoblasts.

EXPRESSION OF MYOGENIC REGULATORY FACTORS IN SATELLITE CELLS DURING 11 WEEKS OF STRENGTH TRAINING IN YOUNG HEALTHY MEN

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The aim was to enhance our knowledge about the events associated with satellite cell activation during strength training. During development, the myogenic regulatory factors (MRF's) are essential for muscle growth, through activation and differentiation of satellite cells. In adult muscle, the role of MRF's during muscle hypertrophy is less clear. In order to assess the activation of satellite cells in response to strength training, we quantified the number of satellite cells positive for MyoD, myf-5 and myogenin and the total amount of these MRF's in muscle homogenate.

Twenty-three male subjects (18 - 40 years old) completed 11 weeks of whole body strength training. The exercise program consisted of three leg exercises and five upper body exercises. Biopsies were obtained from m. vastus lateralis and m. trapezius, before the exercise period, after two weeks, and post training. Biopsies were frozen in isopentan and stored at -80°C. Later, one piece of the biopsies was cut into 8 micrometer thick cross sections and another part was homogenised. The cross sections were double stained using the monoclonal antibody CD56 (BD Pharmigen, USA) which stains all satellite cells and polyclonal antibody against MyoD, myf-5 and myogenin (santa cruz, USA). The same antibodies were used for quantification of MRF protein levels in the cytosolic fraction of the homogenate by Western blots.

There was a significant increase in the number of satellite cells per muscle fibre after two weeks in both m. vastus lateralis (43±9%), and m. trapezius (34±10%). Thereafter the number of satellite cells was stable at this level throughout the training period. The proportion of satellite cells expressing one or more of the MRF's was generally low at baseline (2-3%) and was significantly increased after two weeks of strength training in both m. vastus lateralis (7.9±1.8%) and m. trapezius (5.4±1.0%), follow by a trend towards normalization after 11 weeks of training. There was a general trend for increased levels of MRFs in both muscles both early and late in the training period, but only the increase in MyoD by 80±35% after two weeks reached statistical significance.

MRF's role in satellite cell activation have been shown in vitro (2). Our results show an up regulation of MRF's in satellite cells along with an increase in the number of satellite cells per muscle fibres. This confirms that the satellite cells are activated in a similar way as during myogenesis when muscles are exposed to high load strength training. We have demonstrated an increase in the number of satellite cells per muscle fibre occurring already in the early stages of the training. The increase in the number of satellite cells was coincident with an increase in the number of MRF positive satellite cells and overall increased levels of MRF's in muscle homogenate.

References.

Poster presentations (PP)

EXAMINE ATTENTIONAL BENEFIT FOR ANALOGY LEARNING

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Introduction

Movement analogies reduce a number of task-relevant ‘rules’ into a single ‘all encompassing biomechanical’ metaphor. A series of studies has found that analogy learners show resilient performance when required to perform both a primary motor skill and a concurrent secondary task (e.g., Liao & Masters, 2001) or make complex tactical decisions (Poolton, Masters, & Maxwell, 2006). However, stud-
Movement analogies reduce a number of task-relevant ‘rules’ into a single ‘all encompassing biomechanical’ metaphor. In general, previous studies have shown that analogy learning minimizes the accrual of explicit knowledge and imparts relatively robust performance under pressure (Liao & Masters, 2001). However, to date, investigations of analogy motor learning have been restricted to table tennis; therefore, the generalizability of the technique to other sport activities is unknown. In addition, no direct measure of attentional load under stress has been reported. Thus, our objectives were to examine the application of analogy learning in stressful situations using a modified basketball shooting task and to assess attentional change under stress using probe reaction times (PRT).

**Methods**

Analogic and explicit groups (n = 12 for each group) learned a modified basketball shooting task over 24 blocks of 20 trials, followed by a test phase (retention 1 transfer - retention 2). The participants in the explicit and analogy groups were given an instruction sheet containing eight written instructions describing the correct techniques to perform the shot or a single analogical instruction, respectively. They were told to shoot using only the instruction provided. The control group was un instructed and simply told to shoot using their own methods. Each day of learning contained 8 blocks of 20 trials. In dual-task transfer, all participants were asked to perform the shooting and secondary task (counting backward in threes) concurrently to assess the load on an attentional resource imparted by different learning conditions. Verbal reports were collected to assess the amount of task-relevant verbalizable knowledge accrued during learning.

**Results**

We found that all participants improved throughout three-days learning. However, as predicted, the analogy group reported less explicit knowledge and showed robust shooting performance under secondary concurrent task compared with the explicit and control groups.

**Discussions and conclusions**

Analogic learning is an as alternative to traditional learning (i.e., using explicit instructions), that not only shows learning speed similar to explicit learning, but also has benefits akin to implicit learning. Lowered attentional demands may be beneficial to learners when they are concurrently analyzing tactics/game situations, and performing a motor action.

**References**


**ATTENTIONAL DEMANDS OF ANALOGY LEARNERS UNDER PSYCHOLOGICAL STRESS**

Lam, W., Maxwell, J., Masters, R.

*The University of Hong Kong, Hong Kong*

**Introduction**

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**Results**

Subjective anxiety, maximum and averaged heart rates were significantly higher in the transfer test than in retention, confirming the effectiveness of the stress manipulation. Analogy learners reported less explicit knowledge and demonstrated robust performance under stress. Explicit learners reported more explicit knowledge and deteriorated under stress. PRT data revealed that attentional load increased under stress for both groups of learners. Further inspection showed that attentional demand was increased by stress for movement preparation, but not for movement execution.

**Discussions and conclusions**

The results indicate that analogical instruction encourages an implicit mode of learning and prevents skill breakdown under psychological stress. Under stress, attentional demands were elevated regardless of learning mode. It appeared that decreased attentional capacity was detrimental to performance for the explicit group, but not the analogy group, suggesting that the latter's motor performance was less reliant on the availability of attentional resources.

**References**


**BEHAVIOUR PATTERNS ON BUTTERFLY SWIMMERS**

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The objective of this research was to analyse the most common individual behaviour pattern (IBP) of 22 butterfly swimmers, 14 males and 8 females (mean age 18, SD 1.5), above 500 FINA points (mean 609.35, SD 77.66). Hierarchical behaviors relationships over time can be found Bp. The study of BP, can give us detail information of the consolidation of any behavior, of initial behaviors (IB) responsible to develop the movement pattern, of healthy behaviors (performance), of non-healthy behaviors, of base behaviors (IB) which sustain the pattern and of satellite behaviors (two or more relative frequencies with no match in pattern). This research can make unique individual diagnostic because it can find the behaviors stability. We assume that behaviours stability is somehow relative to performance so the solution is to raise the length of the pattern and the quantity of healthy behaviors. In addition, the analysis of a complex set behaviour (event) can show particular non-healthy behaviors that are stable in time but decrease performance. The most complex (a double tree with 4 stroke phases) pattern with logical relationships on each swimmer has been selected and due to the amount of data interaction level was 0.05%. Each swimmer was recorded on a 25 meter sprint competition environment, and 5 cycles were coded using a mix system known as field format and categorical system (Anguera, 1992) composed by 8 stroke phases. The phases were code in 17 behaviors with 107 possible variations on head, body, arms, legs, hands trajectory and water line relationships. The data input was made in Ad hoc Software ButterflyV1 (Cardoso, 2007) that can give multiple and automatic output information such descriptive reports, semi-systematic and systematic reports. This data allows the import for Software Theme 5.0 (complex algorithm detection of the temporal and
MOTOR LEARNING OF ADOLESCENTS WITH AND WITHOUT DEVELOPMENTAL COORDINATION DISORDER

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Motor skills are prerequisites for engagement in physical activity and leisure. Acquisition of motor skills takes place via motor learning and therefore it is an essential part of active lifestyle. Developmental Coordination Disorder (DCD) is a movement skill disorder shown as an inability to perform age-appropriate self-care and academic tasks. DCD occurs in 5-15% of all children. The purpose of this study was to analyze the process of learning a new motor skill, eccentric bicycle pedalling, in adolescents with and without movement difficulties.

Ten male adolescents (14.9±0.5 yrs.) participated in a five week motor learning intervention that consisted of eight training sessions with a motor driven eccentric bicycle. Screening of DCD was based on the 15th percentile of the Movement Assessment Battery for Children (M-ABC2). Participants were divided into three groups; DCD-group (n=3), M-ABC2 52±19, non-DCD (n=3), M-ABC2 76±4), and active athletes (n=4); M-ABC2 90±3). The task was to resist the movement of pedals by producing a constant and steady force against the pedals. The target force level was indicated to the subjects with a visual feedback system. Force production was collected by online computer recording. The coefficient of variation (CV) [SD/Mean] multiplied by 100 was calculated from a 30 second period of force production in the beginning of every training session at the same target force and the pedal rate of 25 rpm. CV was used to describe the motor performance. CV was analyzed from the first, second, 4th, 6th, and 8th training sessions.

The results showed that the initial CV for the participants in the first training session was 27±5. CV improved (p<0.01) between the first and 2nd, 2nd and 4th, but there were no significant improvements between the 4th and 6th training sessions. The results indicated some improvement for the whole group (p<0.05) between the 6th and 8th training sessions. The groups only differed in the final training phase. DCD and non-DCD groups reached the best performance in the 8th training session (DCD 9.0±4.7; non-DCD 7.7±1.7). The active athletes had reached their best performance in the 6th training session (7.5±0.7).

The results of this study suggested that there were no group level differences in the motor learning processes between the groups. It appeared that adolescents with a milder form of DCD learn new motor skill in a similar manner as their peers. This should encourage professionals to organize motor learning interventions to improve the motor competence of DCD adolescents. The more severe the DCD, the more likely the motor learning processes were affected and thus, personalized motor training programs would be useful. Increasing our knowledge of motor learning in children and adolescents with DCD is important in order to find strategies to support their participation in everyday activities and promotion of physically active lifestyle.

CORRELATION BETWEEN PE TEACHERS’ JUDGEMENT OF MOTOR SKILL AND RESULTS OBTAINED BY MEANS OF STANDARDIZED TEST BATTERIES

Vandorpe, B., Vandendriessche, J., Pion, J., Vaeyens, R., Matthys, S., Philippaerts, R., Lenoir, M.
Ghent University, Belgium

Physical Education teachers are supposed to be able to reliably evaluate pupils’ motor competence. While physical components such as speed, flexibility or endurance are easy to evaluate in an objective and reliable way, evaluation of movement coordination is characterized by a relatively high degree of subjectivity.

The aim of this study was to compare teachers’ ratings of Flemish pupils’ motor skill with the results of established tests for motor competence (BOT2-SF1 and KTK2). Primary school PE teachers classified school children (N = 2538; boys and girls, 6-11 yrs. of age) into five categories, ranging from having low knowledge of motor learning in children and adolescents with DCD is important in order to find strategies to support their participation in everyday activities and promotion of physically active lifestyle.

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INTRODUCTION

Adiposity is assuming alarming proportions in the whole western society. Most recent studies indicate that, for the first time, there are more adipose than underweight humans worldwide (Deutsches Ärzteblatt). The physical consequences of adiposity and its co-morbidities are severe and may evolve into a heavy burden, increasingly affecting the younger generation. This study however focuses on the differences in nutrition and physical activity behaviour of children from two opposing countries Germany, as an affluent society and Namibia as a developing country. The purpose of this investigation is to examine how the percentage of the population who are overweight and obese is distributed and how much it affects the physical activity and nutrition of children from these two different environments.
EFFECTS OF CONJUGATED LINOLEIC ACID AND RESISTANCE TRAINING IN RECREATIONAL ATHLETES


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Conjugated linoleic acid (CLA) is a mixture of positional and geometrical isomers of linoleic acid, that are known to possess several physiological effects such as enhancing immune response, reducing atherosclerosis risk, and inhibiting carcinogenesis. Over the last decade, the use of CLA supplement has become widespread among elite and recreational athletes because it should increase training effects, improve fat oxidation, increase energy delivery, reduce body weight, improve lipid profile, and so on. The purpose of this project is to investigate whether CLA supplementation after a resistance training session affects general markers of muscle damage, total testosterone, cortisol and sex hormone binding globulin.

In a double-blind and randomized manner 13 recreational athletes were randomly assigned to supplement their diet with 6 g per day of an sunflower oil placebo or 6 g per day of CLA for 21 days. After two weeks of wash-out, all subjects crossed over to the opposite group for an additional 21 days. The 3 weeks of supplementation were preceded and followed by a resistance training session involved 8 exercises, chosen to include all major muscle groups, consisting of 3 sets of 10 repetitions at approximately 75-80% of one-repetition maximum. Before and after the training session were drawn blood to measure the creatine phosphokinase, lactate dehydrogenase, cortisol and sex hormone binding globulin concentrations.

Measurements at baseline and after the 3 week of supplementation included body composition and strength. The results indicate that CLA supplementation during resistance training should increase the anabolic effect and decrease the catabolic effects of training on muscle protein.

BRANCHED-CHAIN AMINO ACID INGESTION MAY AMELIORATE MUSCLE SORENESS FROM INTENSE ECCENTRIC EXERCISE.

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Inadequate recovery from unaccustomed exercise can limit exercise performance and also the ability to perform habitual activities. Repeated eccentric contractions or unaccustomed exercise leads to loss of muscle strength, an increase in muscle soreness and putative blood markers of muscle damage. Recently, nutritional interventions including branched-chain amino acids (BCAA) have been suggested to alleviate these symptoms. However, supplementation with BCAA has led to equivocal findings. Therefore, the purpose of this study was to examine the role of independent BCAA supplementation during recovery from intense eccentric exercise in carefully controlled trials. The study was a parallel, matched, single-blind experimental trial. Twenty-four non-weight-trained males were assigned to one of two groups: 1) supplemental group (SUP) ingested BCAA beverages (3.5g leucine, 2.1g isoleucine and 1.7g valine) (n=12); 2) placebo group (PLA) ingested artificially flavoured water (n=12). Each trial consisted of five consecutive days. Diet was controlled from day 1 until the final testing session consisting of 1.5g protein/kgBM and 55% of energy as carbohydrate, with the remainder of energy derived from fat. Eccentric exercise was performed on the morning of day 2 of each trial. Subjects performed 12 x 10 repetitions of eccentric knee extension exercise at 120% of their concentric one repetition maximum (62.6 ± 1.8kg). Supplements were consumed 30 min before and 1.5 h following exercise and twice more on day 2. On days 3 and 4 four supplements were consumed between meals. Muscle soreness, function and putative blood markers of muscle damage were assessed pre and post II, 8, 24, 48, 72 h exercise. Soreness was assessed using a visual analogue scale (mm). Muscle function was assessed using electrically-stimulated, maximal isometric contractions. Plasma creatine kinase (CK) and myoglobin concentrations were measured as putative markers of muscle damage. Muscle function decreased after the eccentric exercise at all time points post exercise in both supplementary groups (p<0.0001). The nadir of percentage force loss was observed at 48 h but the degree of force loss was unaffected by BCAA ingestion (-51 ± 3% with SUP versus -48 ± 7% with PLA). There was no effect of BCAA supplementation on CK or myoglobin. SUP resulted in a decrease in soreness of the muscle in the flexed position compared to PLA at 48 h 121 ± 3 mm vs. 32 ± 3 mm; p=0.02) and 72 h (77 ± 3 mm vs. 27 ± 4 mm; p=0.038). Overall flexed muscle soreness, expressed as area under the curve, was 10 ± 7% less for SUP compared to PLA (p=0.024). These data suggest that BCAA supplementation does not ameliorate eccentric exercise-induced decrements in muscle function or increases in repeated blood markers of muscle damage, but may alleviate muscle soreness.
FLUID AND ELECTROLYTE LOSSES IN ATHLETES DURING A DUAITHON COMPETITION

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Exercise in the heat interferes in body's ability of controlling core temperature due to high rates of heat production and heat gain by environmental physical transference. Prolonged sports events such as Duathlon, may lead the athlete to a hydroelectrolytic unbalance, mainly in a warm environment. The present study assessed sweat and blood sodium (Na+), potassium (K+) e chloride (Cl-) losses during a duathlon competition. Twelve amateur male athletes (body mass = 69.5 ± 6.7 kg, height = 174 ± 4.0 cm, age = 29.95 ± 7.78 years) took part in this study. The race took place in late December (Brazilian summer) therefore it was assumed that athletes were acclimatized to the warm weather. On the day of the race, environmental temperature was ~31°C and air relative humidity was ~51%. Blood collections were done pre and post race and sweat was collected during the race by attaching sweat patches to athlete's dorsal region. Serum [Na+] and [K+] were measured by flame photometer (Corning 400, NY, US). Serum [Cl-] was measured by colorimetric method (Hitachi U2000). Sweat [Na+], [K+], and [Cl-] were measured by an automated system (Cobas Integra). The average time to complete the race was 85.0 ± 6.57 minutes. The percentage of dehydration was 3.0 ± 0.92%. The replacement of fluid losses was 31 ± 18.7%. The sweat rate was 1.86 ± 0.56 l/h-1. Sweat Na+, K+, and Cl- concentration were 71 ± 26.05 mmol/l-1, 5.43 ± 1.98 mmol/l-1 and 58.93 ± 25.99 mmol/l-1, respectively. The total sweat loss of Na+, K+ e Cl- was 132.11 ± 62.82 mmol, 10.09 ± 5.01 mmol e 109.75 ± 58.49 mmol, respectively. The main finding of this study was that Duathlon athletes did not drink enough to replace their fluid volume losses. Important electrolytes losses occurred through sweating. However, serum electrolyte concentrations were not changed. Studies have shown that 2% dehydration decreases performance. In this study, although performance has not been assessed, athletes showed a dehydration higher than 2% which could have affected their race performance. Thus, nutritional strategies aiming an adequate fluid intake may help thermo-regulation process and race performance in a Duathlon competition.

CAN THE ADDITION OF PROTEIN TO A CARBOHYDRATE BEVERAGE IMPROVE ENDURANCE PERFORMANCE, ENHANCE RECOVERY, AND REDUCE MUSCLE DAMAGE AND SORENESS?

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Recommendations for endurance performance have emerged to suggest the addition of protein to a carbohydrate beverage is efficacious. However, studies reporting positive effects have been criticized for their methods, and more carefully controlled studies have found no effect. Research has suggested adding protein to a carbohydrate beverage may also attenuate muscle damage, muscle soreness and enhance recovery following endurance exercise. The aim of the present study was to investigate the impact of a carbohydrate-protein beverage on endurance performance, recovery and soreness compared to carbohydrate alone. In a double-blind, cross-over study, 9 trained cyclists (63 ± 6.9 ml/kg) completed two trials, consuming a 6% carbohydrate-only beverage (64.8 g/h carbohydrate, CHO) or a carbohydrate-protein beverage (64.8 g/h carbohydrate, 19.4 g/h protein, C+P). Exercise consisted of a 120-min steady-state cycle pre-load at 50% Wmax, followed by a time-trial designed to last ~1 h. Beverages (270mL) were consumed every 15-min of the steady-state ride. Twenty-four hours after the onset of each trial, participants returned to the laboratory for an electrically-superimposed maximum isometric strength test (MIST). Muscle soreness was rated on a visual analogue scale (VAS) on arrival at the laboratory, following the 1 h time-trial and 24 h after exercise. Blood samples were taken at these same time-points and analyzed for creatine kinase (CK) concentrations, cited as an indirect marker of muscle damage. Nutrient intake was controlled 24 h prior to, and during each of the two trials. Habitual intake was estimated to determine appropriate energy intake. During both trials participants consumed 8g/kg/d carbohydrate, 1.6g/kg/d protein, remainder of energy derived from fat, and were instructed to refrain from training 24 h prior to each trial. Mean power output sustained during the time-trial was similar in both treatments (249±40 and 243±44 W for CHO and C+P, respectively) with no significant between-group difference (P >0.05). No effect of supplement on time-to-complete the set amount of work was evident (61±6.5 and 63±7.5 min for CHO and C+P, respectively). Post-exercise MIST significantly declined from baseline values (492±40.4 Nm) for CHO and C+P(411±42.2 and 420±32.8 Nm respectively) with no significant between-group difference in the decline. Plasma CK concentrations increased significantly at 24 h post-exercise for CHO and C+P with no significant between-group difference (327±203 and 207±70 U/L in CHO and C+P respectively). Furthermore, 24 h post-exercise increases in VAS soreness were not significantly different between CHO and C+P. The findings of the present study indicate the addition of protein to a carbohydrate beverage did not improve cycle time-trial performance. Furthermore, results suggest carbohydrate-protein beverages do not ameliorate plasma CK, reduce muscle soreness or enhance the recovery of muscle function compared to carbohydrate alone.

Poster presentations (PP)

PP-NU02 Nutrition 2

A SHORT DAILY EXERCISE MAY LIMIT APPETITE IN RATS

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Introduction.
Strategies used to counteract overweight include generally endurance exercise. Force-resistance exercise has not been tested yet with this objective. The aim of this study was to investigate the response of the main regulatory hormones of food intake (insulin, adiponectin, leptin, ghrelin) and corticosterone, to a short force resistance exercise.

Methods
Two groups of 16 rats, 65 days old, weighing 330 g, were constituted. A standard diet (containing Glucid: 72.2, Lipid: 7.7, Proteine: 20 % calorie) was given ad libitum. One group served as control, the second group was submitted to exercise training during 5 weeks. The applied exercise consisted of a two fold 5 series of 30 sec gripping on a grid which was alternatively put horizontally and vertically, additive loads (up to 200g) were progressively introduced. The total duration of the exercise didn’t exceed 10 min. Body composition: at the end of the five weeks training, lean and fat masses of each animal were estimated, under choral anesthesia, using dual X-ray absorptiometry, (Hologic QDR 4500A, Massy, France).
Hormones were assayed using available commercial kits following manufacturers recommendations. Results. Training reduced the rats body weight by 6.4% (456 vs 487, p = 0.001) mainly via a reduction of fat mass (- 10.5%). The total food intake during the 5 weeks was decreased by 11%. The insulin and ghrelin levels were lowered (respectively -41%, p = 0.05 and 20%, p = 0.04) while corticosterone level was increased (+ 85%, p = 0.02). Leptin and adiponectin exhibited no change. Conclusion. It appears that exercise, even of low intensity and duration, decreases the body weight via a decrease of food intake, this decrease is induced by changes on hormones that regulate food intake and limit overweight. These results show that exercise in rat is able to counteract weight gain, not through an increase in energy expenditure, but mainly through a reduction of food intake. They are symetrical to results reporting recently in youth that overweight linked to sedentarity was associated with increased calorie intake (Wiecha et al., 2006). References. Wiecha, J., Peterson, K.E., Ludwig, D.S., Kim, J., Sobol, A. and Gortmaker, S.L. (2006). When children eat what they watch: impact of television viewing on dietary intake in youth. Arch. Pediatr. Adolesc. Med. 160, 436-442.

THE EFFECT OF 14 DAYS SUPPLEMENTATION WITH A PROBIOTIC ON CIRCULATING HORMONAL, LEUKOCYTE, AND CYTOKINE RESPONSES TO PROLONGED CYCLING IN MAN

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Prolonged intense exercise has been associated with a transient fall in immune function that is associated with elevated levels of anti-inflammatory stress hormones and cytokines and a heavy schedule of training and competition can lead to immune impairment in athletes, with an increased susceptibility to upper respiratory tract infections (Gleeson, 2005). Probiotics could potentially modify immune function and so could be of benefit to athletes. The aim of the present study was to investigate the effects of 2 weeks of daily oral supplementation of a probiotic (Yakult) on immunoendocrine responses to a bout of prolonged cycling. With local ethics committee approval, 5 trained male cyclists mean (SD) age: 19.6 (±1.3) years, body mass 73.8 (7.6) kg, maximal oxygen uptake 56 (9) m l/ kg/min, training 10-15 h per week, completed the study which was a randomised, double blind, placebo-controlled, crossover design with a 2-week washout period. Each subject consumed 130 ml/day of Yakult probiotic beverage (PRO) or Placebo (PLA), for 2 weeks followed by a 2.5-hour cycle ergometer exercise trial at 60% of maximal oxygen uptake. Saliva (IgA) and venous blood samples were taken before exercise, immediately post-exercise, and 1 h post-exercise for blood leukocytes and lymphocyte subsets (FACScan, CELQUEST software), phorbol myrisate acetate-stimulated neutrophil oxidative burst activity and plasma hormones and cytokines. To compare the two trials a 2-way repeated measures ANOVA was used. Paired t-test post hoc analysis was used where appropriate with the Holm-Bonferonni correction.

Total leukocytes, lymphocytes, CD3+CD8+ and CD3-CD16+CD56+ cells and plasma growth hormone, IL-6 and IL-10 all increased post-exercise to a similar extent on the PRO and PLA trials. Post-exercise blood neutrophil counts and plasma ACTH were higher in the PRO trial compared with PLA (both P<0.05). CD3-CD16+ cells and the CD4+/CD8+ ratio were higher on the PRO trial (main effect of Trial, both P<0.01). Stimulated Neutrophil oxidative burst activity was reduced post-exercise to a similar extent on both treatments. Saliva IgA concentration tended to be higher on PRO than PLA (P=0.06). Thus, 2 weeks supplementation with Yakult had little to no effect on the immunoendocrine response to prolonged exercise. However, potential benefits included an increased circulating CD4+ cells and CD4+/CD8+ ratio which was evident both at rest and post-exercise. This could be interpreted as a potentially beneficial effect of Yakult supplementation for physically active individuals as CD4+ cells fall transiently following acute bouts of exercise and the CD4+/CD8+ ratio falls during prolonged periods of heavy training. A large scale trial is needed to confirm the indication from the salivary IgA data, that Yakult supplementation may boost mucosal IgA.


EFFECTS OF MACA BOOSTER FOOD SUPPLEMENT ON SPORTSMEN’S BODILY ADAPTATION TO PHYSICAL LOADS

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INTRODUCTION

The Maca Booster food supplement (Almonds, Germany), is gaining popularity among sportsmen. Its basic component is the natural plant Lepidium meyenii (Maca). In folk medicine, maca is used to relieve fatigue, to improve metabolism, immune state and endurance, to strengthen the cardiovasculary system (1,2,3). However, these applications lack scientific substantiation. The aim of the present work was to elucidate the effects of the Maca Booster food supplement on sportsmen’s physical capacity and the morphological and biochemical composition of blood.

METHODS

The study cohort involved 18 sportsmen aged 20-22 years. They were administered five capsules of Maca Booster per day. One capsule contained 800 mg of dry maca root powder. The sportsmen were examined before Maca Booster supplementation, after 10 and 20 days of taking the supplement, and 20 days after its termination.

We established: single muscular contraction power ISMCP, and anaerobic elastic muscular power [AAMP], anaerobic glycolytic capacity (AGC), aerobic capacity. Vein blood samples were taken for morphological, biochemical and hormonal analyses.

RESULTS

Over the study period, the absolute SMCP increased from 1997.2±111.1 to 2137.5±107.7 W and the relative SMCP from 25.9±1.2 to 27.4±1.3 W/kg (p<0.05). The relative AAMP index increased from 16.3±0.3 to 17.3±0.4 W/kg (p<0.05). Working power under a 10-s stress load increased from 18.3±0.5 to 20.3±0.5 W/kg (p<0.05). The AGC index increased from 494.8±12.3 W to 530.1±11.0 W (p<0.05). Blood lactate level increased from 13.6±0.5 to 15.5±0.6 mmol/l (p<0.01). After 20 days of Maca Booster supplementation, PWC170 increased on average by 8.8 W (p<0.05).

Under 10 days of the study period the lymphocyte percentage increased from 34.8 to 39.9 %, erythrocyte sedimentation rate became significantly lower. Changes in blood creatinekinase, creatinine, uric acid and urea levels have shown that its supplementation may potentially increase bodily physical abilities.
CARBOHYDRATE INGESTION PRIOR TO SHORT DURATION HIGH-INTENSITY EXERCISE: EFFECTS OF TIMING OF INTAKE AND CARBOHYDRATE CONCENTRATION

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The present study investigated 1) whether high-intensity exercise capacity could be influenced by pre-exercise blood glucose concentration (Part A), and 2) whether graded blood glucose elevation would impact upon high-intensity exercise capacity (Part B). In Part A, seventeen males, and in Part B ten males, performed an initial peak power output (PPO) test, two familiarisation trials riding to exhaustion at 90% of PPO, and 4 (for Part A) or 3 (for Part B) experimental trials involving exercise capacity tests at 90% PPO. In Part A, the 4 trials were conducted following ingestion of either a 6% CHO/electrolyte sports drink or flavour matched placebo administered 30 min (CHO30 and P30) or 2 hrs (CHO120 and P120) prior to exercise. No differences were observed between trials on the 2nd day of ingestion. In Part B, the 3 trials were performed on 3 days at different ingestion of 0%, 2% or 12% CHO solutions. In both parts of the study all trials were performed in a double blind cross-over design in the morning following and overnight fast. Diet and activity in the two days prior to exercise was recorded before the first visit and replicated on all other trials. Mood/arousal, blood glucose, lactate, and heart rate were recorded at intervals. In Part A, CHO ingestion 30 min prior to exercise significantly increased exercise capacity (mean±SD 9.0±1.9 min, P<0.05) compared with all other trials (7.7±1.5 P30, 8.0±1.7 P120, 7.9±1.9 CHO120). A significantly higher pre-exercise blood glucose was observed in the CHO30 trial (8.7±1.3 mmol.L-1, p<0.01) vs. P30 (5.0±0.3), P120 (4.7±0.7) and CHO120 (4.7±0.4). No differences were observed in mood/arousal, heart rate or blood lactate between trials. In Part B, blood glucose was significantly different (p<0.01) at the pre-exercise sample time between all trials (5.2±0.2 mmol.L-1 on 0% trial, 6.7±0.6 on 2% trial, and 8.5±1.3 on 12% trial). Exercise capacity following ingestion of the 2% CHO solution (9.2±2.1 min) compared with 0% (8.2±0.6) and 12% (8.0±1.2) solutions was not different but approached significance (p=0.09). Blood lactate was higher pre-exercise on 12% trial than 0% and 2% with no other differences observed between trials. The mean (95% CI) % improvement in exercise capacity amounts to 16.9 (9.5 to 24.2) % for CHO30 vs. P30 in Part A, and 11.9 (-1.5 to 25.3) % for 2% vs. 0% trials, and 15.0 (-0.8 to 30.8) % for 2% vs. 12% trials in Part B. In part A, improved exercise capacity in the CHO30 trial compared with all other trials appears to be linked to a higher pre-exercise blood glucose since mood changes from pre-drink to pre-exercise were not different and an equal amount of CHO was ingested on CHO30 and CHO120 trials. In part B the tendency for improved exercise capacity in the 2% trial indicates a moderate effect of elevating pre-exercise blood glucose and suggests that there may be an optimal pre-exercise glucose concentration for maximizing high-intensity exercise capacity.

EFFECTS OF L-CARNITINE L-TARTRATE SUPPLEMENTATION ON OGTT INSULIN SENSITIVITY INDICES AND EXERCISE METABOLISM IN LEAN AND OVERWEIGHT/OBESE MALES.

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This study examined the effects of 14 days L-Carnitine L-Tartrate (LC) supplementation on blood glucose and insulin response to an oral glucose tolerance test (OGTT) and submaximal exercise. Sixteen male participants were recruited and assigned to two groups (lean (n=8) and overweight/obese (n=8)). After completing a first visit for a submaximal predictive exercise test, participants attended on three further occasions, in the morning after an overnight fast, for fasting blood samples and 2hr OGTT tests followed by an exercise bout (20 min at 40% of predicted VO2peak). The first test was a familiarisation trial and the final two tests were conducted two weeks apart following 14 days of ingestion of placebo (PL, 3g glucose/day) or LC (3g/day) ingested as 2 capsules 3x/day with meals. Blood was drawn at rest and at 15, 30, 45, 60, 90, and 120 minutes of OGTT and at 10 and 20 min of exercise for analysis of glucose and insulin. Data obtained were then used for determination of usual insulin sensitivity indices (HOMA-IR, AUC glucose, AUC insulin, 1st phase and 2nd phase beta cell function, estimated insulin sensitivity index, and estimated metabolic clearance rate). There was a significant difference between groups for body mass, % fat and BMI with no significant difference in age and height. Mean fasting glucose (5.4±0.2 PL, 5.5±0.2 LC, mmol/L), insulin (13.7±3.5 PL, 13.7±1.7 LC, μuU/ml) and HOMA-IR (2.6±0.6 PL, 2.7±0.4) LC were not different between trials, and no significant differences were observed between groups prior to supplementation. Analysis of the blood glucose response during the OGTT revealed no group effect but there was a time effect (p<0.01) and a trial by group interaction (p<0.01). Highest plasma glucose concentration was observed at 30 minutes in both trials but was significantly lower (p<0.05) at 30 min in the trial after LC (8.5±0.4 PL, 7.3±0.6 LC, mmol/L). AUC glucose was not different between trials but AUC insulin tended to be higher following LC (529±989 PL, 584±1032 LC, p=0.09). AUC estimated 1st phase (821±64 PL, 419±38 LC, μuU/ml and 2nd phase (106±12 PL, 132±8 LC, μuU/ml) beta-cell function were both significantly (p<0.05) greater following LC supplementation. No treatment differences were observed in glucose and insulin response to exercise but a trial by group interaction revealed that plasma glucose was lower after 10 minutes in the lean group (p<0.05) and plasma insulin higher at 20 minutes of exercise in the overweight/obese group (p<0.05). No effects of LC supplementation were observed on heart rate, VO2 or RER during the exercise task. It is concluded that LC appears to induce changes in blood glucose regulation during an OGTT that this may be driven by changes in beta-cell function, and that this response to LC supplementation is not different between lean and overweight/obese. Therefore, further investigation of carnitine action on beta-cell function is warranted.
HYDRATION STATUS OF DOG SLED DRIVERS IN THE FINNMARK DOGSLED RACE

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A continuous dog sled race across the Finnmark plateau in Norway starts in Alta at 70 degrees North, in March every year. The race goes through several checkpoints 4 to 10 hours apart, taking 5-10 days. During the race there are two compulsory stops, and a minimum resting time. The temperature during the race is normally all the time way below freezing, this and the fact that the driver are standing on the sled make it challenging for the drivers to drink. In a study done in the Iditarot dog sled race (1) it was found that the majority of mushers studied showed signs of dehydration. As a part of a project comparing physical strain during the Finnmark race and Iditarot, we wanted to study dehydration during the Finnmark race.

Six male drivers of the Finnmark dog sled race in 2007, volunteered to take urine samples the morning before start of the race, during the race and as soon as possible after the end of the race. The urine samples were analysed for urine specific gravity (Usg) by refractometer and osmolality (Uosm) by freezing point depression, at the University Hospital in Tromsø, Norway.

Dehydration was determined using the criteria of Uosm >900mOsm L-1 and Usg > 1,020.

All together we got only eighteen urine samples. From two of the musher’s we had urine samples from start and end of race. One musher giving three samples, got only half way through the race, a musher participating in the 500km class gave 5 samples. When using the criteria Uosm >900mOsm L-1 one of the musher’s were dehydrated even before the race. All the mushers had urine samples showing signs of dehydration during the race. Two of the musher’s had values below the Uosm criteria at the end of the race, even if they had shown signs of dehydration during the race. When using the criteria Usg > 1,020, three of the 6 musher’s were dehydrated before start, they showed all mild signs of dehydration throughout the race, but one musher had values below the Usg criteria at the end of the race.

The results show that the mushers at the Finnmark dog sled race show the same signs of dehydration as the mushers during the Iditarot References.

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PROTEIN MODIFICATION RESPONDS TO EXERCISE INTENSITY AND ANTIOXIDANT SUPPLEMENTATION

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Background: Several oxidative stress related studies report that exercise and/or antioxidant supplementation can influence concentrations of carbonyl groups on protein (CP) in trained men and women (1, 2). There is also evidence that the redox state of human serum albumin (HSA) is changed in response to exercise (3).

Purpose: To assess the effects of different cycle exercise intensities and 28 week antioxidant supplementation on plasma CP concentrations and HSA modification in trained men. Methods: Trained men (n = 44, VO2max: 55 ± 5 mL o kg-1 o min-1, non-smokers, 34 ± 5 years of age) from a homogenous population of police Special Forces were randomly assigned to perform on a cycle ergometer either at 70% (n = 21) or 80% (n = 23) of individual VO2max for 40 minutes. Each group was further divided in a double blind manner to either placebo or active treatment (JPC) group.

Results: In the placebo group, CP concentrations increased at 80% VO2max IE and 30M, returning to pre-exercise concentrations by 30H (P < 0.05). At both 16 and 28 weeks, the placebo groups showed significantly higher BE- and 30H CP concentrations than the JPC groups (P < 0.05). The reduced fraction of HSA, human mercapt albumin (HMA), decreased at all 4 exercise tests at both exercise intensities IE and 30M, returning to pre-exercise values by 30H (P < 0.05). The modification of HSA was more pronounced in the 80% exercise intensity groups (P < 0.05). Supplementation had no influence on HSA.

Conclusions: These results indicate that CP concentrations increase with 80% VO2max intensity and respond to antioxidant supplementation. The JPC groups had lower baseline CP levels after 16 and 28 weeks and attenuated exercise induced CP increase. The HSA redox status is reversibly shifted to a more oxidized state by recent intense exercise, independent of antioxidant supplementation. References:


EFFECT OF SODIUM BICARBONATE SUPPLEMENTATION ON TENNIS SKILL PERFORMANCE AFTER A SIMULATED MATCH

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The accumulation of H+ is one of the major causes of fatigue. It has been shown that NaHCO3 supplementation may increase extracellular buffer capacity, reduce exercise-induced H+ accumulation, and enhance exercise performance. The aim of this study was to investigate the effect of NaHCO3 supplementation on skilled tennis performance after a simulated tennis match. Nine male college tennis players were recruited (mean age 21.78 years, height 173.11 cm, weight 67.97 kg). Each subject completed a bicarbonate trial (BIC) and a placebo trial (PLA) in a randomized order, separated by one week. Subjects performed 2 tennis skill tests before and after the simulated game in each trial. The skill test evaluated the accuracy and consistency of service and ground stroke to both sides of the court as previously described (Davey et al, 2002). The simulated match consisted of 12 games. Each game contained 36 hit balls, including forehand and backhand ground strokes and volleys. The subjects consumed NaHCO3 (0.3 g/kg) or placebo (NaCl, 0.209 g/kg, equal amount of Na) 70 min before the first skill test. Each subject also ingested 0.1g/kg NaHCO3 or 0.7g/kg NaCl after the third game of the simulated
match. Biochemical parameters in arterialized venous blood were measured by autoanalyzers. There were significant time and trial \( x \) time effects in plasma lactate concentration. Lactate concentrations were significantly increased after both trials with BIC showing higher increase (pre-match: \(1.22 \pm 0.54\), post-match: \(2.17 \pm 1.46\) in PLA, pre-match: \(1.25 \pm 0.41\), post-match: \(3.21 \pm 1.89\) mM in BIC). The significant trial, time, and trial \( x \) time effects were present in bicarbonate concentration. Bicarbonate concentration remained unchanged after PLA but was significantly elevated after BIC (pre-match: \(27.99 \pm 2.02\), post-match: \(26.37 \pm 3.50\) in PLA, pre-match: \(28.84 \pm 2.16\), post-match: \(37.98 \pm 3.95\) mM in BIC). Trial, time, and trial \( x \) time effects were significant in OxyBE. OxyBE was significantly lower after PLA (pre-match: \(2.46 \pm 1.68\), post-match: \(0.12 \pm 2.15\) mM) but was significantly elevated after BIC (pre-match: \(3.08 \pm 1.47\), post-match: \(11.36 \pm 3.70\) mM). The trial, time, and trial \( x \) time effects were also significant in blood pH. Blood pH remained unchanged after PLA but was significantly elevated after BIC (pre-match: \(7.37 \pm 0.32\), post-match: \(7.37 \pm 0.14\) in PLA, pre-match: \(7.37 \pm 0.26\), post-match: \(7.45 \pm 0.63\) in BIC). In the skill test, significant trial \( x \) time effect was present in service consistency. The service consistency was significantly decreased after the simulated match in PLA (pre-match: \(8.56 \pm 2.83\), post-match: \(5.56 \pm 3.00\)), but remained unchanged in BIC (pre-match: \(7.00 \pm 2.78\), post-match: \(6.89 \pm 3.14\)). The results suggested that NaHCO3 supplementation could increase extracellular buffer capacity and increase skilled tennis performance after a simulated match.

References

AWARENESS OF SPORTSMEN AND SPORT SPECIALISTS ABOUT USE AND INFLUENCE OF DRUG SUBSTANCES AND SUPPLEMENTS
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The use of drug substances and supplements in professional and non-professional sport is influenced by the following factors: 1) the commercialization of professional sport, 2) the possibility to obtain drug substances and supplements, 3) information of various drug substances and supplements quasi positive effects on the results without explaining consequences of influence of these substances on the organism. Although information about influence of drug substances is accessible (Porterfield, 2007) and there are descriptions of famous sportsmen whose career have come to an end with using of doping the use of pharmaceutical substances in Latvia sports is a serious problem. One of the prevalent used groups of forbidden substances is androgen anabolic steroids. The aim of the work was to summarize and analyze the knowledge of Latvian professional sportsmen, non-professional sportsmen, sport specialists (coaches and sport teachers) and sport physicians about pharmacological drug substances and supplements, use of these substances and consequences connected with it. The questionnaire of professional sportsmen, non-professional sportsmen, sport specialists and sport physicians was carried out. The results of the questionnaire showed, that 80% professional sportsmen, 25% coaches, 17% sport physicians and 13% non-professional sportsmen have been contacted with the use of drug substances (doping). The main reasons of the use of drug substances are the necessity of endure strain for a long time, necessity to reach high results and keep good fit for a long time and often traumatism in professional sport. Nobody of secondary school sport teachers have been contact with the use of doping. The majority of questionnaire persons have been experience in the use of food supplements. The results of the questionnaire showed, that the majority of professional sportsmen, coaches and sport physicians could adequately assess the influence of drug substances on organism but the majority of non professional sportsmen have not enough knowledge about the influence of drug substances on organism and consequences of using drug substances. Interview with professional sportsmen demonstrated one of the ways of distributing pharmacological substances by companies: sportsmen receive products without of charge but they must suggest using these products for visitors of fitness clubs. Informative materials about drug substances (doping) and food supplements as well as information about influence of using these substances on organism are essential for sport organizations, fitness clubs and schools in order to obtain non professional sportsmen and students with better information about problem of using drug substances (doping) and food supplements.

References

MUSCLE GLYCOGEN DEPLETION AND BCAA SUPPLEMENTATION IN TRAINED RATS: CONSIDERATIONS ABOUT PURINE NUCLEOTIDE CYCLE AND MALATE-ASPARTATE SHUTTLE
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Introduction
BCAAs are oxidized directly in muscle during exercise. In intense activities, when glycogen stored might be depleted, BCAA carbon skeletons are oxidized and the amino groups, released by muscle in a greater extent. Fast-twitch muscle fibers seem to enhance AMP deaminase activity transporting NH3 to muscle. The aim of this study was to verify if BCAA supplementation in trained rats submitted to glycoen depletion and intense exercise influenced some reactions regarding PNC function and Malate-Aspartate Shuttle.

Methods
40 male Wistar adult rats were divided into 5 groups (BCAA, ISOleucine, LEUcine, VALine, PLAcebo) and were trained using a swimming protocol of 8 weeks, 1 hour a day, 5 days a week, with a 5 % load attached to their tails. In the sixth week, they performed anaerobic test (treadmill). Then they were given BCAA for the last 7 days (166 mg/kg weight/day). One day before the final experiment, they trained 1 hour, and were kept fasted during 24h to deplete glycogen stores. The final test consisted in swimming for 10 min without any load on their tails and then to swim with a 7 or 8% load according to their lactate threshold until fatigue. They were euthanized, blood and tissues were collected and kept in liquid N2. Muscle glycogen (MG) resistance to fatigue (s). Muscle Aspartate Amino Tranferase activity (AST), FUMurate and MALate levels were measured.

Results
Exercise performance was not different among experimental groups, regardless of their supplementation. MG was lower in LEU group when compared to PLA. FUM levels featured no differences in our experimental groups either. MAL in BCAA group was significantly higher compared to all other experimental groups. AST activity was statistically different higher in ISO group compared to PLA.

Discussion/Conclusion
Muscle contraction as observed in anaerobic metabolism activates AMPdeaminase, resulting in a higher aspartate and GTP uptake to reaminate IMP to S-AMP. This might explain a higher AST activity in ISO group. LEU group, due to leucine greater oxidation in muscle, might have higher NH3 muscle levels, leading to a PK activity enhance and thus favouring glycolysis. It seemed that some PNC cycle
and Malate-Aspartate shuttle reactions had an important role, regulating aminoacids and carbohydrate metabolism during intense exercise.

References.

NUTRITIONAL ADVICE BASED ON REPETITIVE COMPLETION OF A FOOD DIARY CAN IMPROVE NUTRITIONAL HABITS OF YOUNG ATHLETES

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Introduction
Healthy dietary habits acquired at young age play an important role in sports performance and health maintenance (Meyer, 2007). Repetitive food diaries are preferred to estimate dietary habits (Willett, 1998).

Aims
To estimate the dietary habits of Flemish adolescent top track sprint athletes and to give nutritional advice towards a healthier sports diet.

Methods
According to Flemish Athletics League rankings, top 10 boys and girls of each sprint discipline were invited for voluntary participation. In summer and winter of 2006 and 2007, a 7 day food diary was administered. Individual nutritional advice was provided after each analysis, done by the same investigator using the Becel food-program BINS 3.0. Mean intake values as obtained by the four diaries were compared using the ANOVA procedure. The significance level was set at $p < .05$.

Results
The four food diaries were completed by 24 girls and 22 boys (age at start respectively 14,8 ± 1,6 and 14,7 ± 1,7 yrs). Total energy intake (TEI) did not change for both sexes. Protein intake expressed as percentage of TEI ranged between 14,7 ± 2,5% and 15,8 ± 1,8% in girls and 13,3 ± 1,6% and 14,8 ± 2,0% in boys. In girls, fat intake expressed as percentage of TEI was significantly higher in the first survey (29,0 ± 4,9%) than in the second (28,7 ± 4,4%) and fourth survey (28,8 ± 4,9%). In boys, percentage of total fat intake in the first survey (31,7 ± 5,1%) was significantly higher in the first survey than in the three following surveys.

For all macronutrients, a trend towards healthier intakes was observed. Higher intakes for fibre and polysaccharides expressed as percentage of TEI indicate better choices in carbohydrate sources. Moreover the lower percentage of total fat intake after nutritional advice is an indication of a better balanced diet. In conclusion, single nutritional advice on an individual basis has a positive effect on the adolescent athlete's diet, but repetitive advice can induce further improvements.

References.

Poster presentations (PP)

PP-PE01 Physical Education 1

TRACKING OF MOTOR COORDINATION OF CHILDREN FROM THE AZORES ISLANDS

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Tracking of Motor Coordination of Children from the Azores Islands.
The aim of this study was to investigate the tracking of motor coordination in children of both genders from the Azores islands, Portugal that were followed longitudinally during 4 years. A stratified random sample of children from 7 to 10 years of age from four of the most populated islands of the Azores archipelago was chosen (142 girls and 143 boys). Annual Measurements were taken at the beginning of each academic year. Motor coordination was assessed with the KTK test battery consisting of four tests: balancing backward (BB), hopping in one leg (HO), jumping sideways (JS) and shifting platforms (SP). A general coordination score (GCS) based on the weighted sum of the four tests was also available. Intraclass correlation was used to estimate reliability. Tracking was computed in two different ways: (1) auto-correlations in each test as well as in GCS; (2) of Foulkes & Davis requiring the use of the best fitting model that describes intra-individual trajectories in inter-individual crossover over the 4 years. Systat 11 and LDA softwares were used in data analysis.

Reliability estimates ranged from 0.58 to 0.83 in all tests. Auto-correlations across the 4 time points ranged from 0.27 to 0.59 for (BB) for girls, and from 0.27 to 0.66 in boys, in JS from 0.52 to 0.63 in girls, and 0.60 to 0.74 in boys, in SP, from 0.28 to 0.44 in girls, and 0.17 to 0.52 in boys, in HO, from 0.16 to 0.74 in girls, and 0.39 to 0.73 in boys. For girls, Davis in girls ranged from 0.43 to 0.54; in boys, values ranged from 0.29 to 0.54. GCS auto-correlations ranged from 0.66 to 0.80 in girls and from 0.51 to 0.79 in boys: of Foulkes & Davis estimate was 0.59 for both gender.

In conclusion, individual coordination tests showed low to moderate values, but general coordination scores evidenced moderated to high values. There is also evidence of crossing of interindividual trajectories over the four years suggesting some random variation in coordination development that requires adequate attention from teachers of physical education. Moreover, and given that not all children develop coordination at the same rate, careful didactical programming of physical education classes must be developed so as to reach the diversified capabilities of all children.
SUBSTANCE USE AMONG TEENAGE GIRLS

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The development of a healthy lifestyle during adolescence is a complex and evolving process. The continued integration of our global society has caused a shift in human social interaction and redefined the contexts of adolescents’ lives. Adolescents are inundated with a variety of choices at a stage of their lives where they are trying to create their own identity and are often faced with a number of crises and dilemmas. Adolescent girls grapple with life’s complexities and there is considerable evidence supporting the idea that health risk behaviours amongst adolescents is in fact mounting. Research has shown that health risk behaviours among Coloured adolescent girls prevail in Worcester, a region in South Africa.

Youth tend to engage in behaviour that has an impact on their health status and make them vulnerable to poor health. These risk behaviours include violence, cigarette smoking, alcohol and drug use and abuse, irresponsible sexual behaviours, unhealthy eating behaviours and physical inactivity that place adolescents at an increased risk for premature morbidity and mortality.

This paper explores the health risk behaviours associated with cigarette smoking and alcohol and drug use among a selected group of teenage girls. The sample population (N=1 805), between the ages of 13 and 16 years, was selected from three previously disadvantaged high schools in the Worcester region. They completed a questionnaire based on the Youth Risk Behaviour Survey (YRBS) (NCCDPHP, 2004). The results indicated that 60% of the respondents had smoked a cigarette, 65% had consumed alcohol and 11% used dagga. Substance use among teenagers is a grave concern and intensified efforts are needed to address this social ill.

This study’s results cannot be generalised, but it does indicate a possible direction for further exploration. It may also serve as a starting point for an early multi-dimensional intervention. Adolescence presents an opportune time for intervention. Not intervening at this point is to miss an ideal opportunity!

NEW TEACHING METHOD IN HURDLE RUNNING IMPROVED PERFORMANCE BETTER AMONG ELEMENTARY SCHOOL 6TH GRADERS

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We compared the effects of two methods of teaching elementary students in a hurdle class. One is a new method of teaching hurdle running with maximal interval run velocity and with minimal deceleration during hurdling. And it was emphasized that a forward take-off and clearing the hurdles with the trailing leg parallel to the trunk simple hurdling form and to run in a three-stride rhythm. The other is a general method of teaching hurdle running. That is, it was emphasized to run over the hurdles, trail the back leg parallel to the ground during clearance and run in a three- or five-stride rhythm with maximal interval velocity. We refer to the former method as the new teaching method and the latter as the common teaching method in this study.

We divided elementary school 6th graders (26 boys and 16 girls) who had little experience in hurdle running into experimental (13 boys and 8 girls) and control (13 boys and 8 girls) groups that were taught using the new and common methods, respectively. Each class comprised 4 days. The effects were compared as performance in pre and post-40 meter hurdle test filmed with seven cameras operating at 60 Hz. We analyzed hurdling velocity, interval run velocity, hurdling distance, step length, and hurdling time required to finish the race. The main findings were as follows:

1) The hurdle running records improved in all of the students in the experimental group (t = 7.23, p < 0.01), but in 69% of the control group (t = 1.20, n. s.).
2) Post-test hurdling velocity in both groups significantly increased (experimental vs. control group: t = -3.24, p < 0.01 vs. t = -2.57, p < 0.05), while interval run velocity significantly increased in the experimental group (t = -4.03, p < 0.01).
3) Both hurdling and landing distances significantly increased in the experimental group in the post-test (t = -3.59, p < 0.01 and t = -4.01, p < 0.01, respectively), while the control group did not (t = -1.81, n. s. and t = 1.46, n. s., respectively).
4) Hurdling time in the control group significantly decreased in the post-test (t = 2.56, p < 0.05), but the experimental group did not (t= 1.25, n. s.).

These findings suggested that the new teaching method is more effective in improving hurdle running records, hurdling velocity and interval run velocity, because all of the students ran faster after teaching with an emphasis on simple hurdling form.

EDUCATIONAL USE OF HEART-RATE-MONITORS IN PHYSICAL EDUCATION

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Heart-rate-monitors (HRM) are widely used tools in sports and exercise training. Mostly this device is used in a purely functional approach such as to give objective information about the exercise response. Unfortunately, this approach has also been assumed for the application in physical education lessons (3). However, the educational approach should be primarily targeted in young pupils respecting the special needs of this group (1, 2). The physical education curriculum of secondary school demands to give pupils the possibility to train the perception and knowledge of their own bodies and is therefore not only characterized by a purely functional approach typical for athletic training (2). Aim of this study was therefore to develop playful applications of HRM use in physical education lessons in secondary school. Several applications were investigated in 56 pupils of a secondary school (age: 11.3 ± 0.5 yrs; height: 155.1 ± 6.0 cm; weight: 45.5 ± 10.7 kg).

1) PLAY with HRM: Lessons to become acquainted to the HRM in a playful form and to learn how to use them properly
2) LEARN with HRM: Lessons to learn about the own body’s response to various forms of exercise
3) EXERCISE HRM: Lessons to learn about classmates and teachers body’s response to various forms of exercise

For example: One lesson was called Find your feel-well-zone. Pupils performed using an effort evaluation sheet and determined their subjective heart rate related to each of seven effort pictures. In order to be able to master this task, children are supposed to assess their own bodies and judge their feelings at different heart rate values. This application type was tested in physical education lessons. Children moved for 11.6 ± 2.6 minutes with an average heart rate of 158.4 ± 10.3 beats/min (76.1% HRmax) until they valued all of the assigned pictures. Performing in this game, children had great fun to complete an age-appropriate endurance training within an aerobic intensity range, without recognizing the teacher’s intention to perform endurance training.

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COACHING EDUCATION THROUGH A VIRTUAL WORLD LEARNING ENVIRONMENT: A TEAM HANDBALL CASE IN SECOND LIFE

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INTRODUCTION: Life Long Learning (LLL) is a concept which is with no doubt associated to the evolution of society as we know. It’s a need for a more competitive and cooperative communities, citizenship, and a more equal participative democracy. The outstanding development of new technologies and communication in the last decades in conjunction with the improvement of the well being and accessibility of and to the general people, promoted the LLL. The new technologies made LLL available for everyone, providing accessibility and knowledge achievement everywhere, anytime, about almost everything, based on Web 2.0. Nowadays, new possibility emerges everyday, based on 3D virtual worlds; where there’s a scientific need to confirm the relevance and utility of this new tool to the improvement and development of a more competitive human capital. Virtual worlds play an increasingly important role in the development of innovative and effective teaching and learning strategies. The virtual world of Second Life (SL) has the most active residents, by the distinguish and innovation of the conception of contents and for being referenced by the most distinguish higher education and research institutions development in the world.

PURPOSE: The aim of this study is to analyze the context of interaction between student and teacher, in a lecture on the 3D virtual world of SL.

METHODS: We organized a webinar in a classroom in SL provided by Beta Technologies. The students (coaches) enrolled (n=30) were selected by the highest degree in team handball coaching in Portugal, which means at least 6 years of coaching. The instrument was the channel of communication between lecture and coaches: a written chat. The chat conversation was automatically recorded in a log file. We used the method of content of analysis to analyse the chat conversation.

RESULTS AND CONCLUSIONS: (a) The most representative categories were: direct instruction, feedback and affection; (b) it was possible to verify that the majority of the interaction was direct instruction and feedback; (c) there was an easy interaction and affection among all participants that gathered a closer and active participation; (d) coaches had many simultaneous interventions related to the subject of the webinar, that could be all answered; (e) it was also possible to observe that the lecture could enhance and follow the programmed presentation and attend to consult simultaneously other resources in real time, to clarify with more precision the doubts of some students; (f) further investigation is needed to verify these qualitative results of the content analysis between the interaction of coaches and lecture in others sports and in the virtual world of Second Life and future studies should use voice to verify the interaction between students and lectures and to test the limitation of this tool in the virtual world of SL.

THE PROMOTION OF HEALTH-RELATED FITNESS IN PHYSICAL EDUCATION: COMPARISON OF 45 VERSUS 90 MINUTES PHYSICAL EDUCATION CLASSES

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Introduction: Physical Education (PE) is recognized as the most widely available resource for promoting physical activity (PA) among young people. In Portugal, the time allocated for PE in 7th to 9th grade is 135 minutes a week and in grades 10th to 12th is 180 minutes. Each school PE department can decide how to use this time. The PE curriculum suggests three 45 minute lessons, or two 45 minute lessons plus one 90 minute lesson during non-consecutive days of the week. However, no evidence exists to support this suggestion or to determine if it is followed.

Objective: We have conducted a case study focused on a secondary school PE department, aiming to quantify the lesson time spent by students in moderate to vigorous PA during 45 and 90 minutes classes and to determine their quality.

Methods: The quantity and the quality of PE were determined by heart rate (HR) monitoring and using the SOFIT. The HR of 4 students from 6 teachers was assessed during 6 lessons (3 of 45 minutes and 3 of 90 minutes). HR was recorded using a Polar system which scored HR at 5-second intervals. On a rotational basis, the PA levels of those students, as well as the lesson contexts in which they occurred, and teacher behaviours, were also observed and coded throughout each lesson, using momentary time sampling (SOFIT). To process this data two analysis were completed. The first analysis was made in reference to the students, establishing an individual comparison of different classes. After this, an analysis was made in relation to the teachers.

Results: The average HR was 133.5 (±18.6) for 45 and 130.6 (±8.6) for 90 minutes classes. The results from SOFIT and HR monitoring showed that the teachers have dedicated 59.6% and 56.5% of their class time in activities with moderate to vigorous intensity, respectively to 45 and to 90 minute lessons. In 45 minute class lessons, 16.8% of the time was dedicated to the promotion of fitness and 32% to games. These percentages are superior to those of the 90 minutes class lessons 14.7% and 28.3%, respectively. As for PA intensity, despite the fact that there were no significant differences between the 45 and 90 minutes class lessons, it could be observed that during 45 minutes there is a tendency for student HR to exceed 140 bpm for a longer time period. The results of the cluster analysis showed that games were the activities that characterize classes with moderate to vigorous intensity. A HR between 140-160 bpm is correlated with the time dedicated to fitness (r=0.64).

Conclusion: No differences were found between the 45 and 90 minute class periods, suggesting that from a pedagogical viewpoint, both options are adequate. From the SOFIT it was possible to verify that the activities with vigorous intensity happen in the periods in which the teacher had that intention, namely in the periods of fitness exercises and games. Thus, as for all teaching activities, the intensity of classes requires planning by PE teachers.
The burnout syndrome in Slovenian PE teachers
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People, working in professions with intense involvement with other people, are continuously exposed to factors that threaten their psychological and physical stability. The chronic stress finally leads to burnout, a state of physical and emotional exhaustion as well as attitudinal change. Among others, teacher profession is one of the most threatening. Burnout syndrome has a large negative influence on teachers' state of mind and consequently on pedagogical work and educational process. In Slovenia, the burnout syndrome has not been thoroughly researched among teachers yet, and there is no study among PE teachers. The aim of this work is to explore the burnout syndrome among Slovenian PE teachers, focusing on the impact of sociodemographic factors, stressors, and strategies for coping with stress. The study sample consists of 54 PE teachers, selected on voluntary basis. They answered the questionnaire, consisted of 4 parts: (1) personal data and data about the work environment, (2) Maslach burnout inventory, which assesses emotional exhaustion (feeling drained and tired), depersonalization (impersonal response toward students) and personal accomplishment (feelings of incompetence and ineffectiveness), (3) stressors scale and (4) strategies for coping with stress. The basic statistical analyses were conducted, followed by the comparison with research results of Slovenian and some other foreign countries. The results show that Slovenian PE teachers are less burnt out than Slovenian teachers in general, the statistical differences are significant. We assume that those differences relate to different personal traits and different strategies for coping with stress. The majority of PE teachers listed as strategies for coping with stress sport activities, psychological relaxation (SPA, meditation, talking about problems with important others...) and good preparation for classes. Nevertheless, the assumption cannot be confirmed because no research has been done yet in that direction. The most influential stressors for PE teachers are the complex and demanding work, students' bad working habits, involvement in different obligations at once, educational reforms and great responsibility for others. Further research of prevention programmes are pointed out.

Poster presentations (PP)

PP-PE02 Physical Education 2

The level of parents' education in the question of the correct bearing formation for the preschool age children.
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Nowadays there is a very serious problem of children's health formation in the preschools. Insufficient physical development, weakness of muscles and ligamentary system, disbalance of muscles and different transgressions of normal movement stereotype - these are the reasons of serious disturbances of children's bearing, and in Latvia they are observed more and more often in the preschools. The data of health statistics and medicine technology state agency in 2006 about 3-14 year-old children, scoliosis and other disturbances of weight bearing show that every year the number of children with scoliosis or other disturbances of bearing grows. The number of children with scoliosis grows 30.5 of 1000 examined children of corresponding age in 2006, compared to 28.4 children in 2005 (disturbances of bearing kyphosis deflected spine 0.5%, lordosis 0.2%, correct bearing 14.3%).

The prophylaxis of motion system's early disturbances of preschool age children is an important medical, pedagogical, economical and social problem. To make children's health sound and robust educators, parents and medical workers have to collaborate. The solution of this problem depends on values in the family, on the level of erudition of parents and educators and in the conditions of health, on the healthy way of life in the family and on that fact if the adults understand their responsibility in respect of children in the question of their health. The limited level of knowledge and acquirements in the question of health is a serious obstacle in the solution of this task and in the question of health protection.

The aim of the study was to clarify the level of parents' and educators' theoretical and practical knowledge about the problems of formation of children's bearing and their attitude towards them. Study of literature, analysis and questionnaires have been used as researching methods. To clear up the theoretical and practical knowledge of parents in the formation of children's bearing the questionnaire has been conducted. The questionnaire of Yuri Bokovsky has been taken as a basis. The parents of 3-7 year-old children have participated in the survey. Three hundred and eighty parents have been questioned.

The results of the questionnaire showed, that the parents have not got enough knowledge in the question of the formation of correct bearing. Only 8.6% of the questioned parents have the high level of knowledge. 31.6% of the parents have the mean level, but 59.8% have the low level of knowledge. This study let us to conclude that educational direction provides systemization of knowledge and first of all forms the attitude to the problem.

Hyperactivity and attention deficiency among elementary schoolchildren in comprehensive schools
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Hyperactive-child syndrome accompanied with attention deficiency is the main reason of school dysadaptation. There are three types of the disorder: syndrome combining both hyperactivity and attention deficiency, attention deficiency syndrome without hyperactivity and hyperactive-child syndrome without attention deficiency. Developing of effective preventive and rehabilitation measures for such children is one of the live issues of child and adolescent remediation. The aim of our research is to detect the occurrence of the syndrome among the pupils of primary schools in Slavyansk-on-the Kuban and Volgograd. A special questionnaire for parents was developed to detect the hyperactive-child syndrome among 5-15 year-old children and teenagers (Zavadenko N.N., 2005).

During the survey 1467 parents, whose children attended 39 primary schools in Slavyansk-on-the Kuban and Volgograd were questioned. Before participating in our survey only 14% of parents believed that their children need the consultation of a neurologist because...
of serious cognitive dysfunction and behavioral problems. Parents did not see any specialist though, explaining their actions by business, fear that everybody would know about the visit to the doctor and their child would suffer social ostracism. About 19, 9% parents thought that their child had real problems with studies and behavior. They took the view that these problems would disappear when the children grew up without any help. Finally 66,1% of parents fully denied that their children had any psychoneurological problems and rejected any psychologist consultancy or medical assistance and said that they could manage the problem without any help.

According to our research 10% of primary schoolchildren have clinical presentations of the hyperactive-child syndrome. The structure of mostly slight psychopathic disorders allows us to claim that these disorders have organic nature. We can’t help mentioning the fact that 56% of parents have changed their opinion and strongly intended to see a psychoneurologist.

BIOMEDICAL PROVISION OF PHYSICAL TRAINING FOR PRIMARY SCHOOLCHILDREN
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Introduction.
Recently physiologists have faced some problems connected with organization and biomedical provision of PT-lessons for primary schoolchildren. These problems were caused by growing discrepancy between school physical education demands for higher level of health advocacy on the one hand and absence of scientific knowledge for successful development and implementation of new technologies on the other hand.

Our research is aimed to find the proper system of biomedical provision of physical training for primary schoolchildren in Slavyansk-on-the Kuban. The research was carried out from 2005 to 2007.

We stated the following research problems:
1. Work out methods allowing teacher to control the physical fitness of 7-10 year-old children taking into account their physical growth and development.
2. Study the programs of physical education for primary schoolchildren.

We used the following methods of investigation: anthropomorphic measurements, questionnaire survey, teacher monitoring, testing of PT-instructors’ professional skills, testing of children’s physical fitness, medicobiological testing, pulse frequency measurement, educational experiment, methods of mathematical statistics.

Results and Discussion.
The physical training system for primary schoolchildren has been developed; the emphasis was put on exercise tolerance, physique-builders and physical stunts. To increase children’s endurance we recommended cyclic exercise with exercise time exceeding gradually from 1 to 10 min with pulse rate at 130-150 bpm, interval cyclic exercise performed for from 10 to 18 min varying in speed and intensity and special outdoor games.

An effective biomedical provision of physical training for schoolchildren should include the following stages: a) practical application of modern diagnostic tests for health status assessment, ancillary qualified examination of children belonging to risk-group; b) development of individual and group rehabilitation programs; c) reasoned medical group distribution of children; d) exclusion of physical exercise with injury risk from the program; e) cooperation of various experts for organizing of acute biomedical control of children’s health; f) introduction of methods allowing to estimate the results of physical education instructors’ work for improvement of children’s health and development of an incentive plan for teachers who achieved the best results in sport and recreational activities.

Conclusions
Physical education of primary school children should be altered. Poor physical growth and development of 20-40% of 7-10 year-old children disclosed during our research proves this fact.

BURNOUT AND JOB SATISFACTION LEVELS OF PHYSICAL EDUCATION TEACHERS: A GENDER DIFFERENCES
Approach
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For any process to succeed, is it not essential to actually it to feel happy, to like what he/she is doing and feel that it is useful? In this context the purpose of this study is to evaluate and to specify the level of the job satisfaction Level and the state of BurnOut of the physical education teachers in TRNC-Turkish Republic of Northern Cyprus.

During this study all the P.E. teachers employed in TRNC during the period of 1st of April-30th of June 2007 were targetted as test subjects.

All the data was collected by face to face contact according to “Maslach Burnout inventory” and “Minesota job satisfaction” processes. 105 questionaires were received and evaluated. Statistical technics was employed in evaluation. The difference between the female and the male subjects and the difference in length of employment were processed by t-test method. All the data was processed by using SSPS 12.0 data processing program. Error level of p<0.05 was accepted.

The findings of the study was as such: In general Burn out below an acceptable level was not found among the P.E. teachers. The female subjects was in a state of more sentimental burn out than the male P.E. teachers (p<0.05) while the male subjects and the female subjects had started their profession in a more Burned out state then the female subjects (p>0.05). In this respect the P.E. teachers’s job satisfaction level was high enough to carry on doing their job and to contribute to education. The Burn out level of the teachers was not high enough to stop them from claiming their responsibilities or avoid spending enough time for their job. Going into detail on the basis of gender, there seems to be a slight difference in Burn out level but it is not a major difference and more detailed studies within male and female groups and also on personal level can be done as a result.

References.
EFFECT OF FATIGUE COMPLAINTS ON SALIVARY CHROMOGRAININ A LEVEL IN JUDO TRAINING AND LECTURE IN STUDENTS

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Effect of fatigue complaints on salivary chromogranin A level in judo training and lecture in students. Kunihiro Sakamoto, Naomasa Sakamoto Preventive Medicine, Hyogo College of Medicine, Japan

Introduction: In previous study, the effect of judo and lecture on the change rate of salivary chromogranin A (CgA) level were examined. The degree of stress of judo was 1.4 times more than that of lecture. Those who complained of yawning and sleepiness at fatigue survey showed the increased change rate of CgA. In this study the relation between salivary CgA level and complaint items of fatigue survey were analyzed.

Methods: Subjects were eight healthy male students, nonsmoker, average age 24.75 years old and standard deviation 7.94 years old. Salivary collection and fatigue survey were down three times at attend school, after first lesson and after second lesson. The fatigue survey was consisted of three categories that contained 10 complaint items in each category. Ist category was physical fatigue complaints, IInd category was psychiatric fatigue complaint and IIIth category was neurosensitive fatigue complaints.

Results and discussion: The complaint items of fatigue by judo and lecture lesson were examined using fatigue survey. Normal fatigue pattern of those three categories was a type of I>III>II in the order of the frequency of the fatigue complaint items in each category, and this pattern was 80.0% of this subjects. After Judo lesson, the complaint rate of fatigue items in lst physical fatigue category was 87.5%, and the complaint rate of fatigue items in IIIth neurosensitive fatigue category was 25.0%. After lecture lesson, the complaint rate of lst category was 87.5%, and the complaint rate of IIth category was 12.8%. Thus Judo lesson tended to show higher level of the neurosensitive fatigue than that of the lecture lesson. Salivary CgA levels were 1.141±0.873pmol/mgprotein at attend school, 1.007±1.095pmol/mg after judo and 1.058±1.209pmol/mg after lecture lesson. CgA level after judo lesson tended to decrease from the level of at attend school.

Correlation coefficients (r) between CgA level and the complaint items of fatigue were analyzed as follows, r=-0.255 for body languid, r=0.304 for yawning, r=0.309 for sleepiness, r=0.244 for feeling to lid down, r=-0.294 for heavy head and r=-0.348 for lumbago. Thus, CgA level was tend to show a positive correlation to the parasymptathic condition. The effects of the complaint items on CgA level were analyzed by multiple regression method. The standard partial regression coefficients of CgA level to the complaint items of fatigue were examined by multiple regression analyses. Those values were 0.459(p<0.02) for body languid, 0.473(p<0.02) for sleepiness, -0.447(p<0.05) for lumbago, and -0.560(p<0.03) for thirst. Thus, subjects who complained body languid and sleepiness showed high CgA level.

As a result, it seemed that salivary CgA level tended to sho

THEORETICAL DISCOURSE OF SPORT EDUCATION IN THE CONTEXT OF A HUMANISTIC PARADIGM OF EDUCATION

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There are major changes that are taking place in our contemporary society. The changes in education has to do with the attempts of integrating humanistic and sustainable ideals in the current educational practice. The current programs of sport education in Latvia has a clear tendency towards integrating the humanistic approach in education.

In all humanistic theories a human person is seen as the highest value. All what brings benefit to a person - holistic upbringing, taking in account person’s needs, his/her health and a well being is what meters the most. Any action even if it is efficient, but not orientated towards a well being of a person- one’s self development and self-realization is viewed as anti-human, no matter whether it is a sphere of sport or any other sphere of work. Humanism allows one to reevaluate processes in education and the attitude towards a human being. Particular attention in this article is paid to the education of sport. The current article focuses on a number of question about the education as viewed through the lenses of humanistic pedagogy, as well as on fostering humanistic and spiritual values in sport education.


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Judo is a wide-known sport in Brazil, praised not only for the competitive context but also for the educative values that it implies. As well as all the society segments, sports also takes advantage of the technologic development that are of great help in the physical preparation, the clothing or the pedagogical processes. The objective of this study was to verify if children that practice Judo (white band, who had used other materials (like CD-Rom), would have better grades than the children who had used the traditional method in the examination to get the gray band. In order to do this, 12 Judo-practicing children had been selected. They were 9- and 10-year-old children, were ready for the examination for the gray band and had been trained by the same teacher. The control group consisted of children of the “Project Future” (three girls and three boys) that had participated on the conventional training of Judo. Children of the “late Club” Academy of Londrina (three girls and three boys) were the experimental group that, besides the conventional training of Judo, had also used multimedia materials. The data collection was carried out resorting to a test for theoretical evaluation, a video (practical filming) was also watched and a transcription was made to a test of practical evaluation. For the statistic analysis, the Mann-Whitney test was used to compare the averages reached by the two groups, with significance of 5%.

The results reached in the Mann-Whitney test in the evaluation of the theoretical part (p = 0.025 < 0.0) and of the practical part (p = 0.031 < 0.05) had been statistically significant for the experimental group in comparison to the control group. This leads us to infer that, in the groups studied, the reinforcement done by the multimedia materials influenced positively in the Judo-learning process.

PERFORMANCE OF BALANCE BEAM TASK OF K.T.K. BATTERY: BY PEOPLE WITH MENTAL DISABILITY

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The Motor Coordination description of mentally disabled people has been scarcely studied and few references can be found about it. Evaluations are essential when choosing the Physical Education programs for people with intellectual disability. Before that, however, the
professional in this area must know how to classify the information obtained from such evaluations. To analyze the progress of individuals with intellectual disability from 6 to 11 years of chronological age of both the sexes, with mental deficiency, regarding the task of Balance on the Beam (E.Q.). The intervention used sequential practice and was carried out at APAE in Rolândia, Paraná. From a set of thirty individuals with intellectual disability, of both sexes, members of the APAE of Rolândia, Paraná, nine students were selected to be research subjects, with chronological ages from 6 to 11. The selected students were all diagnosed as having intellectual disability without syndromes and belonged to different classrooms. Only one of the subjects was female. The battery of motor coordination tests K.T.K. comprises four tasks: balance beam, hopping on one leg, jumping sideways, and shifting platforms. In this study, only the balance beam task will be analyzed. The results are described as averages (x), Standard Deviations (SD). The Wilcoxon test, a referential, non-parametrical test, allowed us to evaluate the effect of the intervention on the subjects, at a significance level of p<0.05.

Results and Discussion. - The results of this task reveal an increase of 100% in the group, that is, the initial average was 6.55 and evolved to 14.11 after the interventions. According to Table 1, these values were statistically significant at the level of p < 0.05, thus confirming the influence of the Specific Physical Education Program they went through. We should mention, however, that, when analyzed individually, according to Tables 2 and 3, children I, II, V and VII didn’t have a significant growth in the balance task, walking backwards on the beam.

Conclusion. - Given the diversity of the difficulties, it is not easy to identify with precision the measures to be taken in an Adapted Physical Education Program aimed at improving body coordination of who have mental disability, as well as which tests should be used.

Based on the achieved results, we can notice clear evidence that was done with the interventions is highly significant. However, some individuals didn’t have satisfactory results post-test, indicating a necessity of more time for the interventions and deeper analysis about other behaviors.

References.

AN ANALYSIS OF THE VIEWS OF SECONDARY SCHOOL PHYSICAL EDUCATION TEACHERS ON CONVEYANCE OF P.E. COURSES IN SECONDARY SCHOOLS IN NORTHERN CYPRUS

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Certain factors such as the curricula followed, the level of knowledge and information possessed by instructors and their relations with the structural foundations of the institutions they work play a crucial role in educating the students undertaking physical education courses at school. This study aims at determining physical education teachers’ attitudes towards how these courses are administered in the secondary education system in Northern Cyprus. A total of 169 secondary school physical education teachers between the ages of 25-55 of whom 66 were female and 103 were male, were consulted. These participants were administered a questionnaire composed of two sections and forty-six questions. The first section includes four demographic questions where the second section consists of 42 questions designed to reveal the curricula followed by teachers, the way courses are administered and the interaction between the principal, teachers and the students. Analysis of data gathered through the surveying process is performed by the SPSS 12.0 Statistical software program. For reliability testing, the survey was administered to 10 secondary school physical education teachers twice in 5-day intervals as a pre-test. Validity and reliability of the survey is measured by Cronbach’s Alpha, which is found to be 0.91. The main finding of this article is that while physical education teachers stress the importance of P.E. courses on human development, they indicate that the school administrations and parents do not place much emphasis on these courses.

COMPARATIVE INVESTIGATION IN LOMBARDIA AMONG DIFFERENT SPORTIVE DISCIPLINES AT 11-12 YEARS

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This research wants to verify how much the education and the development of the motor abilities is important, respecting the individual rhythms of the motor learning and the take-offs, before improving the executive techniques of the sport. The research, made on 2006-2007, was directed to 6 different sportive disciplines, concerns 400 young males and it has interested an average of 25-55 years of age, both males and females. The participating young males trained 2-3 times at week and to school they do 2 hours of Physical Education at week, the students practice 2 hours of Physical Education in school at week and in the leisure time, they only performed no structured motor activity. The tests (administered in september 2006 at the beginning of the school and in june 2007 at the end of the school) are: Stick test and Sit & reach (flexibility), tapping and 50 m fast run (rapidity), forward throw medical-ball and long standing jump (strength of upper and lower limbs), 100 m (endurance). Some test have been administered once alone during the same session, other three times and at the last, we calculated the average.

From the result obtained by the medical screening, the tests and questionnaire, the following tendencies emerge:
- 50 mt. fast run: basketball, track and field and rugby furnish best data in comparison to the other disciplines to the control group; 1000 mt.: the control group and judo are clearly inferior in comparison to the other disciplines, Stick test: the results of handball, basketball and judo are inferior in comparison to the other sports; feel rapidly: the data of basketball, handball and judo are superior to the other sports; strength of the upper limbs: the data of basketball and handball are better than the other sports; strength of lower limbs: track and field and basketball, have the best results;
- the beginning of the sport activity is too much precocious (judo, swimming at 5-6 yr);
- the coaches works few time during training session on the development of the motor abilities compared with the time dedicated to teach technique;
- the drop-out often depends from the type of practiced sport and from the heavy trainings that too much condition the leisure time.

This research offers very interesting data on which to reflect as it regards the formulation of a correct methodology of training to propose when the boys start a new sport.

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STUDENT’S RETENTION OF TEACHER’S INSTRUCTION IN PHYSICAL EDUCATION LESSONS ACCORDING TO DEMOGRAPHIC AND INFORMATION CHARACTERISTICS

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The present study analyzes the teacher’s instruction during Physical Education lessons, studying the coherency between the information that the teacher transmits and the one the students retain. We intended to see if the level of retention varies in relation to some students’ characteristics (gender, age and school level) and instructional characteristics (form, direction and affectivity content). Doyle (1986) suggests that the effectiveness of teaching depends on the way how students processes the information provided by the teacher. The clarity of teacher’s verbal presentations, facilitating comprehension and retention, has been considered a predictive variable in the teaching effectiveness in Physical Education. The literature about the retention of information demonstrated that quantity of information and the nature of selected instructional strategies can affect the level of retention (Cloes Knoden & Piéron, 1991, Januírio, Rosado & Mesquita, 2006). We hypothesized that not only the length or quantity of information affects the retention but, also, the nature of the information, namely, form (verbal or mixed verbal and visual), direction (personnel, group or all class) and affectivity orientation (positive versus negative). The study was developed in 35 Physical Education lessons, involving 149 students. Teacher’s instructions were audio and video recorded. After the instructional moments, the student answered to a structured interview. All teachers’ and students’ interventions were transposed to written protocol, having this information been submitted to a logic-semantic content analysis. A descriptive and comparative analysis was done. We applied the Kolmogorov-Smirnov, Mann-Whitney and Kruskal-Wallis tests. The level of significance was p < 0.05.

The results showed that the coherency between the teacher instructions and the one the student retains varied, only, according to the form of the instruction. Namely, we found a significant difference (p=0.04) when comparing the retention of verbal information (80.65% of retention) with mixed information (66.87% of retention). The direction and the affectivity content of the instructions didn’t affect the level of retention (p=0.76 and p=0.42, respectively). The value of coherency of retained information was not significantly influenced by students’ characteristics as gender (p=0.63), age (p=0.90) and school level (p=0.81).

REFERENCES:

MOTIVATIONAL TASK CHARACTERISTICS, RELEVANCE AND ACCEPTANCE OF TEACHERS INSTRUCTIONS AS PREDICTORS OF STUDENTS RETENTION OF INSTRUCTIONS

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The present study analyzes the teacher’s instruction during Physical Education lessons, studying the coherency between the information that the teacher transmits and the one the students retains, looking for the influence of several mediator variables. In fact, retention can be closed related to the nature of the task, namely, specific task motivation and general motivation to that particular activity or sport. Otherwise, the student’s perceptions of the relevance of the instructions being given and the agreement or acceptance of the instructions can, also, mediate retention. In order for the information to be used at a later stage, it should not be only received and comprehended but also accepted. We intended to see if instructional retention varied in relation to students’ perception of the relevance of the instructions being given and in relation to the level of acceptance or agreement with teacher’s instructions. We also related task motivation characteristics (level of task motivation and motivation for the practice of that particular sport) with retention of the instructions. The mediator paradigm emphasized the need to study student’s attention, comprehension, retention and acceptance of the instructions to really understand the learning process. It is necessary to pay attention to the retention processes, the retention is determined by attention, selection mechanisms, codification and information storage and recuperation processes that occur in interaction with particular social contexts, motor tasks and motor activities, involving not only cognitive processing but, also, affective information processing. The studies about the retention processes of teacher instructions can be decisive in the optimization of the instructional processes.

The study was developed in 35 Physical Education lessons, involved 149 students. Teacher’s instructions were audio and video recorded. Immediately after the instructional episode, the student answered a structured interview. All teachers’ and students’ interventions were transposed to written protocol, having this information been submitted to logic-semantic content analysis looking for coherency. A descriptive and comparative analysis was done. We applied the Kolmogorov-Smirnov, Mann-Whitney and Kruskal-Wallis tests. The level of significance was p < 0.05.

The results showed that the coherency between teacher instructions and the one the student retains do not vary according to the students’ perception of instruction relevance (p=0.54) and students’ level of agreement or acceptance of teacher’s instructions (p=0.43). Coherency was not, also, significantly influenced by task motivation characteristics, namely, the level of specific task motivation (p=0.55) and the general motivation to that particular sport activity (p=0.35). Our results do not confirmed that these particular variables had an impact on instructional retention in Physical Education lessons.

ARGUMENTS CONCERNING THE NECESSITY OF ELABORATION OF SOME INSTRUCTIONAL STRATEGIES SPECIFIC TO THE MINORS REEDUCATION CENTERS

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INTRODUCTION

The special educative tasks children area embraces children with difficulties, a category where we include institutionalized minors in reeducation centers, after they had committed some penal delinquencies.

CONTENT, METHODOLOGY

Our research refers to the fundamentation of advancing some educational strategies focused on objectives that are established according to the causes that have led to the delinquent act. All the methods, means and organization forms will be focused on the objectives

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achievement and accomplishment of some competences in cognitive, moral, cultural and physic plan which can generate the reorganization of behavior in society.

The conclusions of the organizational audit offer us the possibility of elaboration educational strategy's objectives in connection to the aspects that cause delinquency and the special situation of framing on grades of the institutionalized minors: 38% of minors come from reorganized or separated families; 36% of delinquency acts represent the effect of the independence endeavor of teenagers who come from families where parents are extremely authoritative using physical compulsion and drastic punishments; 35% of minors undergo the curricular cycle of fundamental acquisitions during the liquidation of illiteracy grades at the age of 14 - 17 (13.63%; 45.4 % - 16.5 years; 38.81% - 15 years; 1.11% - 14 years);

CONCLUSIONS, DISCUSSIONS

knowing the delinquency concept and the legislative and juridical frame where the minors centers function; the operationalization of the educational and moral reeducation objects of these children; the selection of the instruction and education means according to the delinquency type and the individualization of the instruction and education routes, the promotion of some models, young people who become personalities in sport and art, as means of moral education, the selection of the instruction and education models according to the cause of committed delinquency and centering them on the individual; the simulation of self-reappraisal in connection to the society with the help of the used didactic means and methods.

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SCHOOL SPORTS COMPETITION QUALITY INDICATORS IN MADEIRA

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The organisation model of school sports in the Autonomous Region of Madeira (Portugal) is important for interschool competition and represents one of the factors that attracts students and enhances the development of their sports capacities. This study aims at highlighting the quality indicators of this service with regard to sports competition of youngsters who regularly take part in school sports.

The sample consists of 1317 students enrolled in school sports (25.7%) from all schools of the 2nd and 3rd Cycles of Basic and Secondary Education of Madeira and was selected using a random stratification method applied to each nucleus/team. The data analysis and treatment procedures were then carried out using SPSS (Statistical Package for the Social Sciences) software, version 15.0 for Windows and the Microsoft Office Excel programme, version 11.0. These tools made it possible to extract results in the form of graphs and tables.

In what concerns the most practiced modalities, Footsal/Football (24.4 %) takes the clear lead in relation to the rest, followed by Volleyball (15.11%) and Basketball (12.2%). The gender distribution throughout the age groups is even and it is between the age of 12 and 13 that there is the largest number of boys and girls competing. Training began in October for 55.1% of the students but it was only after the end of November that the programme was operating at full with 92.1% of the students practicing.

One should add that training is the type of practice that gains more participation (82.5%), followed by the competitions with other schools (78.1%). However, in what concerns the number of hours dedicated to weekly training, the majority of the students (44.57%) practise only between ninety minutes and two hours. This may be explained by incompatibilities between operating hours of the sports premises and availability of students. Notwithstanding, 31% of the students practise between 12 noon and 2 pm.

One of the negative aspects of the quality of the service may be explained by the fact that students (49.4%) compete (with teams of other schools) only between one and four times during the 2006-2007 school year. The results of this study suggest that more teams be put into competition and, consequently, there be more competitions throughout the whole school year. Besides these aspects, the improvement of refereeing quality and the adequacy of transportation timetables to and from games should also be borne in mind. One should also stress that 25.4% of students enrolled in schools sports are also involved in the practice of federate sports, with football being the modality where the accumulation of the two sports types gains greater significance (40%).

PRELIMINARY RESEARCH ON PHYSICAL ABILITIES IN CHILDREN FROM 8 TO 10 YEARS IN CREMONA AND PROVINCE

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This research in 2006-2007 considered 592 children attended the 4th and the 5th class of Primary School in Cremona and province. The main goal is to know which are the factors that influence overweight and obesity as: the lack of any kind of physical activities, the presence of pararomisms, a poor diet or a wrong feeding.

This work used a questionnaire on the children's habits and style of life, a series of anthropometric and physical test. A medical visit, has been done in each school in order to measure height, weight, skinfolds, circumference of the waist, examine morphological-postural, mathematics, writing and reading tests.

The trend of the height and weight between these children is nearly equal between males (142, 5 cm ± 6, 5; 39 kg ± 6) and females (143, 5 cm ± 9, 38,5 kg ± 10,5). The body mass index has quite a similar trend between males (19 kg/m²±1) and females (18.7 kg/m²±1).

The medical visit has underlined that the majority of children does not show accentuations or meaningful reductions of the physiological curves dorsal and lumbar. In the 50 meters fast run males (8,15 s ±1,35) are faster compared to the females (.8,8 s ±1,7) but not in a significant way (p>0.0001). In the long standing test and forward throw Minibasket ball, the trend is analogous between males (143 cm ±15/46/6,5 cm ±173) and females (130 cm ±20 - 399 cm ±86). In stick test, males (88,05 cm ±7,5) obtain better results than females (96,1 cm ±91). In the Sit & rich test, females (7,3 cm ±3) obtain better results than males (7,8 cm ±4,1). In the 600 mt. test males (3,55 min ±0,42) obtain better results than females (3,91 min ±0,28).

The information from the questionnaire outlined that males (21%) spend more than an hour and half playing, instead females (20%) one hour; some child (3%) told they never play. About the sport activity practice, males prefer playing soccer, basketball and swimming instead females prefer gymnastic, swimming and volleyball. The 4% of children told they do not play any sport activities.

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The few sport activity is associated to a bad way of eating. Only few children (3.5%) prefer eat meat, cheese and vegetables. Considering mathematics, writing and reading tests, compared to the motor tests, the results outlined children with better motor performances, are more rapid in the answers, in understanding and solving problems. Females are better compared to males.

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DEVELOPMENTAL REASONS FOR SCHOOL SPORTS DROPOUT
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Voluntary sport practice in schools (school sport) is a typical sport practice environment that affects millions of students and research must address dropout reasons and the specific mediator variables that affects withdraw in this specific context. The aim of the present study was to describe students' reasons for dropout school sport practice and related them with student's developmental characteristics as gender, age and school level. The subjects were 266 students from Lisbon metropolitan area: 138 boys and 128 girls, between 12 and 21 years old. From third grade level and 100 from high (secondary) school. Data gathering was obtained through a Likert type questionnaire with 84 items, developed by Rosado & Mesquita (2003). The statistics tests used for scale evaluation were Principal Component Analysis and Cronbach Alpha. We used qui-square (with standardised residual adjusted) tests for group comparisons. We grouped influential factors into three categories: the sport-related, the milieu-related (these are the environmental factors lying outside the sport realm) and the developmental factors. Generally, the characteristics of students like age, school level and gender affect the reasons to dropout. When these variables influenced dropout, gender and school level had the most impact. With increasing age the youngster develops a desire for autonomy and begins to resent the often strictly regimented lifestyle that accompanies sport involvement and bodily changes at puberty may decrease the suitability of the physique for the sport. So, we believe that the search for dropout motives has concentrated on factors within sport at the expense of developmental and milieu-related factors. Environmental causes include physical factors (e.g., injuries), logistical factors (e.g., time constraints and organizational problems) and extra sport social-interpersonal factors (problems with others). The results showed that nonsport influences, such as work, study and family commitments are, often, stronger motives for sport disassociation than dissatisfactions with elements within the sport itself.

EVALUATION IN THE INITIAL FORMATION: REFLECTIONS AND POSSIBILITIES
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This article has as objective analyze the evaluation of the process teaching learning in the initial formation, establishing as starting point, the complexity that involves the process of evaluation, its concept considering the educational scenery. For this analysis we opted for a field research and we went through some authors as (Allal et al., 1986, Bloom et al., 1988, Guba & Lincoln, 1994, Stufflebeam and Shinkfield, 1995; Madaus, Stufflebeam and Scriven, 1991; Viana, 2000) that discuss the evaluation looking for an approach with the context paradigm. This way, these constituent elements of reflections and also of relative critics to the subject of the evaluation in the teachers' initial formation, signaled the need of the development of methodologies quality evaluation that recognize the humanity of the men in the time and in the society, as well its capacity of intervention and transformation. It was possible to observe that the teachers after graduated finding difficulties in the treatment of the evaluation of the learning to be accomplished with their students in classroom, constituting in a certain discomfort. It is curious to observe that “the subject ‘evaluation’ is avoided by the teachers, even if its ‘to answer subjects, or to allow observations in classroom” (Camargo, 1999, p. 166). This discomfort can be justified for the lack of preparation in the teachers' initial formation concerning the understanding of how the knowledge is built and also how the evaluation can regulate in a quality way the process teaching-learning, answering to the teachers' expectations and students. The teachers' initial formation should assure the development of this content (evaluation) opportune to the future teacher to live forms of performance in the educational context, using different instruments of evaluation and fleeing a little to the traditional methodologies. The teacher should adapts himself to the new demands, looking for a growing qualification in the domain of the knowledge the didactic aspects, for an effective educational intervention, that approximates the pedagogic practice of democratic seeking to improve the educational practices.

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Poster presentations (PP)
PP-PM01 Physiology 1

BIOLOGICAL DEVELOPMENT AND BODY COMPOSITION OF TALENTED SOCCER PLAYERS
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Education of elite athletes is a long procedure. It contains the continuous selection according to the morphological, physical, psychological etc. requirements of top athletes and specific training processes. In a practice, especially at the beginning of process, the coaches have information that arises from the responses of young athletes. The aim of the study was to evaluate the human biological consequences of trainers' selection procedure. Young athletes were selected by the evaluation of trainers based on their performance during trainings and national age group competitions. A total of 300 boys were investigated. Their calendar age ranged between 11.51 and 14.50 years. These boys represent the most talented players of Middle-Hungarian region. The athletes had preliminary 4- to 8-year training history and 5 training sessions every week. Anthropometric data collection was carried out in the summer training camp July 2007. Biological development was assessed by the morphological age (Mészáros et al., 1984). This estimate is a bone age validated age indicator. Young adult height was also predicted. Physique characteristics were described the Conrad's (1963) metric and plastic indices. Body fat content was estimated by the suggestions of Štajner (1961) and the proposals of Drinkwater and Ross (1980) were followed.
during the assessment of muscle mass relative to body weight. The young soccer players had significantly taller than average height means and moderately lighter body mass means. Their physique was definitely athletic in all age groups. Morphological age mean was significantly smaller than the calendar age in the group of 12-year-old subjects, but it was greater by 0.33 year in the oldest group. The means of body fat content relative to weight decreased with age significantly and the muscle mass showed an increasing age related trend. Taller stature of the players can be attributed to the selection procedure but the favourably low body fat content and greater muscle mass can be related to the effects of regular sports training and physique attributes. The explanation of biological age differences is not simple. We have to stress this comparison based on a cross-sectional data collection. The increasing prevalence of advanced individual may also be evaluated as selection effect. The advanced biological development has consequences both in physical and exercise physiological performance the increase of biologically older boys cannot be evaluated as a success of trainers' selection procedure.

**UNEXPECTED CARDIOVASCULAR RESPONSE DURING ULTRA-ENDURANCE EXERCISE**

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During prolonged exercise at fixed work rate heart rate (HR) increases slowly with concomitant decrease in stroke volume (SVI) in order to maintain cardiac output. Simultaneously, an increased oxygen uptake (VO2) occurs. In this paper we report an unexpected and previously not observed cardiovascular response to ultra-endurance exercise. Nine well-trained male athletes performed 24-h exercise in a controlled laboratory setting, with altering blocks of kayaking, running and cycling. Each block consisted of 110 min of exercise and 10 min of rest. Measurements (HR, VO2 and blood samples) were conducted during cycling at fixed work rate every 6th hour. The average work intensity was approximately 0.55 % of respective VO2peak. HR was increased at 6 h with 15 beats/min (13 %) compared to pre-exercise (Pre-Ex), but thereafter unexpectedly returned towards initial values. VO2 on the other hand was increased with 0.22 l/min (10 %) at 6 h and 0.37 l/min (17 %) at 12 h compared to Pre-Ex, and thereafter remained stable. This implies an increased oxygen pulse (VO2/HR) with approximately 10 % compared to Pre-Ex at the last half of the exercise. The cardiovascular drift did not progress continuously, but instead changed drastically when duration exceeded 6 hours. The changes in HR and VO2 might have different and complex explanations. HR drift might be explained mainly by central circulatory adaptation (e.g. desensitisation of cardiac adrenergic receptors) whereas drift in VO2 may depend upon peripheral changes (e.g. decreased mitochondrial efficiency). Consequently, using solely HR for determining exercise intensity and energy expenditure becomes invalid during ultra-endurance exercise, if the cardiovascular drift is not measured and taken into account.

**RECOMBINANT HUMANERYTHROPOIETIN ALTERS FLOW-INDUCED DILATATION IN SMALL MESENTERIC ARTERY OF RAT: INVOLVEMENT OF ENDOTHELIN-1**

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Chronic use of the recombinant human erythropoietin (r-HuEPO) in the therapeutic or sporting field is often accompanied by serious side effects. Being given the importance of shear stress on vasodilation induced by the rise in flow at the time of exercise, we propose to study the direct influence of r-HuEPO on the flow-induced dilatation of rat mesenteric arteries. Mesenteric arteries were cannulated, pressurized (60 mmHg) and perfused while varying intravascular flow (from 0 to 100 µl/min) in presence or not of the NO synthase inhibitor (L-NAME, 10-4M) and/or r-HuEPO (10 IU/l). Before to increase the intravascular flow, the association L-NAME/r-HuEPO caused a slight and significant decrease in lumen diameter. L-NAME completely inhibited the flow- and NO-induced vasodilation. r-HuEPO significantly attenuated the flow-dependent vasodilatation. However, the association L-NAME/r-HuEPO caused a markedly vasoconstriction in response to the rise in intravascular flow. In the presence of Bosentan (10-5M), an endothelin-1 receptor blocker, the flow-induced vasoconstriction induced by L-NAME/r-HuEPO disappeared without to restore vasodilation. Furthermore, cumulative addition of endothelin-1 induced a concentration-dependent constriction of mesenteric arteries which was significantly increased and shifted to the left in presence of L-NAME/r-HuEPO. Our results suggest that, in absence of NO, r-HuEPO induces vasoconstriction in response to the rise intravascular flow and shear stress, probably via an increased release and/or sensitivity to endothelin-1.

**AUTONOMIC NERVOUS SYSTEM RECOVERY FOLLOWING SUPRAMAXIMAL EXERCISE**

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The autonomic nervous system (ANS) is an important regulator of the cardiovascular system. ANS recovery following 2 types of supramaximal exercise (one Wingate, 4W, and four Wingates, 4W) was studied using heart rate variability (HRV). 4W consisted of 4 Wingates interspersed with 4 min. of light cycling. The RR intervals (RRi) of nine males, aged 19.4 ± 0.4 yrs. were monitored during 10 min. of supine rest and 8 min. of standing after 50 min. of supine rest. Data was collected for analysis before exercise (PRE), after 50 min. of supine rest after exercise (POST1) and 1 h. 50 min. after exercise (POST2). The frequency domain of HRV was analyzed using the Blackman-Tukey method to determine low frequency (LF), high frequency (HF) and LF:HF ratio. Supine HRV showed a main effect for time for HF (p = 0.007), LF (p < 0.001) and LF:HF (p = 0.01). HF was increased at POST1 (71.9 ± 14.6) compared to PRE (105.7 ± 8.3) and both LF and LF:HF were higher at POST1 (180.2 ± 15.4; LF:HF, 4.2 ± 1.2) than PRE (137.2 ± 12.5; LF:HF, 1.4 ± 1.2). There was a main effect for time for standing HRV such that HF was decreased (p = 0.047) at POST1 (30.9 ± 11.2) compared to PRE (41.6 ± 16.4). The type of exercise had no effect on HRV. We conclude that ANS takes longer than 1 h. to recover following supramaximal exercise. This study was supported by NSERC Canada.

**EFFECTS OF ECCENTRIC EXERCISE TRAINING ON OSTEOGENESIS AND ADIPOGENESIS IN RAT PROXIMAL TIBIAE**

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Introduction: Marrow stromal cells can differentiate into osteoblasts and adipocytes. The osteoblast-adipocyte balance is influenced by local factors, especially mechanical load. We demonstrate here that the training of hindlimb muscle with high-force contractions influences osteogenesis and adipogenesis in bone.
Material and methods: Two groups of Sprague Dawley female rats (5 weeks old, n=13) were used: control (Con, n=8), high-force resistance training (Train, n=5). Training consisted of 60 stimulated eccentric contractions of the left and right ankle plantar-flexors every 2 weeks for 8 weeks. Contractions were performed under anesthesia using electrical stimulation at 140 Hz and 1.5 second and servomotor. After the training period, contractile properties in the plantar (PLA) muscles were measured, and then PLA, the right and left tibiae were obtained. After fixation with 1 % glutaraldehyde, 1 % formaldehyde and 0.05 % CaCl2 in 0.1 M sodium cacodylate buffer (pH 7.3), the right tibiae were quickly frozen in isopentane, cooled using liquid nitrogen for carboxymethyl cellulose (CMC) gel block preparation, the left tibiae were demineralized in 0.1 M disodium ethylenediaminetetraacetic acid (pH 7.3) for 6 weeks at 4 °C, dehydrated through a graded ethanol series, and embedded paraffin. The frozen tibiae were re-embedded in 5% CMC gel and frozen. Each CMC block was covered with a polyvinylidene chloride film coated with synthetic rubber cement. Serial longitudinal sections (10 micrometer) with the film were cut using a cryostat with a disposable tungsten carbide blade at -25°C. Specimens were stained with media of Oil red O and hematoxylin for counting the number and volume of adipocytes. Each paraffin block was cut into 5 micrometer sections using a microtome. Specimens were stained with media of Azan or HE (hematoxylin-eosin) for counting the volume of bone at the secondary spongiosa. Quantitative analysis of microscopic observations was performed using a digital microscope (Coalscope, Nikon), which comprised a video monitor and a personal computer with image analysis software (Image J ver. 1.38).

Results: The muscle characteristics and the contractile properties were not changed by 8 weeks of training. The training increased the number and volume of trabecular bone, and decreased the number of adipocyte significantly. The size of adipocyte in Train group tended to be lower (30%) than that of Con group.

These data suggest that the training of muscle with high-force contractions improved osteogenesis. Furthermore, the differentiation from marrow stromal cells to adipocytes and the maturity of adipocytes were inhibited by the training.

RELATIONSHIPS BETWEEN MUSCLE VOLUME OF ELBOW FLEXORS AND ELBOW FLEXION JOINT TORQUE IN YOUNG, MIDDLE-AGED AND ELDERLY INDIVIDUALS

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Introduction

Muscle strength is closely related to its cross-sectional area in young and elderly individuals (1). This relationship would be theoretically converted to the relationship between joint torque (TQ) and muscle volume (MV) (2). In elderly individuals, however, no clear relationship between them is observed due to a decline in activation capacity (3). Thus, it is unclear whether TQ is related to MV in elderly individuals. This study aimed to clarify the dependence of TQ on MV in young, middle-aged and elderly individuals. In addition, age-related differences in TQ, MV and TQ/MV (an index of specific tension) were examined.

Methods

Subjects were divided into 20-34 yr group (31 men and 23 women), 50-64 yr group (13 men and 20 women), and 65-79 yr group (17 men and 22 women). The MV of elbow flexors was measured using magnetic resonance imaging. The TQ was measured using a torque meter, in which each subject performed maximal voluntary contraction of isometric elbow flexion for 3 seconds at 90 deg of elbow joint angle.

Results

The TQ was significantly correlated with MV in each sex in each group. The correlation coefficient for 20-34 yr women (r = 0.924) was significantly higher than those for 50-64 yr men (r = 0.631) and women (r = 0.680) and 65-79 yr men (r = 0.573). In addition, the correlation coefficient for 20-34 yr women tend to be higher than those for 20-34 yr men (r = 0.784) and 65-79 yr women (r = 0.758). Although there was no age effect on TQ/MV, the coefficients of variance of TQ/MV for 20-34 yr men and women were higher than those for 50-64 yr and 65-79 yr men and women. The MV for 20-34 yr men was significantly higher than that for 50-64 yr men with no significant difference in TQ.

Discussion

In contrast to a prior study (3), TQ was significantly correlated with MV in each sex in each group. This result suggests that MV is a major determinant of TQ in middle-aged and elderly individuals as well as young individuals. However, the differences in the correlation coefficients among age and/or between sexes were observed. Furthermore, the interindividual variation in TQ/MV for 50-64 yr and 65-79 yr groups was greater than that for 20-34 yr group. The age-related decline in TQ that does not always accompany a decrease in MV might be a reason for these phenomena. Given that TQ is related not only to MV but also to other factors such as agonist activation and antagonist co-activation (4), the present results suggest that the relative contribution of MV and/or the latter factor to TQ are different among each age and each sex. To put it more concretely, it is likely that the effects of the latter factor on TQ are greater for middle-aged and elderly individuals.

References.

CHANGES IN MUSCLE MECHANICAL FUNCTION WITH 2 WEEKS OF LIMB IMMOBILIZATION IN YOUNG AND OLD HEALTHY MEN

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Introduction

Aging can have a markedly effect on the muscle mechanical function, particularly affecting the capacity for rapid muscle force exertion (Rate of Force Development – RFD) and muscle mechanical function (1,2). However, these age-related changes can be modulated by other factors, including changes in nervous system function, and especially the level of physical activity seems to be a potent factor, e.g. in relation to hospitalization or disease (3,4). Thus, our objective was to study the effect of short-term limb immobilization on changes in muscle mechanical function in healthy young and old men, with special emphasis on the initial and late phase of maximal muscle contraction.

Methods
Results

At Pre, OM had significant lower values in MVC and late phase RFD. At Post, OM decreased (p<0.01) for all parameters (MVC ~16%, early phase RFD and Impulse ~36%, late phase RFD and Impulse ~30%). In contrast, YM only demonstrated decreases (p<0.05) in MVC (~15%), late phase RFD and Impulse (~15%). The declines in early phase RFD and Impulse were significantly greater in OM compared to YM (p<0.004-0.025). Further, in OM contractile RFD decreased disproportionally more than MVC as evidenced by a greater reduction in relative RFD (p=0.012).

Discussion

The present data demonstrate that acute limb immobilization results in significant decreases in MVC, with a somewhat equal effect in YM and OM. However, the capacity for rapid force exertion was affected to a much larger extent in OM. The findings indicate a more pronounced impairment in neural function (5,6) and/or more marked reductions in mechanical tendon stiffness in OM compared to YM, although muscular adaptations could also have contributed to this qualitative change. These findings indicate a more serious functional implications in elderly, e.g. when reacting to unexpected perturbations during walking, especially when exposed to periods of immobilization or limb disuse, either due to disease or hospitalization.

References


METHODOLOGICAL CONSIDERATIONS FOR THE PREDICTION OF MAXIMAL OXYGEN UPTAKE FROM PERCEPTUALLY REGULATED EXERCISE

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Recent work by Eston et al (2005; 2006; 2008) suggests that maximal oxygen uptake (VO2max) can be predicted accurately and reliably using a graded perceptually regulated exercise test (PRET). Although the original study (Eston et al, 2005) reported limits of agreement (LoA) between predicted and actual VO2max scores (±5.8ml/kg/min) that were interpreted favourably, the subsequent studies were less encouraging (Eston et al, 2006; 2008), yielding LoA of 11-14 ml/kg/min that were possibly influenced by methodological shortcomings and inconsistencies. With this in mind, the present study modified the protocol and documentation connected with the PRET and re-visited its validity and reliability as a means of predicting VO2max. The modifications included: (ii) the provision of modified instructions for using the rating of perceived exertion [RPE] scale in perceptual regulation mode, (ii) randomising the order of presentation of perceptually regulated RPE levels, (iii) the provision of an additional opportunity to alter the resistance during each bout, (iv) the measurement of VO2max at the end of the testing, and (v) the use of 3min bouts at each RPE level (rather than 2min).

Twenty three volunteers (27±7 yrs) completed four counter-balanced PRETs on an electromagnetically braked cycle ergometer and one maximal graded exercise test (GXT). The PRETs required participants to regulate the exercise using Borg’s 6-20 RPE scale, at levels 9,11,13,15 and 17 in a randomised manner. The PRETs consisted of 2x2 min and 2x3 min bouts conducted over a nine day period, each separated by 48hrs. Prior to each bout a standardised set of instructions was read to the participants to facilitate their understanding of the task ahead. Throughout each PRET, oxygen uptake (VO2) was recorded continuously. VO2 values for the RPE range 9-17 were extrapolated to RPE 20 using regression analysis to predict individual VO2max scores. The concordance of the predicted and actual VO2max scores and the trial-trial reliability of the predicted scores were analysed using LoA.

Validity analysis revealed non-significant (p>0.07) differences between actual (42.2±10.1 & 41.6±10.2 ml/kg/min, 3min; 41.8±10.6 & 42.0±9.9 ml/kg/min) VO2max scores and LoA of -2±10.9 and -0.6±7.9 ml/kg/min (2min) and -0.4±9.0 and 0.2±7.3 ml/kg/min (3min). Reliability analysis of predicted VO2max scores yielded LoA of -1.4±8.5 ml/kg/min (2min) and -0.2±5.9 ml/kg/min (3min). It was concluded that the modified PRET used in the current study provided estimates of VO2max that were acceptable and better than those reported in recent studies. The estimates were most accurate and reliable when the 3min bout was employed. These findings bode well for future investigations into the application of perceptually regulated exercise tests.

References


REPRODUCIBILITY OF PERFORMANCE GAINS TO SIMULATED LIVE HIGH/TRAIN LOW ALTITUDE

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Introduction

Some elite athletes undertake multiple altitude exposures within and between training years to improve sea-level performance. The published literature on the magnitude of performance changes and the underlying mechanisms following altitude training are equivocal [1]. The wide variety of published outcomes and anecdotal evidence from athletes and coaches, suggests that reproducibility and individual response to altitude exposure is a key consideration. No previous study has addressed the reproducibility of responses to altitude exposure in the same group of athletes. This study quantified the test-retest reproducibility of physiological adaptations and performance gains following two simulated Live High/Train Low (LHTL) altitude bouts.

Methods

Sixteen highly trained male and female runners (VO2max: 70.3± 6.1 ml/kg/min, mean ± SD) completed 2 x 3-wk blocks of LHTL altitude exposure or resided near sea-level in a randomised controlled design. The altitude group (n=8) spent 14 h/day in normobaric hypoxia.
(3000 m) while the control group (n=8) slept in normoxia (600 m). Both groups trained at 600 m. Laboratory (treadmill VO2max) and field (4.5 km time-trial) performance tests were completed before and after each 3-wk altitude block. Haemoglobin mass (Hbmass) was measured before, weekly and one week after each 3-wk block. Data were log-transformed prior to analysis to reduce any bias arising from non-uniformity of error. Mean effects and their 90% confidence limits (CL) were estimated via the unequal-variances t statistic computed for change scores between pre- and post-tests (2).

Results
The altitude group demonstrated reproducible improvements after each 3-wk LHTL block in Hbmass (2.7 ± 3.1% and 2.7 ± 2.6%, mean ± SD) and VO2max (2.1 ± 3.1% and 2.1 ± 5.7%). The change in Hbmass was substantially greater after the 2nd 3-wk block in the altitude group (altitude-control: 4.1%, ±2.1%, 90% CL) but not the 1st (1.3%, ±3.2%) compared with the control group. There was no substantial difference in the change in mean VO2max between the groups in the 1st (0.9%, ±3.6%) or 2nd 3-wk block (1.4%, ±4.6%). Time-trial performance showed small and variable changes after each 3-wk LHTL block in the altitude group (1.4 ± 1.7% faster and 0.7 ± 2.0% slower, mean ± SD). Similarly there were variable changes in time-trial performance in the control group (0.6 ± 2.4% slower and 0.7 ± 1.1% faster).

Conclusion
A 3-wk LHTL altitude block can induce reproducible physiological adaptations in highly trained runners, but changes in performance are more variable. Competitive performance is dependent not only on physiological adaptations, but also on many other factors including fitness, fatigue and motivation. All these factors require careful, individual management to improve performance following altitude training.

References

THE EFFECT OF WEARING GRADUATED COMPRESSION STOCKINGS ON RUNNING PERFORMANCE

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Background. Graduated compression stockings (GCS) have been worn by world champion endurance runners to enhance performance; however, minimal published research has stipulated the optimal compression required to enhance performance. Athletes wearing knee-length GCS during 10,000 m running tests achieved lower average heart rate (HR) at the same performance time (T), indicating a possible performance enhancement.

Purpose: To quantify run time and physiological and perceptual variables for runners completing 10,000-m time trials whilst wearing different compression grades of GCS.

Methods: Following an initial familiarisation run, 9 male and 3 female competitive athletes (mean ± SD; VO2max 68.7 ± 5.8 ml/kg-1/min-1, age 33 ± 10.3 years, mass 68.5 ± 6.2 kg) completed four 10,000-m time trial runs on an outdoor 400-m track wearing either control (0 mmHg; Con), low (12-15 mmHg; Lo), medium (18-21 mmHg; Med), or high (23-32 mmHg; Hi) GCS in a randomised counterbalanced order. All trials were conducted between 18:00-20:00 h and average temperature and humidity were 18°C (12-22°C) and 71% (53-94%), respectively. Based on their performance in the familiarisation trial, athletes were set off at 1-min intervals and the same order was used for all subsequent trials. Leg power was assessed pre- and post-run via counter movement jump (CMJ) using a jump mat. Blood lactate concentration (Lact) was assessed pre and post-run while HR was monitored continuously during exercise. Perceptual scales were used to assess the comfort, tightness and any pain associated with wearing GCS.

Results: There were no statistically significant differences in performance time between trials (min:s; Con 39:50 ± 4.58, Lo 39:26 ± 3.57, Med 39:41 ± 3.46, Hi 39:51 ± 4.01, P=0.99). The delta change in pre- to post-exercise CMJ performance was significantly better in Lo (1.2 ± 6.0 cm) and Med (1.7 ± 4.8 cm) than Con (-2.9 ± 3.9 cm, P=0.001). Mean HR was not different between trials (168-169 beat/min-1, P=0.99) but [La] was significantly higher in GCS trials relative to Con (P<0.001). Participants rated Con and Lo as more comfortable than Med and Hi (P<0.01), Med and Hi were rated as tighter than Lo (P<0.01) and all GCS were rated as tighter than Con (P<0.01), and Hi was associated with the most pain (P<0.01).

Conclusions: In competitive runners wearing GCS does not appear to affect 10,000 m performance time. However, low and medium grade GCS help retain leg power following exercise thus possibly having implications for sprint performance at the end of a race. Furthermore, low grade GCS appear to be the most comfortable type of garment for runners.

References:

RELIABILITY OF AN ENDURANCE RUNNING PERFORMANCE TEST

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The aim of the present study was to determine the reliability of a running endurance test using an automated treadmill system which requires no manual input to control running speed. On three separate occasions, 7 days apart, ten experienced male endurance trained runners (age 32 ± 10 yrs, VO2peak 61 ± 7 ml kg-1 min-1 mean ± SD) completed a treadmill time trial, in which they were instructed to run as far as possible in 60 min. The treadmill was instrumented with an ultrasonic feedback-controlled radar modulator that spontaneously regulated treadmill belt velocity corresponding to the changing running speed of each runner. Estimated running intensity was 70 ± 11 % VO2peak and distance covered 13.5 ± 2 km, with no difference between trials. The coefficient of variation (CV), estimated using ANOVA with subject and trial as main effects, was 1.4%. In summary, using an automated treadmill system, improves the reliability of 60 min treadmill time trial compared to time trials where speed is controlled manually. The present protocol is a reliable method of assessing endurance performance in endurance trained runners.
EXERCISE TRAINING PREVENTS THE CARDIOVASCULAR RISK INDUCED BY CHRONIC KIDNEY DISEASE IN RATS TREATED WITH RECOMBINANT HUMAN ERYTHROPOIETIN

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Chronic renal failure (CRF) is associated with endothelial dysfunction accompanied by many pathogenetic factors which contribute to hypertension and coronary artery disease, major causes of morbidity and mortality in patients with renal failure. Recombinant human erythropoietin (rHuEPO) has been widely used for long-term treatment of anemia that is associated with chronic renal failure. It is however recognized that rHuEPO can be responsible of arterial hypertension (HTA). It has been reported that exercise may influence the progression of chronic renal disease in both man and animals. Exercise training, which has some potential for improving cardiovascular and metabolic disorders, is beneficial in the treatment of many chronic disease states including hypertension. On these bases, we investigated whether physical activity in CRF rats treated with rHuEPO, prevents the associated cardiovascular risk.

Rats with 5/6 renal mass ablation were submitted to treadmill exercise for 30/60 min (5 times/week for 7 weeks). During the same period, Rats were treated or not with rHuEPO (100 UI/kg, twice a week, subcutaneous injection). The blood pressure was measured weekly. After sacrifice of rats, the citrate synthase activity was measured at the soleus muscle. Hematocrit, serum creatinine, and blood urea were measured. The vasorelaxation of the aorta to acetylcholine was studied. The vasodilatory response to intravascular flow of isolated perfused and pressurized mesenteric small arteries was also investigated.

An arterial high blood pressure developed in CRF rats associated to a deterioration of the aortic endothelium- and NO-dependent vasorelaxation compared to Sham rats. rHuEPO did not accentuate hypertension in CRF rats. Exercise, associated or not to rHuEPO treatment, prevented blood pressure elevation and endothelial dysfunction in CRF rats. Anemia did not appear in CRF rats but hematocrit increased in rats treated with rHuEPO. Endothelium- and NO-dependent vasodilation of perfused mesenteric arteries in response to increased intravascular flow levels was altered in CRF rats and more severely in rHuEPO compared to Sham rats. This deterioration was prevented in all rats submitted to exercise training.

In conclusion, exercise prevents hypertension and endothelial dysfunction induced by CRF and/or rHuEPO in rats. These findings indicate that exercise may be preventive upon cardiovascular risk associated with chronic kidney disease and rHuEPO treatment.

INTERRELATION OF PSYCHO-PHYSIOLOGICAL FACTORS AND PARAMETERS OF MOTOR-EVOKED POTENTIAL OF THE UPPER AND LOWER LIMB MUSCLES AT MOTOR CORTEX MAGNETIC STIMULATION

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Management of movements is defined by condition and peculiarities of the numerous structures of the central nervous system (CNS). Formation of motor response to stimulation is a part of complicated process, so the motor response formation are defined by both physiological and psycho-physiological characteristics of the CNS.

Peculiarities of the interrelation of physiological and psycho-physiological factors are studied in the present research. 12 athletes, aged 20-25, took part in the research. There were registered such parameters as the motor-evoked potential (MEP) threshold and a maximal MEP amplitude, motor reaction latency (MRL) at simple and selective reactions, mobility of the neural processes.

Investigation of the psycho-physiological factors was made in conditions of performing testing tasks by upper and lower extremities. The received data were processed by a correlation analysis method. During the analysis of the data, the following was revealed: correlation of MRL and MEP amplitude in case of the simple reaction is weak (r=-0.20), however, in case of the selective reaction the value is at an average level (r=-0.53). The correlation between the MRL and the MEP threshold in case of the simple reaction is lower than average (r = 0.31) and in case of the selective reaction it is higher than average (r=0.62).

The correlation of the results of the tapping test (mobility of the neural processes) and the values of the MEP amplitude is weak (r=0.15) while the correlation with the MEP threshold is lower than average (r=-0.31). Thus, to a definite extent, the shorter the MRL is, the higher the MEP amplitude is and the lower the MEP threshold is. The higher mobility of the neural processes is, the lower the MEP threshold is and higher the MEP amplitude is.

The revealed peculiarities of the correlation between parameters of the MEP of the upper limb muscles and psycho-physiological characteristics thus confirm the previous results of the registered MEP of the upper limb muscles. The parameters of the MEP of the upper limb muscles are in stronger correlation with the psycho-physiological characteristics received at upper limb testing than those received at lower limb testing. In its turn, the parameters of the MEP received from the lower limb muscles are in stronger correlation with the results of the psycho-physiological testing, in conditions of lower limb testing. Such results are likely to be conditioned by formation of the upper and lower limb muscles MEP in different areas of the motor cortex.

Thus, on the ground of the foresaid, we can conclude that the mechanisms of formation of the upper and lower limb muscles MEP have a similar structure.

DOES OXIDATIVE CAPACITY AFFECT ENERGY COST? AN IN VIVO MR INVESTIGATION OF SKELETAL MUSCLE ENERGETICS

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Although it is commonly accepted that training improves muscle oxidative capacity, investigations of training effects on exercise energy cost through cross-sectional studies have yielded conflicting results (Gissane et al., 1991; Mallory et al., 2002, Johansen & Quistorff, 2003, Mogensen et al., 2006). In addition, muscles investigated and exercise mode differed from those mainly involved in the training process and the energy cost has been assessed through whole body measurements thereby questioning the conclusions related to the local metabolic adaptations induced by exercise training. The purpose of the present study was to compare quadriiceps energy cost and oxidative capacity between endurance-trained and sedentary subjects during heavy dynamic knee extension.

We quantified the rates of ATP turnover from oxidative and anaerobic pathways with 31P MRS and we measured simultaneously pulmonary oxygen uptake in order to assess both muscle and O2 energy cost. Seven sedentary (SED) and seven endurance trained (TRA) male subjects performed dynamic standardized rest-exercise-recovery protocols at an exercise intensity corresponding to 35% of maximal voluntary contraction. Changes in muscle recruitment occurring within the quadriiceps were measured using surface electromyography.
Endurance trained subjects exhibited a higher maximal pulmonary oxygen uptake (66.1 ± 10.4 for TRA and 42.3 ± 6.2 for SED ml O2.min-1.kg-1, P < 0.01) and a larger muscle oxidative capacity (Qmax = 52.3 ± 31.4 for TRA and 25.8 ± 3.8 mM.min-1 for SED, P < 0.05). We found that the energy cost was 73 % higher in the endurance trained group (P < 0.05). This higher energy cost was mainly due to a 82 % higher oxidative ATP production although O2 cost was not significantly altered. In addition, the energy cost was related to both muscle oxidative capacity and maximal whole-body rate of aerobic energy expenditure. Overall, we found that the energy cost was increased as a result of training thereby suggesting an increased activity of additional ATP consuming processes not involved in work production e.g. ionic pumps.

References.

EFFECTS OF MUSCLE POTENTIATION INDUCED BY PRIOR HEAVY KNEE-EXTENSION EXERCISE ON ATP PRODUCTION AND ENERGY COST

Preliminary exercise (warm-up) is well recognized to improve subsequent exercise performance through a variety of mechanisms. Increased time to exhaustion by priming heavy exercise (Jones et al., 2003) has been related to an improved oxidative ATP supply or a reduced energy cost (Rossiter et al., 2001). However, given that the glycolytic flux has not been quantified, the corresponding conclusions are questionable. Alternatively, it has been suggested that muscle potentiation could increase force output of slow twitch fibers or reduced the number of motor units recruited for a given power output so that endurance performance could be improved (Sale, 2002).

Accordingly, the purpose of the present study was to determine whether a prior heavy knee-extension exercise would affect muscle energy cost, O2 cost and quadriceps EMG activity during subsequent heavy exercise. Fourteen male subjects involved in recreational to regular physical activity performed repeated bouts of high-intensity square-wave, knee-extension exercise for 6 min, inside a whole-body magnetic resonance spectroscopy (MRS) system. Rates of ATP production through exercise. Med Sci Sports Exerc 35, 2085-2092.


This slowing may have important repercussions on motor control and balance. Therefore, the aim of this study was to investigate whether the reduced rate of torque development can be partly caused by a lower rate of neural activation, quantified by motor unit discharge frequency. Five young (18-22 years) and five elderly adults (71-84 years) took part in the study. The subjects performed isometric contractions as fast as possible with the ankle dorsiflexors while sitting with the ankle at 90°. The torque and corresponding surface and intramuscular electromyograms (EMGs) from the tibialis anterior were recorded during the fast contractions. In three subjects of both groups, mechanical responses to electrical stimulation were also recorded. The peak torque, the time to peak torque and the maximal rate of torque development were measured for each fast voluntary contraction and from the mechanical response to the electrical stimulus. The rate of EMG rise during the fast voluntary contractions was quantified by computing the integral of the rectified surface EMG (integrated EMG) from its onset: (1) to the first 25 and 50 ms, (2) to the time at which the maximal rate of torque development was attained (~75 ms), and (3) to the end of the EMG burst. During the voluntary contractions, single motor unit action potentials were also recorded and identified on the basis of amplitude, duration, and waveform shape. Their discharge frequency was measured at the offset of the fast contractions for the first three interspike intervals. During the fast contractions, the maximal rate of torque development and corresponding integrated EMG were lower in older adults, by respectively 48 % (P=0.05) and 16.5 % (P=0.05). The young adults, but not the older ones, exhibited a passive association (r²= 0.33, P<0.01) between the maximal rate of torque development and the corresponding integrated EMG. These age-related changes during fast voluntary contractions were accompanied by a decline (P=0.001) in motor unit discharge frequency (19 %, 28 % and 34 % for first three interspike intervals, respectively) and in the percentage of units (45 %, P<0.05) that exhibited double discharges (doublets) at brief intervals (< 5 ms). As aging decreased the maximal rate of torque development of fast voluntary contractions to a greater extent (~10 %) than that of an electrically evoked twitch,
collectively the results indicate that the age-related decline in maximal motor unit discharge frequency limits, in addition to the slowing of muscle contractile properties, the performance of fast voluntary contractions. 

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INCREASED HMAX/MMAX-RATIO INDUCED BY MAGNETIC STIMULATION OF THE HUMAN SOLEUS MUSCLE

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Introduction

It is well known, that the electric field induced by magnetic stimulation (MS) is characterized by a great depth of penetration (Barker, 1999). Therefore, it is able to stimulate deep intramuscular motor axons, which evoke muscle contraction (Machetanz et al., 1994). The purpose of the present study was to examine the effects of repetitive MS (rMS) of the m. soleus (So) on the Hmax/MMax-ratio.

Methods

24 healthy male students took part in a double blind study. Subjects were randomly assigned to a treatment group (G1: n = 13; age 24.08 ±1.98; weight 77.77 ±7.34; height 181.31 ±6.76) and a control group (G2: n = 11; age 23.00 ±1.55; weight 79.55 ±11.67; height 182.00 ±8.31). rMS was delivered using a MagProR30 stimulator and a MC-125 circular coil. The stimulation protocol included the application of symmetric biphasic pulses, a frequency of 15 Hz, 20 trains, inter train interval 2 sec, 100 bursts per train and 40% stimulator output. rMS took place once and was applied to So of G1. G2 received a placebo rMS with 0% stimulator output. H-reflex stimulation used a bipolar set up and 0.5 ms rectangular pulses. The subjects remained in the same standardized ventral position on the CYBEX NORM Testing & Rehabilitation System (Computer Sports Medicine®, Inc.) and stayed inactive during the whole experiment with the foot fixed to the device. Before and after rMS Hmax/MMax-ratios and torque (T in Nm), produced by plantar flexion of So as a result of electrical stimulation of the N. tibialis, were evaluated.

Results

After rMS Hmax/MMax was significantly enhanced in G1 (0.585 ±0.176 vs. 0.630 ±0.142; p = 0.015), whereas Hmax/MMax of G2 remained nearly unmodified (0.516 ±0.195 vs. 0.519 ±0.214). The increment of Hmax/MMax of G1 was not generated by enhancements of Hmax (3.681 ±1.914 vs. 3.637 ±1.679), but on account of a significantly decreased Mmax (6.105 ±2.095 vs. 5.644 ±1.945; p = 0.027). Furthermore, T of G1 revealed nearly no changes (10.20 ±2.67 vs. 10.13 ±2.81).

Discussion

The decline of Mmax was likely induced by muscular fatigue, although T did not indicate on that. Hmax reduction during the course of the experiment may reflect phenomena described by Crone et al. (1999). The predominant mechanisms remain unclear.

Conclusion

The used stimulation protocol led to an enhancement of Hmax/MMax-ratio, due to the reduction of Mmax.

References.


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HEAT SHOCK AND ANTIOXIDANT PROTEIN ADAPTATIONS OF HUMAN GASTROCNEMIUS MUSCLE TO SIX WEEKS OF HIGH INTENSITY INTERVAL TRAINING

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Skeletal muscle adapts to the stress of acute (Morton et al., 2006) and chronic (Morton et al., in press) contractile activity via rapid changes in gene expression to yield an increased content of heat shock proteins (HSPs) and antioxidant defences. An increased muscle content of such defence networks following stress function to restore cellular homeostasis, facilitate repair from injury and protect the cell from further insults. A consistent elevation of ‘stress proteins’ during repeated bouts of exercise may therefore be a component of the cellular mechanisms by which regular exercise provides protection against exercise-induced muscle damage. Adaptations of HSPs and antioxidants following running exercise have only been studied in the vastus lateralis, despite the gastrocnemius muscle being more metabolically active in this mode of exercise (Costill et al., 1974). The purpose of this study was therefore to investigate HSP and antioxidant adaptations in the gastrocnemius following high intensity interval training.

Following ethical approval, eight recreationally active male participants performed 50 min of high intensity intermittent running exercise, four times per week for six weeks. The protocol included a 10 min warm up at a running velocity corresponding to 70% of 2max followed by five 3 min bouts at a running velocity corresponding to 90% 2max separated by 3 min active recovery periods (1.5 min at a velocity corresponding to 25% 2max followed by 1.5 min of velocity corresponding to 50% 2max). The protocol ended with a 10 min cool-down period at a velocity corresponding to 70% of 2max. Assessments of 2max, running economy at 10 km.h-1 (Re) and performance on a Yo-Yo intermittent recovery test (IR2) were performed before and after training. Resting muscle biopsies were also obtained from the lateral portion of the gastrocnemius muscle before and after the training period. Training induced significant (P<0.05) improvements in 2max (10%), RE (4%) and IR2 (16%). Training also resulted in significant increases (P<0.05) in HSP60 (22%), αB-crystallin (8.5%), MnSOD (38%) and a tendency (P=0.09) for an increase in HSP70 (20%) content of the gastrocnemius muscle. In contrast, HSP27 content showed no significant changes following training (P=0.9).

This study is the first to examine HSP and antioxidant protein adaptations of the gastrocnemius muscle to exercise. Data demonstrate that six weeks of high intensity intermittent exercise improves both aerobic and anaerobic performance indices and induces a specific up-regulation of stress protein content of skeletal muscle. The intermittent nature of the training protocol makes this training model suitable for athletes involved in high intensity intermittent sports.

References.


THE EFFECT OF ACUTE MODERATE AEROBIC EXERCISE ON BACTERIALLY-STIMULATED NEUTROPHIL DEGRANULATION RESPONSES IN PATIENTS WITH CHRONIC KIDNEY DISEASE

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Patients with chronic kidney disease (CKD) suffer from immune dysfunction, leading to a high incidence of infectious complications, a major cause of morbidity and mortality among these patients (Cohen et al., 1997). It has been demonstrated that acute intensive exercise exerts a temporary depression on many aspects of immune function, whereas moderate exercise exerts little influence on these measures (Gleeson et al., 2007). However, it is not clear what effect moderate intensity exercise may have in CKD patients given their already compromised immune systems, even though regular physical activity in these patients has been shown to have a positive impact upon a variety of important parameters including muscle atrophy and cardiovascular risk as well as self-esteem and quality of life (Johansen, 2007). Therefore, the aim of this study was to determine the effects of acute moderate aerobic exercise on bacterially-stimulated neutrophil degranulation responses in patients with CKD.

Eight patients (6 males and 2 females) with a mean age of 56 years (range 38-76 years), with Stage 4 CKD (n=5) or on continuous ambulatory peritoneal dialysis (n=3), walked for 30 min on a motorised treadmill at a 1% gradient and at a speed that elicited a subjective rate of perceived exertion in the range of 12-14 (somewhat hard). Venous blood samples were collected before (pre-ex), immediately after (post-ex) and 1 h after exercise (1 h post). Elastase release from unstimulated (plasma elastase) and bacterially-stimulated neutrophils was determined by ELISA. Results were analysed using a one-factor (time of measurement) repeated measures ANOVA with post-hoc Student's paired t-tests with Holm-Bonferroni adjustment applied. Values are mean (SEM).

There was no significant effect of time on numbers of circulating neutrophils (pre-ex: 3.8 (0.5) x 10^9 cells/l, post-ex: 4.2 (0.4) x 10^9 cells/l, 1 h post: 4.3 (0.4) x 10^9 cells/l, F=2.3, P=0.170). Exercise induced an increase in plasma elastase concentration (pre-ex: 38.9 (3.8) µg/l, post-ex: 53.9 (6.9) µg/l, F=5.0, P=0.068), but values returned to resting levels 1 h after exercise (pre-ex vs. 1 h post: P=0.568). Bacterially-stimulated elastase release per neutrophil did not change immediately after exercise (pre-ex: 752 (104) fg/cell vs. post-ex: 708 (108) fg/cell, P=0.568) but had increased by 1 h after exercise (pre-ex vs. 1 h post: 1102 (156) fg/cell, P=0.019). These results suggest that 1 h after an acute bout of moderate exercise the ability of neutrophils to respond to a bacterial challenge is improved in patients with CKD, suggesting improved resistance against bacterial infection.

References:

Acknowledgments
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REDUCTION IN INTRA-ABDOMINAL ADIPOSE TISSUE AFTER AN 8-WEEK PERCUTANEOUS ELECTRICAL STIMULATION PROGRAM IN YOUNG WOMEN

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BACKGROUND: Excessive deposition of visceral adipose tissue is known to predispose to cardiovascular diseases. Exercise training may counteract the aberrant metabolic profile associated with abdominal obesity both directly and as a consequence of body fat loss (Buemann and Tremblay, 1996). Several studies have shown reductions in intra-abdominal adipose tissue (IAAT) after total body strength-training programs (i.e., Ibañez et al., 2005). However, none of these studies used percutaneous electrical stimulation (PES) to activate the muscles during the strength training programs proposed. Moreover, little is known about the consequences of PES application on lipid metabolism.

OBJECTIVE: To evaluate the influence of a third-weekly progressive PES strength training program, without a concomitant weight loss diet, on IAAT in young healthy women.

METHODS: Twenty one young women (aged 17±1) participated in a 8-week PES supervised training program for abdominal muscles group. Diet, habitual physical activity and body composition were measured. Abdominal fat was obtained by computed tomography. The measurements were taken 4 weeks (wk -4) before training, immediately before training (wk 0), and at the week after the end of the training program (wk 9). Abdominal muscles were electrically stimulated during 60 min/day, 3 days/week for 8 consecutive weeks, using a dual-channel battery-powered stimulator. The stimulator delivered a biphasic current of 8 Hz frequency. The current characteristics were set up as follows: on-off mode stimulus 18 s stimulation, 2 s rest, pulse width 200ms, rise and fall time 1s, and maximal stimulation amplitude 100 mA.

RESULTS: No significant variation was observed in any of the above selected parameters during the 4-week control period. During the training period diet and physical activity were not significantly modified. After the PES training visceral and subcutaneous abdominal fat decreased significantly by 17.1 % (from 174.5 ± 141.9 to 149.4 ± 26.6 cm3, P < 0.01) and by 11.2% (from 219.0 ± 45.5 to 192.6 ± 38.8 cm3, P<0.01), respectively, while no changes were observed in body mass.

CONCLUSION: Three sessions per week of PES on abdominal muscles, without a concomitant weight loss diet significantly decreased IAAT in a group of young healthy women.

References:
CENTRAL AND PERIPHERAL FACTORS RESPONSIBLE FOR THE INCREASE IN FORCE VARIABILITY WITH MUSCLE FATIGUE

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Introduction
It has been often reported that the variability of force output increases with muscle fatigue. However, the mechanisms responsible for the increase in force variability with fatigue are poorly understood.

Two potential factors were studied: the increase in central drive to the muscle that accompanies impairment of contractile function and the variability in the twitch mechanical response of the muscle fibre.

We conducted a series of experiments in order to determine the relative contribution of the increase in central drive and of the contractile mechanisms of muscle cell in the increase in force variability observed during fatigue. The first experiment was designed to determine to which extent the increase in force variability during fatigue parallels the increase in the motor command magnitude needed to achieve a given force. The second experiment was designed to determine to which extent the increase in central drive could account for the increase in force variability with fatigue. The third experiment was designed to determine to which extent the variability in muscle cell contractile mechanisms could account for the increase in force variability. In the 3 experiments, force fluctuations were studied at low to moderate contraction levels, where the precision of force production is likely to be most functionally relevant.

Methods
Exp 1
We studied force variability when participants were asked to sustain the same force of elbow flexion pre- and post-fatigue. The force range was 7 / 53 % of maximal voluntary contraction. Surface EMG was recorded as indicator of the neural drive to the muscles.

Exp 2
In order to control the variability due to the increase in central drive, we studied force variability when participants were asked to sustain the same level of muscular activation pre- and post-fatigue. This was done by giving participants a bio-feedback on their elbow flexor EMGs. The force range was similar as experiment 1.

Exp 3
In order to investigate the contribution of peripheral factors to force variability, we studied force variability when force was evoked by muscle electrical stimulation. Various levels of force were evoked pre- and post-fatigue (range 5 / 40 % of maximal voluntary contraction).

Results and conclusion
In Exp 1, the coefficient of variation of force increased with fatigue whatever the force level. In contrast EMG increased only at moderate force levels. It is concluded that the increase in the central drive to muscles is partly responsible for the increase in force variability during fatigue. However, our results suggest the existence of alternative mechanisms of neural but not muscular origin, especially at low force levels.

POST-EXERCISE BLOOD PRESSURE RESPONSES TO CONTINUOUS VERSES INTERMITTENT EXERCISE: EFFECTS OF TIME OF DAY

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According to guidelines for hypertension treatment, 30-min or more of continuous or intermittent exercise is advocated to lower blood pressure (BP). Following a bout of continuous dynamic exercise, BP does fall, but research on BP following intermittent exercise is scarce with only one study involving walking being controlled for total work done (Park et al., 2006). Nevertheless, the time of day that exercise began was not controlled in this study, even though circadian variation in the BP reactivity to exercise has been established (Jones et al., 2006). Therefore, we hypothesize that the exercise-mediated BP reduction will be greatest following intermittent exercise, even when total work done is controlled, but that time of day moderates this effect.

Eight normotensive, active males, aged 29±7 years (mean±SD), body mass 75.9±6.2 kg completed two semi-supine cycling protocols on separate occasions at 08:00 and 16:00 h on differing days. Each protocol comprised of cycling at 70% peak oxygen uptake for 30-min. Protocol 1 consisted of 30-min of continuous cycling (CONT) and protocol 2 consisted of three 10-min bouts of cycling each separated by 10-min of rest (INT). Five minutes before, and 20-min after, each exercise protocol systolic, diastolic and mean arterial (MAP) blood pressure was measured continuously. Changes from pre-exercise baseline were calculated and averaged into 5-min periods.

Over the 20-min post-exercise period, MAP changed by 1/2 mm Hg following CONT exercise compared to a -7/2 mm Hg reduction following INT exercise (P=0.029). The respective post-exercise changes in systolic and diastolic pressures were -13 (4) vs -19 (5) and 2 (2) vs -4 (2) mm Hg following CONT vs INT exercise protocols. There was no significant interaction of time of day on these protocol-determined differences in post-exercise BP responses (P>0.119). There was evidence that the post-exercise reductions in systolic, diastolic and MAP were sustained for a greater time period following the INT exercise protocol (condition x post-exercise time, P<0.010). At the 20-min post-exercise time point, MAP was 1/3 mm Hg following CONT exercise compared to -9 (3) mm Hg following INT exercise. The respective 20-min post-exercise time points for systolic and diastolic BP were -13 (4) vs -21 (6) mm Hg and 3 (2) vs -5 (2) following CONT vs INT exercise.

These findings suggest that intermittent exercise causes greater acute BP lowering effects compared with a single continuous bout of equivalent work. This greater hypotension following intermittent exercise was not moderated by time of day. Therefore, we recommend that, for optimal BP lowering, a bout of exercise should be occasionally interrupted with short rest periods.

References
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PLASMA HOMOCYSTEINE NITRIC OXIDE AND OXIDANTS LEVELS IN FEMALE VOLLEYBALL PLAYERS AND SEDANTARIES

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Introduction

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Homocysteine (Hcy) is believed to mediate its toxic effects through the formation of oxygen-derived free radicals, namely superoxide and hydrogen peroxide (1). The relationship between the plasma Hcy and physical activity remains unanswered (2). Its setting forward that regular, non intensive exercises could decrease plasma Hcy concentrations, but intensive prolonged exercise has the contrary effect (3). It has also been showed that, hyperhomocysteinemia (HHcy) both increases and suppresses nitric oxide (NO) production. Exercise training resulted in significant increases in eNOS protein content and activity (4). Increasing eNOS protein expression, and activity, exercise training may attenuate Hcy induced endothelial dysfunction. We proposed to examine if the plasma Hcy levels, plasma lipids, plasma nitric oxide, plasma oxidants and antioxidants were different in female volleyball players and sedentary girls.

Methods
Ten female volleyball players from a professional team participated in the study. Sedentary group was formed by 7 young females of the same age (mean age = 18) among medical students in Gazi University (GU). Blood lipids, homocysteine, folate, vitamin B12, glucose, insulin, nitric oxide, MDA (as oxidant) and glutation (as antioxidant) levels were assessed in GU, Faculty of Medicine Laboratories. Data were analysed with the SPSS for windows and results were expressed as mean ± standard deviation.

Results
The Hcy (14.2 ± 3.5), NO (33.2 ± 10.3), MDA (0.7 ± 0.3) levels in volleyball players were found significantly higher than the Hcy (9.4 ± 2.3), NO (22 ± 2.9), MDA (0.4 ± 0.07) levels of sedentary girls. Although the GSH level (93 ± 8.9) is higher in volleyball players comparing to seden-tary females’GSH levels (88 ± 5.1), the difference was not significant. However there were no significant differences between the levels of plasma lipids such as kolesterol, triglyserid, HDL, LDL and VLDL. Concentrations of plasma Hcy, were negatively correlated with plasma folate and plasma vitamin B12 both in volleyball players and sedentaries.

Conclusion
We found that long term exercise didn’t decrease the plasma Hcy levels, indeed it increased the plasma Hcy, NO and MDA levels. Since Volleyball has been described as an ‘interval’ sport with both anaerobic and aerobic components, these results were correlated with Rousseau results who suggested that plasma Hcy concentrations increase in highly aerobic exercise trained athletes (5).

References

EVALUATION OF DELAYED ONSET MUSCLE SORENESS AFTER ECCENTRIC WORK OF VARIOUS VOLUMES
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Delayed onset muscle soreness (DOMS) is one of unfavorable consequences of the intense physical activity especially of eccentric exercise. However the triggers of DOMS initiation are still unclear. The purpose of our study was to reveal the intensity of DOMS and creatine phosphokinase activity (CPK activity) after acute eccentric exercise of various volumes and equal intensities. 17 subjects performed eccentric exercise using bicycle ergometer with floating seat. The intensity of exercise was 140 % of maximal oxygen consumption. The number of 30-seCONDS exercise bouts divided by 3-minutes rest periods was chosen randomly from 3 to 12 bouts for each subject. DOMS was evaluated during 14 days recovery after an acute exercise using special scale in three tests: during going down stairs; during 10 isometric contractions of different intensities (40-100 % of maximal voluntary contraction) of knee extensors; during applications of dozed press on evaluazed muscles. The peak levels of DOMS were recorded at the 2-3 day of recovery. The relationship between the level of pain sensation and volume of exercise was rather weak. On the other hand close correlation was revealed between DOMS level and physical condition. The later was evaluated in preliminary tests. The higher was physical condition the lower were DOMS and CPK levels. Noteworthy similar attenuation of unfavorable effects of eccentric exercise was revealed when exercise was performed for a second time after a week rest. Thus DOMS and blood CPK levels after eccentric exercise depend on previous physical activity of a subject.

THE WINGATE TEST: A REFERENCE IN THE SCOPE OF CHILDREN ANAEROBIC FUNCTION
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Introduction
The evaluation of the anaerobic functional capacity concerning children is still a challenge in what research is concerned. The Wingate test (WAnT) is a laboratorial procedure of reference in the scope of children anaerobic evaluation (1). One of the advantages of this test is that it enables its application in both legs and arms (2) and it has been widely used in children at different ages but seldom used simulta-neously. This study intends to compare the maximum of anaerobic capacity of pre-pubescent children who are trained in different sports, such as football and swimming, bearing in mind the aim of identifying an adaptable metabolic specialization.

Methods
Participants: 22 subjects, all with two years of practice: 11 football players (age: 11,27 ± 0,47; weight: 37,82 kg ± 4,14; BMI: 17,22 ± 1,84; VO2max/kg: 57,61 ml/kg/min-1 ± 7,29) and 11 swimmers (age: 11,55 ± 0,52; weight: 41,00 kg ± 5,71; BMI: 18,09 ± 1,59; VO2max/kg: 54,39 ml/kg/min-1 ± 5,67). Modified Balke maximal protocol using ergo-spirometry procedures (Cosmed® b2) was selected to physio-logical characterization of the sample. In order to quantify anaerobic performance two applications of WAnT in the cycle ergometer (Monark® 849) were made, one for the legs (10,075/kg, 7,5 % of body weight) and other with the arms (0,05/kg, 5% of body weight) following official procedures (2). Three relative parameters were assessed for both tests: Peak Power, Average Power and Power Drop. Heart rate was measured with the Polar S610. The two groups were compared and the experimental variables correlated (SPSS, ver. 13.0).

Results
There were no significant differences observed for the experimental parameters between the groups. Nor differences were found within each group between arms and legs cycling, however, when we report our study to the graphic analysis of the power rate and the heart rate, we could saw some differences between the groups during the test and on the recovery phase.

Discussion/Conclusions

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When we talk about children that attend to regular practice of swimming and football, we can say that this sport promote a very slightly adaptation on physiological characteristics in children as saw in the graphic analysis, however, the level of practice it's a very important issue that we must have in consideration. So, the results suggest that there is no metabolic specialization between the practice groups. The learning effect, the active muscle groups or the application of tests in laboratory context with children will able to explain these results.

ENDURANCE PERFORMANCE AND LACTATE REMOVAL IN WELL-TRAINED RUNNERS

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Some studies have supported an association between aerobic fitness and lactate removal following high intensity exercise, whereas others have failed to confirm an association (Tomlin and Wenger 2001). Regarding this, it was hypothesised a relationship between training status, running protocol, and lactate removal in distance runners of different training background.

Twelve well-trained endurance runners (7 middle-distance runners; 5 long-distance runners) performed after the end of the competitive season the Université de Montréal Track Test (UMTT) (Léger and Boucher 1980) for determining the maximal aerobic speed (MAS) and total final time (TUMTT). More than 48 h afterwards, they performed the time limit at MAS (Tlim) (Billat et al. 1994). Final lactate levels within the first minute after the end of both protocols were determined [LA1]. Recovery lactate levels were determined after ten minutes of the end of both protocols [LA10]. The difference between LA1 and LA10 was also calculated (LADIF).

Mean LA1 after the UMTT was 11.82 ± 2.02 mMol·L-1 whereas mean LA1 after the Tlim was 12.01 ± 1.94 mMol·L-1. After recovery, mean LA10 was 9.57 ± 1.30 mMol·L-1 after the UMTT (LADIF = -2.24 ± 2.20 mMol·L-1), whereas after the Tlim was 11.08 ± 2.55 mMol·L-1 (LADIF = -0.92 ± 2.52 mMol·L-1). LA10 values between days were significantly different (p<0.05). Only LA10 of UMTT day was significantly different than LA1 (p<0.05). Matched LA1 and LA10 between days were significantly correlated (LA1: r=0.652; p=0.022; LA10: r=0.745; p=0.003). ANOVA analysis did not reveal any influence of training status or training background on lactate removal. In summary, a group of well-trained distance runners remove lactate 10 min after performing a UMTT but not after a Tlim.

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THE PROTECTIVE ROLE OF THE ALPHA-ACTININ-3 PROTEIN IN PAIN DEVELOPMENT AND MUSCLE DAMAGE AFTER TRAINING

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Introduction-The ACTN3 gene encodes for the alpha-actinin-3 protein, which has an important structural function in the Z-line of the sarcomere. A stop codon (R577X) in the ACTN3 gene causes a complete loss of the protein in the XX homozygotes. Association studies show an enhanced performance of the R-allele in fast dynamic muscle tasks, while the X-allele seems beneficial for longer sustained muscle contractions(1). Little is known about the effect of the ACTN3 genotype on variability in strength training responses. Clarkson et al. reported lower baseline Creatine Kinase values [marker of muscle damage] in XX carriers compared to heterozygotes. They found no association between the R577X polymorphism and baseline strength or the change in strength or blood proteins after exercise(2). In our study we wanted to evaluate the genotype-dependent response to an acute eccentric training bout. We hypothesized that RR carriers rate less pain and show lower expression of muscle damage markers compared to the XX group. Methods-Nineteen (9RR, 10XX) healthy young (18-30 yrs) male subjects participated. The training bout consisted of 20 maximal eccentric quadriceps contractions in 8 series (4/leg). Blood samples were taken before, 6h, 24h and 48h after the training session, strength was measured before (minus one week) and after 48 hours. Muscle biopsies were taken before, 1 hour and 6 hours after the training bout and will be used to study mRNA expression profiles of hypertrophic pathway genes. A visual analogue scale (VAS) was used to evaluate the pain subjects experienced after training. Creatine Kinase was measured as a marker of muscle damage. Results-We found a significant drop in strength in each group 48 hrs post exercise, although no genotype-dependent differences were found. At 24h post training a trend (p=0.10) towards significance was found in the CK values; the RR carriers show lower serum CK levels than XX carriers. The analysis of the VAS results showed a higher rate less pain and show lower expression of muscle damage markers compared to the XX group. Results-We found a significant drop in strength in each group 48 hrs post exercise, although no genotype-dependent differences were found. At 24h post training a trend (p=0.10) towards significance was found in the CK values; the RR carriers show lower serum CK levels than XX carriers. The analysis of the VAS results showed a higher rate less pain and show lower expression of muscle damage markers compared to the XX group. The ANOVA analysis did not reveal any influence of training status or training background on lactate removal. In summary, a group of well-trained distance runners remove lactate 10 min after performing a UMTT but not after a Tlim.

Acknowledgments: This work is supported in part by Consejo Superior de Deportes Grant (112/UPB31/06).

References.


VASCULAR RESPONSES TO COLD WATER IMMERSION: IMPLICATIONS FOR POST EXERCISE RECOVERY

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Background: Cold water immersion therapy has been shown to be effective in enhancing post-exercise recovery. Benefits may arise from cold induced reductions in limb blood flow, which serve to reduce muscle damage and inflammation following strenuous exercise. However, no study to date has comprehensively investigated the influence of cold water immersion on limb blood flow responses. The present aim was therefore to investigate the influence of water immersion temperature on lower-limb conduit artery and cutaneous blood flow.

Methods: Nine healthy male subjects (25 ± 2 years) were randomised to four different water temperatures (8°C, 11°C, 15°C, and 21°C) on separate days. During each condition, subjects were placed in a semi-reclined position on a custom-designed platform, and lowered into the water to the iliac crest for a total duration of 10 min (2 x 5 min, with a 2 min time window in-between for data collection). Rectal
temperature, skin temperature and forearm and thigh skin blood flow were continuously monitored at baseline, throughout immersion and for 30 min post-immersion. Muscle temperature was recorded immediately pre-, and post-immersion and at 30 min post-immersion. Superficial femoral artery blood flow was assessed using duplex ultrasound, in conjunction with mean arterial pressure, at rest, between immersions and during the 30 min post-immersion period. All data were analysed using a two-factor (condition x time) within participants general linear model (GLM).

Results: Mean skin temperature significantly declined during immersion under all conditions with values significantly lower in 8°C and 11°C water compared to 15°C and 21°C (P < 0.0005). Muscle temperature was also reduced in all conditions compared to baseline (P < 0.0005) with the greatest decrements observed in 8°C and 11°C water 30 min post-immersion (P < 0.0005). Femoral artery conductance was significantly reduced immediately following immersion and remained lower than baseline at 10, 20 and 30 min post-immersion under all water immersion conditions (P < 0.0005). Forearm and thigh cutaneous vascular conductance were significantly reduced during immersion under all conditions relative to baseline with further decrements observed during the 30 min post immersion period (P < 0.01). Femoral and cutaneous conductance were not significantly different between temperature conditions.

Conclusions: This study demonstrates that immersing the lower limbs in water causes significant reductions in femoral and cutaneous blood flow and conductance that may have implications for recovery of the muscle following strenuous exercise. Reductions in blood flow appear to be largely independent of water temperature (range 8-21°C), skin and muscle temperatures.

THE INFLUENCE OF ACE I/D POLYMORPHISM ON HUMAN MUSCLE FUNCTION, CONTRACTILE PROPERTIES AND MUSCULARITY OF OLDER MEN

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Aging is associated with a progressive decline in muscle strength and function largely due to sarcopenia. Healthy older individuals have age related deficits in muscle power that are even greater than muscle strength (1), which is of particular concern as the loss of power can decrease physical function, the ability to live independently and increase the risk of falls. ACE genotype has been shown to influence muscle strength in young white males (2) and the ACE D allele has been found to influence fibre type composition in a Japanese population (3), potentially influencing muscle function and contractile properties but this has not been investigated in older adults. The aim of this study was to conduct a thorough investigation of the influence of ACE genotype on muscle function, contractile properties and lean body mass in a UK population of older men.

Following ethical approval a range of muscle function measurements were taken from healthy non strength trained UK white males (60-70yrs) on two occasions. A conventional strength testing chair was used to measure maximal isometric knee extensor and elbow flexor strength. Maximum twitches were electrically evoked (Digitimer DS7AH, UK) in the quadriceps to assess time to peak tension (TPT) and half relaxation time (HRT). Isokinetic knee extensor peak torque was measured at two velocities (30°.s⁻¹, 240°.s⁻¹) using isokinetic dynamometry (Cybex Norm, USA). Relative strength at high velocities (240°.s⁻¹:30°.s⁻¹) was calculated. A Dual-energy X-ray Absorptiometry (DXA) scan (Lunar Prodigy Advance DXA machine, GE Lunar, Madison, WI) was used to assess lean body mass. ACE I/D genotype was determined from whole blood samples using polymerase chain reaction. A conventional strength testing chair was used to measure maximal isometric knee extensor and elbow flexor strength. Maximum twitches were electrically evoked (Digitimer DS7AH, UK) in the quadriceps to assess time to peak tension (TPT) and half relaxation time (HRT). Isokinetic knee extensor peak torque was measured at two velocities (30°.s⁻¹, 240°.s⁻¹) using isokinetic dynamometry (Cybex Norm, USA). Relative strength at high velocities (240°.s⁻¹:30°.s⁻¹) was calculated. A Dual-energy X-ray Absorptiometry (DXA) scan (Lunar Prodigy Advance DXA machine, GE Lunar, Madison, WI) was used to assess lean body mass. ACE I/D genotype was determined from whole blood samples using polymerase chain reaction. In a preliminary cohort (n = 64) ACE genotype distribution was in Hardy Weinberg Equilibrium (P = 0.20). Characteristic differences were independent of genotype (age, height, body mass, lean body mass, body mass index). Isokinetic strength at 30°.s⁻¹ was influenced by ACE genotype (ANOVA, P = 0.01) with II genotype individuals having lower strength than ID individuals (Bonferroni corrected t, P = 0.01). No other differences were found between ACE genotypes for measures of isometric strength, relative strength at high velocities, TPT or HRT.
Isokinetic strength at 30°.s⁻¹ varied according to ACE genotype in this preliminary cohort. The knee extensors have functional importance for mobility and tasks of daily living and an ACE genotype influence on strength of this muscle group may have consequences for quality of life in old age. As the cohort number increases it will be interesting if this effect is maintained.

References.

**DYNAMICS OF CARDIAC OUTPUT, DEOXYGENATED AND COMMON HEMOGLOBIN IN WORKING MUSCLE DURING INCREMENTAL BICYCLE TEST IN SUBJECTS WITH DIFFERENT LEVELS OF AEROBIC PERFORMANCE**

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Oxygen consumption of working muscles depends on oxygen delivery and oxidative capacity of muscle. The aim of the study was to compare dynamics of cardiac output, blood filling of working muscle evaluated by common hemoglobin and deoxygenated hemoglobin (index of muscle oxygen consumption) during bicycle incremental test till exhaustion.

7 physically active young men (VO2 max 45-55 ml/min/kg) and 8 athletes (VO2 max 55-70 ml/min/kg) participated in the experiment. Incremental ramp test till exhaustion was performed on a bicycle ergometer. Cardiac output was determined by breathing mixture with soluble and insoluble gases using gas mass-spectrometer. Cardiac output was measured at 20, 40, 60, 80, 90, 95 and 100% of maximal aerobic power. Concentrations of deoxygenated and common hemoglobin were continuously evaluated in working muscle (m. vastus lateralis) by near-infrared spectroscopy. During tests pulmonary oxygen consumption was measured breath-by-breath, lactate concentration in capillary blood was determined as well.

Half of the subjects demonstrated slowing down of an increase of common hemoglobin in m. vastus lateralis at 90-100% of maximal aerobic power. In athletes who demonstrated higher level of aerobic performance deoxygenated hemoglobin increased linearly during test till exhaustion. We assume it to be related with greater muscle oxidative capacity. Physical active subjects and less trained athletes demonstrated slowing down of an increase of common hemoglobin at submaximal aerobic power. It might be connected with low oxidative capacity of muscle or with restricted of oxygen delivery to the muscle. Noteworthy we have shown previously that during incremental one-leg knee extensions (work of small muscle mass with unrestricted oxygen delivery) the common hemoglobin increased till exhaustion in all subjects (Popov et al. 2007). In the present study the athletes with highest aerobic performance show an increase of common hemoglobin (blood volume filling) in working muscle until 90-100% of maximal aerobic power during incremental bicycle test, while less trained athletes and physical active subjects were demonstrated slowing down of total hemoglobin in working muscle at 50-80% of maximal aerobic power.

Half of the subjects demonstrated slowing down of an increase of cardiac output (due to stroke volume) at 90-100% of maximal aerobic power. The dynamics of cardiac output did not demonstrate close relation with dynamics of common hemoglobin in m. vastus lateralis during incremental bicycle test. That means that oxygen delivery to working muscle at maximal aerobic power may be restricted both by cardiac output and/or by redistribution of blood from working muscles to other regions (to breathing muscles, for example).

Thus comparison of dynamics of cardiac output with common and deoxygenated hemoglobin in working muscle allows to reveal the factors restricting individual aerobic performance.

**MATRIX METALLOPROTEINASE-EXPRESSION IN HUMAN SKELETAL MUSCLE IN RESPONSE TO EXERCISE**

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The current study explored the effect of exercise training on the expression and activity of Matrix metalloproteinases (MMPs) in human skeletal muscle, and if the skeletal muscle fibres contribute to exercise induced MMP-expression. Changes of the functional and morphological characteristics of the skeletal muscle occur under various conditions and in response to a wide range of stimuli both pathological and physiological. Many of these processes require a remodelling of the extracellular matrix (ECM), degradation as well as regeneration. In fact the vast majority of genes up-regulated in as disparate phenomenon as exercise training and muscular dystrophy are extracellular related.

The MMPs is diverse and large family of proteases which degrade large variety of proteins but each MMP with a reference to specific extra cellular matrix (ECM) proteins. Expression of various MMPs is found in most tissues and has been demonstrated to play essential roles during growth, development and angiogenesis. MMP-2 and MMP-9 are two MMPs with common substrate specificity. They are collagenases with a special ability to degrade collagen IV, the most prevalent ECM protein in skeletal muscle.

Eleven subjects performed one-legged exercise four times per week for five weeks. The subjects exercised one leg for 45 min with restricted blood flow (R-leg), followed by exercise with the other leg at the same absolute workload with unrestricted blood flow (UR-leg). MMP-2, MMP-14 and tissue inhibitor of MMP (TIMP-1) showed similar patterns, a robust increase in the muscle tissue after 10 days of exercise regardless of exercise condition. In addition, MMP-2 mRNA was detectable in laser-dissected myofibers and myofiber MMP-2 expression increased with exercise training. In contrast, MMP-9 mRNA increased transiently and associated to the first exercise bout and to a greater extent with exercise with restricted blood flow. The absolute number of MMP-9 transcripts were low and MMP-2 transcripts were generally 100-fold more prevalent in this material. Still, the gelatinolytic activity of MMP-9 after a single bout of exercise was comparable to that noted from MMP-2 after 10 days of exercise. Taken together the present findings support MMPs to be involved in skeletal muscle remodelling also in non-pathological conditions such as voluntary exercise in humans. The biological significance of the difference in temporal pattern of MMP-9 expression compared to MMP-2 and MMP-14, and the greater expression of MMP-9 in the exercise condition with enhanced metabolic perturbation needs to be further elucidated.
IMPACT OF ARM-CRANK EXERCISE ON FEMORAL ARTERY BLOOD FLOW AND SHEAR RATE PATTERN IN SPINAL CORD-INJURED SUBJECTS AND CONTROLS

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Recent evidence suggests that exercise results in a typical blood flow pattern in inactive conduit arteries, characterised by anterograde flow during systole and substantial retrograde diasstolic flow. This oscillatory pattern acutely results in endothelial release of nitric oxide (NO) and may, therefore, be linked with improved endothelial function in inactive vessel beds as a consequence of exercise training. Purpose. To assess the role of the sympathetic nervous system in the pattern of oscillatory blood flow, we compared changes in femoral artery blood flow and shear rate during arm-crank exercise in 10 healthy men (31+/−4 yrs) and 10 age-matched spinal cord-injured (SCI) subjects who lack supra-spinal sympathetic control in the legs (33+/−5 yrs).

Methods. Before, and every 5 minutes during, a 25 minute arm crank exercise bout at 50% of the individuals maximal capacity, femoral artery blood flow and peak anterograde and retrograde shear rate were assessed using echo Doppler sonography.

Results. Femoral artery baseline blood flow was significantly lower in SCI compared with able-bodied controls. Exercise resulted in a significant increase in mean femoral artery blood flow in controls (ANOVA, P<0.05), but not in SCI, while leg vascular resistance did not change during exercise is either group. Although mean shear rate was lower in SCI than in controls (P<0.05), shear rate pattern was different between groups. Peak anterograde shear rate was significantly larger in SCI than in controls, while peak retrograde shear was not different between groups. Arm-crank exercise induced a significant increase in peak retrograde, as well as anterograde, shear rate in controls. Interestingly, SCI subjects who have no supra-spinal sympathetic control, demonstrate a similar exercise-induced change in oscillatory shear rate in the non-active conduit vessel.

Conclusion. Our findings suggest, in contrast with our hypothesis, the sympathetic nervous system is not an obligatory contributor to the changes in shear rate pattern observed in inactive regions during exercise. Other mechanisms, such as local release of vasconstrictors or systemically active sympathetic hormones, may contribute to these novel observations. More importantly, since the exercise-induced oscillatory pattern is linked with NO release, arm-crank exercise may have important clinical implications to improve vascular health in the paralyzed and physically inactive leg vasculature.

EFFECTS OF THE TRAINING PERIODIZATION IN SWIMMING RATS ON AEROBIC AND ANAEROBIC PERFORMANCES

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Many physiological parameters have been used so far to study the effects of training on aerobic or anaerobic capacities, such as growth, nutritional condition, emotional problems and others factors. Nevertheless, our hypothesis is that the training periodization in rats allows examine some physiological effects by severe control. The objective of this study was to verify the training periodization responses on aerobic and anaerobic performance in rats (Rattus norvegicus). Seventy rats were divided randomly into two groups: Control Group (CG n=30) and Training Periodization Group (TPG n=30). All experiments were preceded by 2 weeks of individual adaptation to the water. The TPG was designed to run during a period of 12 weeks and was divided into three phases: Preparation (6 wk), Specific (4.5 wk) and Taper (1.5 wk). The Lactate Minimum Test (LACm) was adapted to determine the aerobic capacity (deAraujo et al., 2007). The aerobic performances was evaluated by maximal exhaustion time (Tlim) verified during hyperlactatemia induction phase in the LACm protocol. The lactate threshold (LTh) was used as an index of the intensity of the LACm. The Tlim was measured during the hyperlactatemia induction phase of the LACm protocol. The LTh was defined as the intensity at which the lactate concentration in serum began to increase above the pre-exercise level. The aerobic performances were compared using Analysis of Variance (ANOVA) and post-hoc Newman-Keuls test (P<0.05). The anaerobic performances were compared using Friedman test and post-hoc analysis (P<0.05).

Comparing hematologic response to three weeks of intermittent hypobaric hypoxia between trained athletes and triathletes and physically active students

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Short-term intermittent hypobaric hypoxia (IHH) protocols have been shown to elicit acclimatization and hematologic adaptations in mountaineers and physically active individuals [2,3]. IHH stimulates endogenous erythropoietin (EPO) secretion without producing the subsequent erythropoietic response of the same IHH protocol in both physical active and trained subjects, this is the objective of this study. Thirty-two subjects participated in this study. They were highly trained athletes and triathletes (T) [VO2max (mean+SD) 69.2+-2.2 mLkg-1min-1] and physically active students who did not train (NT) [VO2max (mean+SD) 58.3+-2.1 mLkg-1min-1] and who were subdivided in two control groups (C-T and C-NT, respectively) and two experimental groups (T-IHH and NT-IHH). These last ones performed IHH by simulating 4000m of altitude (GO2Altitude, Hipoxicator System, Biomedtech, Australia) during 48h (5's exposure-5's rest/day, 7 days/week over 3 weeks). The training and non-training groups were subdivided in three phases: Preparation (6 weeks), Specific (4.5 weeks) and Taper (1.5 weeks). Preparation was considered as an adaptation to altitude and Specific phase for the optimization of the training response. IHH was carried out twice a week (days 1 and 4) and the hematologic variables were determined after the 3rd day, 15 days, and 30 days. The hematologic responses were analysed using repeated measures ANOVA. Significant differences were found in the control group of physical active students (C-T) and trained athletes (C-T-IHH) after the 1st and 3rd week. However, the hematologic responses were not different between the other groups.

References:

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performed IHH (C-T) showed a significant decrease (p<0.05) in red cells, haemoglobin and haematocrit. We also observed a little decrease in EPO values by 19.3%. Nevertheless, red cells, haemoglobin and EPO increased when the trained athletes and triathletes performed IHH (T+IHH). EPO values were higher than those obtained in C-T, because after 3 wk they increased by 15.9% in T+IHH. Abellan et al. (2005) obtained an EPO's increase of 8.2% in highly trained athletes. The effects of IHH in non-trained physical students (NT+IHH) and trained athletes and triathletes (T+IHH) were similar in red cells (increases of 0.12 and 0.08 millions/ul, respectively), haemoglobin increase (increases of 0.1 and 0.15 g/dl, respectively) and EPO increases of 1.03 and 1.68 mL/mL, respectively. These results were different than those obtained by IHH, so future studies should elucidate this controversy. Possibly the IHH supposed an additional stimulus which increased EPO in T+IHH, and allowed to maintain hematological variables when comparing to C-T. Conclusion first, the IHH was a good stimulus for the production of erythropoietin and the derived haematological variables. Second, this stimulus was independent of the level of physical activity, and future studies should confirm this observation.

References

**MCT1 AND MCT4 GENE EXPRESSIONS IN ACTIVES AND LESS-ACTIVE TISSUES IN RATS SUBMITTED TO A SINGLE SWIMMING SESSION AT THE MAXIMAL LACTATE STEADY STATE**

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It is known that the efficient control of the lactate release to blood by active muscular fibers should play an important role in the muscular resistance to the fatigue. In those and in other tissues, the transport system is mediated by carriers denominated monocarboxylate transporters (MCT), with several isoforms. The presence and activity of the muscular MCTs, as well as in other tissues seems to be influence by the physical training, being possible that the acute exercise can stimulate the production of more transmembrane MCTs. The major efficiency of the lactate transport could produce lactate in the blood starting from the active fibers and, on the other hand, to promote the fast removal of this substrate from blood by muscles less active or in rest. It has been reported that the intensity of the exercise is a fundamental element in the MCTs synthesis activation, but the physiological mechanisms involving these responses were not still very well established. Besides, few studies have been to evaluate these effects on controlled exercise sessions, and there are a reduced number of researches involving analysis of the gene expression of MCTs in active and less active muscular fibers, that is fundamental to understanding of the lactate production-removal during exercise. In the present study, we have examined gene expression (GE) of the monocarboxylates transporters 1 and 4 (MCT1 and MCT4) in activities and inactive tissues as well as in heart and liver of rats submitted a single session of swimming exercise at the maximal lactate steady state workload (MSSLw). Our hypothesis is that lactate concentration in MSSLw may be increase the GE of the MCT1 and MCT4 in less-active tissues due the capacity of remove lactate by these tissues. All experiments were preceded by 2 weeks of individual adaptation to the water. Twenty-Four rats were separated randomly in four groups: Control (n=6); Dead immediately after MSSLw (n=6); Dead after 5 hours MSSLw (n=6) and Dead after 10 hours MSSLw (n=6). For verify GE in active tissues, gastrocnemius (White and Red), soleus muscles, liver and heart were excisions. The biceps was considered less-active tissue. The GE was determined by polymerase chain reaction (PCR). ANOVA was used in analysis statistics with post hoc Newman-Keuls test (p<0.05). The GE in MCT1 increases significantly in the liver [39.05%] 10 hours after MSSLw. In gastrocnemius while the maximum GE was immediately after exercise [62.36%]. The soleus muscle the GE increase after immediately MSSLw [202.1%] and kept increase until 10 hours after exercise [227.35% and 230%, 5 and 10 hours after MSSLw respectively]. No changes in heart, liver, biceps and MCT4 were observed. In summary, we have show that less-active muscle not changes the GE after MSSLw exercise.

**(FAPESP)**

**EFFECT OF EXERCISE INTENSITY ON THE CEREBROVASCULAR RESPONSES IN INTERNAL CAROTID AND VERTEBRAL ARTERY DURING DYNAMIC EXERCISE**

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Purpose The effect of exercise intensity on cerebral blood flow (CBF) during dynamic exercise has not yet been fully evaluated, and there is controversy as to whether increasing mean arterial pressure (MAP), cardiac output (CO), arterial carbon dioxide tensions (PaCO2), and sympathetic activity might regulate CBF during dynamic exercise. The purpose of the present study was to elucidate effect of exercise intensity on the cerebrovascular responses in the internal carotid artery (ICA) and vertebral artery (VIA) during dynamic exercise. Method Ten young adults 11 men and 9 women, age: 22.5±2.5 years, participated in this study. The exercise was performed on the recumbent cycle ergometer. The exercise consisted of a 5-min baseline followed by levels of exercise load at 30%, 50%, and 70% of the power of the VO2peak with 5-min duration of each stage. We continuously monitored CO, MAP (Model flow method with finometer), oxygen uptake (VO2), end-tidal CO2 (PETCO2) (Breathe-by-Breathe), internal carotid artery blood flow (QICA) and vertebral artery blood flow (QVA) at rest and during exercise. CBF was measured by a high resolution color-code Doppler ultrasound system and cerebrovascular resistance index (CVRICA and CVRVA) were also calculated as MAP divided by CBF. Results MAP, CO, and PETCO2 increases significantly with increase of exercise intensity. QICA increased by 12±2% during 30%VO2peak and reached a maximum 6±3% during 50%VO2peak. However, during 70%VO2peak, increase in QICA had a level off, in contrast to a continued increase in CVRICA throughout exercise. On the other hand, QVA increase in proportion to the increase of exercise intensity (17±3, 33±4, and 40±4%) at 30, 50, and 70% VO2peak, respectively. In addition, CVRVA did not change from the resting level throughout exercise. Discussion These data suggested that during dynamic exercise the blood flow responses in VA and ICA are different. This mechanism may serve to maintain a constant cerebral blood flow in the face of a large increase in perfusion pressure. In contrast, it seems that there is a little sympathetic control of blood flow and vascular responses in peripheral branches of VA as compared with ICA, and that passively increase in cerebral blood flow in VA with increasing perfusion pressure and/or PaCO2 during graded dynamic exercise.
RESISTANCE TRAINING WITH VASCULAR OCCLUSION ENHANCES CALF MAXIMAL VASODILATOR CAPACITY

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INTRODUCTION

Resistance training increases peripheral blood flow in young healthy subjects (Rakobowchuk et al 2005). The intensity required for these changes is typically in excess of 75% 1 repetition-maximum (1RM). Previous studies have shown that low intensity (20-50% 1RM) resistance training with concomitant vascular occlusion enhances muscle hypertrophy and strength (Takarada et al 2000), however the effect of resistance training with concomitant occlusion on the peripheral vasculature is not known. The purpose of this pilot study was to determine the effect of resistance training combined with vascular occlusion on maximal vasodilatory capacity.

METHODS

15 healthy untrained females [21 ± 2 yr, 165 ± 7 cm, 61 ± 6 kg; mean ± SD] volunteered for the study which had local ethics committee approval. Participants trained 3 days per week for 4 weeks consisting of 3 sets of dynamic calf plantar-flexion to failure separated by 1 min rest. Participants were randomly assigned to one of three training groups where both limbs were trained at either 25, 50 or 75% of 1RM, one without and the other with blood flow occlusion (110 mmHg) above the knee. Calf blood flow following reactive hyperaemia (RHI) was measured pre- and post-training using venous occlusion strain gauge plethysmography.

RESULTS

At 25% 1RM RHI increased (P<0.05) by 15% (23.7 ± 7.6 to 27.2 ± 7.0 ml/min/100ml) and 28% (24.7 ± 5.0 to 31.6 ± 7.1 ml/min/100ml) in control and occluded limb, respectively. At 50% 1RM RHI increased (P<0.05) by 16% (23.2 ± 6.8 to 26.9 ± 6.7 ml/min/100ml) and 39% (20.3 ± 7.3 to 28.3 ± 9.2 ml/min/100ml) in control and occluded limb, respectively. At 75% 1RM RHI increased (P<0.05) by 32% (18.6 ± 2.9 to 24.6 ± 5.1 ml/min/100ml) and 26% (19.0 ± 2.0 to 24.0 ± 5.1 ml/min/100ml) in control and occluded limb, respectively.

CONCLUSION

Resistance training at an intensity as low as 25% 1RM, for 4 weeks, is sufficient to increase maximal vasodilatory capacity in young healthy females. Moreover, there was a tendency for a greater increase in maximal vasodilatory capacity when training at the lower intensities was performed with vascular occlusion. This data supports the idea that low intensity strength training with vascular occlusion may be of benefit to those individuals who cannot train at high intensities.

References


INSULIN RESISTANCE, SOCS-3 PROTEIN EXPRESSION AND VO2MAX

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Specific members of the suppressor of cytokine signalling (SOCS) family of proteins are thought to have a role in the insulin and leptin resistance by inhibiting insulin signalling pathways [1].

Specific members of the suppressor of cytokine signalling (SOCS) family of proteins are thought to have a role in the insulin and leptin resistance by inhibiting insulin signalling pathways [1]. Purpose. To find out if SOCS3 protein expression is up-regulated in human obese skeletal muscle compared with their lean and overweight counterparts.

Methods. Sixteen lean [fat mass < 20%, ILGI], fourteen overweight [fat mass between 20-25 %, ILGI] and ten obese [fat mass > 25%, ILGI] young males were involved in this study. All groups were comparable in age (mean ± SEM) 25.9 ± 6.5; 29 ± 6.2; 30.3 ± 7.2 yrs respectively, but not in height (177.5 ± 5.5, 176 ± 6.3 and 183.9 ± 8.2 cm for LG, IG and HG respectively; P<0.05) and body mass (70 ± 5.3, 87.5 ± 9.3 and 113.2 ± 16.1 kg for LG, IG and HG respectively; P<0.001). Muscle biopsies were taken from the middle portion of the musculus vastus lateralis. Biopsies were processed for the assessment by Western blot of STAT3 phosphorylation, SOCS3, perilipin A (as a marker of intramuscular fat infiltration) and leptin receptor s (OB-R) protein expression as described elsewhere [2].

RESULTS

Results. Muscle perilipin A content, a protein only present in the adipocytes, was similar in the three groups (0.14 ± 0.27; 0.63 ± 1.4 and 0.62, P<0.01). This SOCS3 up-regulation was not explained by STAT3 phosphorylation (0.28 ± 0.24; 0.16 ± 0.18 and 0.33, P<0.05). However, SOCS3 protein expression and HOMA were not correlated. In turn, VO2max was correlated with HOMA (r= -0.62, P<0.01). This SOCS3 up-regulation was not explained by STAT3 phosphorylation (r= 0.28, P<0.04, 0.16 ± 0.18 and 0.35 ± 0.26 A.U. for LG, IG and HG respectively, P=0.08).

Conclusion. This study shows that in obesity SOCS-3 protein expression in skeletal muscles is increased by a mechanism that does not depend on STAT3 phosphorylation. Although, SOCS3 protein could play a role in insulin resistance in humans, there was no clear correlation between insulin resistance and SOCS3 expression.

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References


A REAPPRAISAL OF THE DESCRIPTION OF THE SLOW COMPONENT OF OXYGEN UPTAKE DURING HEAVY EXERCISE

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The slow component of the VO2 response during transition to heavy exercise was generally considered as beginning about 2 min after the onset of exercise, rather than coincident with the primary component (Barstow and Mole 1991). It results that the kinetics could be well

References

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described by a bi-exponential model with time delays different for the two components. We aimed to re-examine this description of the VO2 response by using a mathematical construction based on an error correction with a common delay for the fast and slow components.

The proposed model included two additive terms with a coincident time delay \( t1 \), an exponential function describing the primary component with a time delay \( t1 \), a time constant \( t2 \) and an amplitude \( G1 \) and \( G2 \) an error correction which is proportional (gain \( Gc \)) to the cumulative difference from the onset of exercise between VO2 and a target value \( T \). This construction assumed that VO2 was directed by the primary component toward a value lower than the demand \( T \) and the late rise resulted in the error correction bringing VO2 closer to the demand. This model was compared to the bi-exponential model using a time delay \( t2 \), a time constant \( t1 \) and amplitude \( G2 \) for describing the slow component. Data came from 8 healthy subjects who have performed an electronically braked cycle ergometer transition from 2-min unloaded exercise to 10-min at 30W above the power output at the ventilatory threshold. Breath-by-breath VO2 was determined from measurement of inspired and expired gas using an algorithm of correction of changes in pulmonary gas stores. After removing the first 15 s and interpolating to one value per second, breath-by-breath VO2 responses were fit by the two models by use of non-linear method minimizing the sum of the square errors.

No difference between the two models was observed for the criteria of the goodness-of-fit or from the visual inspection of the residuals. Coefficients of determination \( R2 \) were 0.895±0.088 and 0.896±0.087 respectively. The proposed model provided \( G1 \) and \( t1 \) lower than with the bi-exponential model \( 1.78±0.28 \) vs \( 2.32±0.31 \) L/min\(-1\) and \( 21.6±6.7 \) vs \( 26.8±5.9 \) s (\( P<0.001 \)) respectively. No difference was observed for \( t1 \) \( 13.6±3.4 \) vs \( 13.0±3.2 \) s respectively) . \( T \) was 3.44±0.42 L/min\(-1\) which was not statistically different than baseline\(+G1+G2\) from bi-exponential model \( 3.39±0.45 \) L/min\(-1\) with a high correlation between them \( R=0.99, P<0.001 \). \( Gc \) was 0.0033±0.0026 di-
mensionless.

In conclusion, since the two different mathematical approaches gave similar fit of the VO2 responses, it questions that the late rise of VO2 would result from a phenomenon beginning about 2 min after the onset of exercise.

References.

**EFFECTS OF SODIUM BICARBONATE INGESTION ON PH AND LACTATE DISTRIBUTION IN RED BLOOD CELLS AND PLASMA AFTER SHORT TERM HIGH INTENSITY EXERCISE**

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**Introduction**

Ingestion of an alkaline solution such as sodium bicarbonate (NaHCO3-) 1 3 h before exercise results in an increase in plasma HCO3- concentration (HCO3-II) and a decrease in plasma hydrogen ion \([H+]\) at the start of exercise. An increase of extracellular NaHCO3- buffer capacity is a way to facilitate the efflux of \([H+]\) and lactate \([La]\) from the muscle cell and thereby delay the critical decrease in intracellular pH during high-intensity exercise and may therefore be important in maintaining performance.

In erythrocytes \( RBC \) \( La \) and \( H+ \) ions are transported by the monocarboxylate-transporter-1 \( MCT-1 \). \( La \) and \( H+ \) ions equilibrate according to an electrochemical equilibrium \( [\text{Donnan equilibrium}] \). Under resting conditions plasma \([La]\) is approximately twice that of RBC. Ingestions of HCO3- may change the RBC membrane potential and/or the transmembrane concentrations of HCO3-, \( Cl^- \), \( K+ \) or \( Na+ \), leading to a different equilibration under resting conditions as well as to different reactions under exercise. Therefore we inves-
tigated effects of sodium bicarbonate ingestion on \([pH]\) and \([La]\) distribution in RBC and plasma after short term high intensity exercise.

**Methods**

10 healthy male subjects participated in this study. Subjects performed a 15-18sec lasting maximal exercise in judo. Subjects were instructed to perform the test in maximal effort. 2h before exercise subjects ingested HCO3- or a placebo. Blood samples were taken pre-exercise, pre ingestion, 0min, 1min, ... 10min after exercise to determine \([La]\) in whole blood, plasma and erythrocytes and blood gas parameters \([pH], \text{HCO3-}\) after the test subjects stayed in a sedentary position on a chair to keep La elimination as low as possible.

**Results**

The \( \text{HCO3-} \) and \( \text{H+} \) in plasma were significantly increased/decreased after HCO3- ingestion at all time points compared to the placebo ingestion. The mean ratio between RBC and plasma \([La]\) under resting conditions did not differ between both conditions \( 0.49±\) 0.03 \([\text{AU}]\) \( \text{Verum}\) vs. \( 0.49±\) 0.05 \([\text{AU}]\) \( \text{Placebo}\), showing a plasma \([La]\) approximately twice as high as in RBC. The ratio between RBC and plasma \( 8 \) was significantly decreased \( 0.34±\) 0.05 \([\text{AU}]\) \( \text{Verum}\) vs. \( 0.33±\) 0.05 \([\text{AU}]\) \( \text{Placebo}\) 0min post exercise, in both situations, showing a faster relative or proportional increase in plasma \([La]\) compared to RBC \([La]\). No significant differences in the ratio were found for all time points.

**Discussion**

The decrease in ratio is the consequence of a delayed La transport across RBC membrane and the consequence of saturation of the transport systems. The fast congestion of La in plasma exceeds the transport capacity of the RBC membrane. But it should be considered, that the total driving force for the co-transport of La and \( H+ \) by \( MCT-1 \) is composed of both the La and the proton gradients. Higher extracellular \( [H+] \) normally increase La influx into RBC but in this study HCO3- did not to influence the transport of La.

**OXIDATIVE PROPERTIES OF SKELETAL MUSCLE IN MICE FED ON A HIGH-FAT DIET**

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The underlying mechanisms related to obesity are important to be investigated in order to attenuate the global prevalence of type 2 diabetes. It has been implicated that mitochondrial dysfunction in skeletal muscle plays a role in the development of this multifactorial disease. The number and activities of mitochondria are important in oxidative metabolism of the cell and additionally metabolic changes usually accompany fiber type change. This study was conducted in order to unravel the possible changes occurring in the skeletal mus-
cle oxidative properties during type 2 diabetes. As a model for high fat diet induced type 2 diabetes we used male C57BL/6J mice. Low fat diet groups were either sedentary \( \text{LFS} \) or voluntarily wheel running \( \text{LFR} \), similarly to high fat diet groups \( \text{HFS} \) and \( \text{HFR} \) respectively.

After 8 and 17 weeks on the experiment, insulin and glucose tolerance tests and insulin sensitivity test \( \text{HOMA} \) were performed to indicate the progression of type 2 diabetes. In addition, skeletal muscle weight and epididymal fat mass were assessed and feeding efficiency was calculated. The myosin heavy chain (MHC) isoform composition was determined with SDS-PAGE, together with the succinate dehy-
drogenase (SDH) staining from the excised heterogeneous skeletal muscle samples. During the 19 week experiment the mice had volum-
tary access to running wheels. When the cumulative running of the mice was examined, there seemed not to be a significant statistical difference between the diet groups. The feeding efficacy of HF mice was greatly higher than in LF mice, but this was normalized during the experiment. Glucose clearance during the insulin tolerance test showed that runners were significantly more insulin sensitive after 17 weeks. Succinate dehydrogenase enzyme activity is used as a marker for oxidative capacity since it correlates with the total amount of mitochondria in a cell. As could be expected, the runner groups seem to have higher SDH activity, but in addition, also the high fat diet group seem to have higher SDH activity compared to low fat diet groups. It is shown that at least physical activity induces fast-to-slow alteration of the muscle fiber composition with increasing oxidative enzyme activity. It is also reported that short-term high fat feeding promotes a more oxidative fiber type. In order to verify these results in our study, we analyzed MHC isoforms. However, these protein analysis results were somewhat contradictory to what we expected and need to be further investigated. All in all, there are indications that high fat feeding and type 2 diabetes point to morphological as well as metabolic adaptations in the skeletal muscles. We hope to confirm later the hypothesis that the muscle oxidative capacity is one possible determinant of obesity.

QUADRICEPS SPECIFIC TENSION IN YOUNG MEN IS HIGHLY VARIABLE

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BACKGROUND It is assumed the maximal force a muscle can generate depends on the number of sarcomeres in parallel. However, the anatomical cross-sectional area (ACSA) of a muscle explains only half of the difference in strength between people (1). The aim of the present study was to further explain the inter-individual variability in strength by quantifying, for the first time, the contribution of a number of key factors that may be related to the variance.

METHODS Fifty-five healthy, untrained men (21±3 yrs) performed maximum voluntary contractions (MVCs) during isometric, unilateral leg extension at optimum knee angle. Anagonist coactivation was estimated from electromyography activity and the level of voluntary activation was assessed with superimposed stimuli. Quadriceps ACSA at 90% femur length and patella tendon moment arm (PTMA) were measured with magnetic resonance imaging, whilst femur length, Vastus Lateralis (VL) fascicle length and pennation angle were determined with ultrasound. Physiological CSA (PCSA) was calculated from the ratio of each of the constituent muscle volumes (ACSA x femur length) to VL fascicle length (assumed to be the same for all muscles) measured at MVC. The effective PCSA of the quadriceps was calculated by multiplying the PCSA of each of the constituent muscles by the cosine of the VL pennation angle. Thirty-three participants provided a VL muscle biopsy to determine myosin heavy chain (MyHC) isoform composition. A more precise calculation of quadriceps effective PCSA was obtained in a subgroup (n=14) by measuring actual muscle volume, fascicle length and pennation angle for each of the constituent muscles. RESULTS Quadriceps ACSA (65±8 cm²) correlated significantly with MVC (235±43 Nm) in both the complete cohort (R²=0.41; p<0.001) and the subgroup (R²=0.40; p<0.001). Correcting MVC for coactivation had no significant effect on this relationship but when voluntary activation was also accounted for the relationship improved by 2% (R²=0.43; p<0.001). Further adjustments for PTMA length, fibre length and pennation angle did not improve the correlation and there was no association between quadriceps specific tension (22±5 N cm²) and the proportion of type II MyHC (75±8%). DISCUSSION Quadriceps ACSA explains 41% of the variation in isometric torque in young, untrained males. Voluntary activation accounts for an additional 2% of the variance, whereas antagonists cocontraction, moment arm length, fibre pennation angle and fibre length did not further explain the variability in strength. Thus, even taking into account an extensive number of factors that could conceivably help to explain the variation, it remains largely unexplained. This strongly suggests that other factors may underlie this variance and we suggest that differences in myofibrillar packing and lateral force transmission in particular remain possibilities to be examined.

References.

DIFFERENCES IN PHYSIOLOGICAL RESPONSE WHEN USING ROTATING SEAT VS. STANDARD SEAT ON KAYAK ERGOMETER

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Introduction
Kayak coaches and athletes are faced with various decisions involving equipment that affect performance (Ong et al. 2005). The rotating seat (RS) is an example. It was used by a sprint medallist in Olympics 2000 and then spread to others elite athletes. The RS invention intended to increase lower limb activity and trunk rotation. In the Portuguese national sprint team 50% of the men use RS. With no research on RS performance, the aim of this study is to determine if there are physiological differences between RS and the standard seat (SS) on kayak ergometer (KE).

Methods
Ten elite male kayak paddlers, all members of the Portuguese sprint team, volunteered for the study (age 22.0 +/- 3.2yrs, height 177.1 +/- 5.8cm, mass 77.7 +/- 5.4kg). Written informed consent was obtained from each subject. All subjects were required to perform two trials, using each a type of seat (RS and SS), which were conducted in random order (7 day apart). Each trial was performed at the same time of day, and subjects were asked to maintain their normal diet. A maximal incremental test, with five steps, was conducted in each trial. The work load of the last step was calculated based on the mean power of a 4 min maximal test performed on the KE prior to the beginning of the study. In each trial it was measured and recorded oxygen uptake (VO2) (Metamax-Cortex analyser), and collected finger blood sample to determine blood lactate concentration ([La-]). All physiological testing was conducted on a calibrated KE (Dansprint). Testing took place on the beginning of the competition period. All results are presented as mean ± S.D. Differences in dependent variables between trials were analysed for statistical significance with paired samples Student’s T-test (p<0.05).

Results Discussion
To be sure that the athlete performed equal trials, using RS and SS, the mean power of the steps tests were compared. No differences were found.
VO2 was slightly higher in every step of the maximal incremental test when used the RS, being statistically different only on the 5th step (p<0.05) of the tests. With the RS the athletes add average VO2 of 57.36±4.58ml.kg⁻¹.min⁻¹ and 55.25±4.22ml.kg⁻¹.min⁻¹ when used the SS. The [La-] at the end of the 5th step of the test was significantly higher (p<0.01) with rotating seat (10.60±2.62mmol.l⁻¹) comparing to normal seat (9.76±2.53mmol.l⁻¹). The higher levels of VO2 and [La-] with RS could be explain by an increase of lower limbs activity, with more muscular mass being involved when paddling on KE. However this produced the same mean power as with SS.

Conclusion

Thursday, July 10th, 2008 14:15 - 15:15
The differences between seats, at high intensities, suggest that there is no advantage in VO2 and [La-] when paddling on a KE with RS, being the SS in terms of effort more economic. Further research is required to fully understand the influence of the use of RS on kayak performance.

References.

Poster presentations (PP)
PP-PM02 Physiology 2

COMPARISON OF ENERGY COST AND RUNNING KINEMATICS IN THE TREADMILL AND IN THE TRACK
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The motorized treadmill is still the most popular kind of exercise in physiological assessment of sportsmen, mainly in competitive runners. Based on oxygen uptake measurements, it has been proposed that a 1% inclination of the treadmill reflects running in the track. However, running kinematics is also pertinent to establish the correspondence between the two kinds of exercise. The aims of the present study were: i) to compare the energy cost (EC) during submaximal (ECSUB) and supramaximal (ECSUPR) running velocities in the motorized horizontal treadmill and in a synthetic athletics track; ii) to compare running stride kinematics between the two types of exercise. The sample comprised 10 male individuals chosen randomly among University physical education students, with mean age, weight, height and % of fat respectively: 21,3±2,5 years, 72,5±6,3 kg, 1,77±0,06 m, and 12,1±3,4%. The subjects performed randomly four tests with a 48h recovery between them: a discontinuous progressive intensity submaximal test and a supramaximal all-out 600m test (both in treadmill and in the track). Mean values of the EC in the treadmill versus track were, respectively: ECSUB (0,192±0,02 and 0,187±0,01 ml.kg-1.m-1), ECSUPR (0,201±0,02 and 0,198±0,02 ml.kg-1.m-1). The previous comparisons provided no statistical significance. Significant differences were found between the two exercise conditions in the following cinematic variables: stride frequency at the supramaximal velocity (3,45±0,3 in treadmill and 3,27±0,3 x.seg-1 in track) and vertical oscillation of center of mass during the support phase during differences were found between the two exercise conditions in the following cinematic variables: stride frequency at the supramaximal velocity (3,45±0,3 in treadmill and 3,27±0,3 x.seg-1 in track) and vertical oscillation of center of mass during the support phase during supramaximal intensities (3,7±0,2 in treadmill and 3,3±0,3 cm in track). We conclude that the horizontal treadmill may be used as energy cost indicator of running in the track, though higher values are to be expected in the laboratory. However the treadmill does not seem to be a good specific method for running training because the stride pattern is modified comparatively to that observed in track.

THE EFFECT OF SODIUM BICARBONATE USE ON FATIGUE THRESHOLD DURING MAXIMUM WORK IN ELITE MEN VOLLEYBALL PLAYERS
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Introduction
The use of substances to buffer the production of H+ ions produced during anaerobic type exercise has received some attention for a number of years. This procedure, known as ‘bicarbonate loading’ has been shown to be effective in offsetting fatigue during maximal performance.

Materials and Methods
Nine volleyball players of elite under control (no ingestion), placebo and Alkalotic conditions with maximal performance and protocol interval (6*1 minute) on cycle ergometer to participate in this project. The two tests were held in a random, Double blind Fashion and Three test sessions were undertaken, with all sessions being at least 2 but not more that 5 days apart. The every session was under three period that blood was then drawn (5ml) from a vein in the forearm. This three measurement period was basal, pre-exercise and post-exercise.

The blood samples in the three condition were analyzed for PH, HCO3- , base excess [BE], base buffer [BB], lactate, Pco2, Po2, O2 sat , also the measurement was distance and time to exhaustion on cycle ergometer. An ANOVA with repeated measures was used to determine statistical significance on the various blood and serum parameters.

Results
The results of the blood gas analyses are shown that in the experimental trial, the PH,HCO3- , base excess [BE], base buffer [BB], lactate, Pco2, Po2, O2 sat , also the measurement was distance and time to exhaustion on cycle ergometer. An ANOVA with repeated measures was used to determine statistical significance on the various blood and serum parameters.

Discussion
It is also evident that there is no simple relationship between the degree of induced alkalosis and the enhancement of anaerobic performance. In certain situations, however, a considerable ergogenic effect may be realized. Studies that employed performance trials with a large anaerobic component, large dosages of NaHco3, or repetitive work bouts showed significant effects. In general, the greater level of metabolic acidosis achieved during the exercise, the greater the ergogenic effect. The elevation in the bicarbonate ions surrounding the muscle cell possibly facilitations the movement of H+ out of the cell and helps to maintain the sarcoplasmic PH for maximal/optimal functioning during exercise.
The present study suggests that aerobic fitness is the most important factor for achieving competitive success when considering the ranking is explained by absolute maximum oxygen uptake. No other variables were significantly correlated to national ranking.

**Methods.**
Following institutional ethical approval and the completion of parental informed consent (children giving assent) 19 elite male age = (mean ± SD) 15.44 ± 1.40 years, height = 170.55 ± 7.84 cm, body mass = 63.71 ± 6.58 kg) surfers participated in assessments of maximal oxygen uptake using a specially adapted ergometer and online gas analysis. Lower body explosive power was assessed using a standing long jump, upper body power was assessed using a medicine ball throw, agility was measured using a pop-up test, static balance was measured using a standing stork test and dynamic balance was measured using a wobble board. A correlational analysis was performed between the measured physiological variables and the numerical national ranking of the subjects using SPSS for Windows (V. 14).

**Results.**
Statistical analysis revealed that there was a significant Pearson Product moment correlation between Absolute maximum oxygen uptake and national ranking (r=0.519, P<0.05, r2=0.269) and the coefficient of determination suggests that 26.9% of the variation in national ranking is explained by absolute maximum oxygen uptake. No other variables were significantly correlated to national ranking.

**Conclusion.**
The present study suggests that aerobic fitness is the most important factor for achieving competitive success when considering the physiological profile of elite junior surfers. Further research is required to ascertain at what point of physical maturity and age blood lactate and peak power measurements become significant.

**EFFECTS OF EXERCISE TRAINING ON HEAT-INDUCED VASOCONSTRICTION AND COLD-INDUCED VASODILATION IN THE FINGERS**

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**Introduction.**
Surfing is a high intensity intermittent exercise which in recent years has experienced a rapid increase in participation rates and growing professionalism amongst competitive athletes. There has been some research of the physiological aspects of surfing performance and indices of fitness which may be related to competitive performance in adults with peak power output and the exercise intensity associated with a blood lactate concentration of 4 mmol/L being significantly correlated to ranking. However, little information is available regarding junior surfers. The effects of exercise on heat-induced vasoconstriction was examined in sixteen healthy male adult volunteers (8 trained who have daily exercise and 8 untrained). Heat-induced vasoconstriction, cold-induced vasodilation, body fat %, VO2max and daily energy and protein intake were measured. The finger blood flow was measured in water of 35°C to 43°C every 10 minutes by laser Doppler flowmetry. Cold-induced vasodilation was measured during the middle finger immersion in ice water at 0.2 °C for 30 minutes.

In the trained group, body fat % (10.2 ± 0.7 %) was significantly lower than that of the untrained group (14.3 ± 1.4 %), and the VO2max (68.3 ± 1.2 ml/kg/min) and dairy protein intake (23.1 ± 18.7 g/day) were significantly greater than those of the untrained group (55.5 ± 0.7 ml/kg/min, 100.5 ± 16.5 g/day). The initial heat-induced vasoconstriction was observed four minutes after the immersion in both groups and the second heat-induced vasodilation at 14 minutes in the trained group and at 16 minutes in the untrained group. During immersion at 38 °C to 43 °C, the increase in finger blood flow per minute was greater in the trained group and the increase in finger skin temperature per minute was smaller in the trained group. The mean skin temperature (4.88 ± 2.13 °C) in trained, 12.04 ± 2.14 °C in untrained) and resistance index (13.0 ± 1.7 in trained, 10.9 ± 1.5 in untrained) as a value of cold-induced vasodilation during ice water immersion were significantly higher in the trained group. These results suggested that arteriovenous anastomosis in the fingers are more quantitatively and/or functionally superior in the trained group. Local heat and cold tolerance in the fingers are improved simultaneously by physical training.

**EFFECT OF AEROBIC TRAINING AND DETRAINING ON NOVEL INFLAMMATORY MARKER THE PREDICTIVE OF CARDIOVASCULAR DISEASE IN WISTAR RATS**

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**Methods.**
Male wistar rats (3 months old) were used. The rats were randomly divided into two groups: 1) experimental group(n=24), 2) control group (n=18, without any program training). Experimental rats participated in a aerobic training program consisting of treadmill running 3 days a week for 12 weeks. Six trained rats experienced the detraining from 8th to 12th weeks. Blood samples were collected at 24h after the first session, end of 8th week and end of 12th week. sICAM-1 levels were decreased insignificantly (p=0.112) in the first 8 weeks and also was decreased significantly (p=0.000) after 12 weeks. As expected, no adaptations were observed by detraining and the body is exposed to risks of atherogenesis damages (p=0.070) confirming a prior study (1).

**Conclusions.**
In summary, this study showed that the measurement of Cellular Adhesion Molecules (sICAM-1), is beneficial for the effective diagnosis of different environmental factors of vascular disorders. On the other hand regular aerobic training would be a helpful method in prophylaxis and reduction of atherosclerosis by lowering the viscosity of sICAM-1(1,2,4).

**References.**
HEART RATE RESPONSE TO GAME-PLAY IN PROFESSIONAL BASKETBALL PLAYERS DURING PRESEASON

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Introduction. The effectiveness of using the heart rate (HR) as an indicator of exercise intensity to monitor basketball training has been the subject of intense investigation ([1,2]). However, recent new regulations and a trend towards a more conditional game have prompted a need to revise field study procedures and demanded the increased specialization of game positions.

The purpose of this study was to measure heart rate response to game-play in professional basketball players during preseason.

Materials and Methods. Five preseason matches played by a men’s Spanish professional league team were analyzed in terms of the HR response recorded in the four game quarters.

Results. For the point guards, forwards and centers, respectively, HRmax (in beats/min) were 186±11.7, 176±8.3 and 177±7.7; and HRmean (beats/min-1) were 163±14.3, 151±10.3 and 155±9.4. While similar HRmax were observed in each quarter, significant differences were detected between the %HRmax values for the point guards versus the forwards or centers (P<0.0001 and P<0.05, respectively).

Conclusions. Our findings indicate that point guards show the highest HR and forwards the lowest. HRmax and %HRmax values were high during the first quarter and continued to increase during the game, peaking in the final quarter. On the other hand our data certificated the distribution pattern shown by the HRmax, including high values for the first quarter that increased during the game and peaked in the final 10 minutes along with the %HRmax.

References.

NO CORRELATION BETWEEN SERUM GROWTH HORMONE RESPONSE AND HEART RATE DURING ACUTE EXERCISE

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The concentration of growth hormone (GH) increase during acute exercise but factors that could influence that response are not well established. During the exercise condition, the resulting higher blood pressure and heart rate (HR) support blood flow and thus growth hormone releasing hormone (GHRH) transport towards the GH producing cells in the pituitary. This might be additionally cause for the significant GH release during exercise. Some results also showed that the increase in HR during exercise was blunted in the GH deficient.

The aim of this study was to establish the possible relationship between dynamics of changes in the growth hormone concentration and heart rate during acute exercise. The study involved a group of 15 healthy males, average 21.7 years of age. They performed 30 min continuous cycling at 60% of VO2max. The growth hormone concentration and the heart rate were measured in the rest, during exercise (6., 12., 18., 24. and 30. minutes) and during recovery (15., 30. and 45. minutes). The standard immunoradiometric (IRMa) method was used to determine serum growth hormone concentration.

We found significantly higher GH values at the first measure during exercise (6 minutes) compared with the rest values (0.46vs.1.95 mU/l, p=0.013). During acute work load, serum growth hormone concentration was increasing successively. Maximal increase in growth hormone concentration was measured at the end of work load (30 min.) and was 33.69 mU/l. Decrease in serum growth hormone concentration during recovery, in the relation to the concentration at the end of exercise, was established. In spite of that, the GH values after 45 minutes of recovery were significantly higher compared with the rest values (0.46vs.6.08 mU/l, p=0.001). Heart rate was increasing successively but no correlation was established between growth hormone concentration and heart rate during exercise or in the recovery period.

References.

THE EFFECT OF SELECTIVE MATCH OF NATIONAL TEAM TO AMOUNT OF CORTISOL AND PROFILE OF PSYCHOLOGY

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The purpose of this study was to the effect of selective match of national team of Iran, amount of cortisol and profile of psychology cadet team karate national of Iran/age:17±0.6 yrs:height 177/97±6/4cm:weight 73/4±10/24kg of 28 of karate athletes. First test of psychology and cortisol assessment apply and finally repeated previous test performed. Statistical method for survey was Pierson correlation coefficient and t test.

No significant differences (p>0.05) were found between pre (14/7±4±5/23) and post (10/23±2. 64) cortisol of competition. No significant differences were found between change of psychology characteristics pre and post win or lose karateka. There was not significant correlation between cortisol with pre and post test of psychology. This data showed that competition cause increase cortisol and also decrease negative alternative for instance: angry tension deoression and fatigue.

Key words: cortisol, profile of psychology, cadet team karate national, selective match
We conclude that there is no relation between the mechanism of growth hormone and heart rate increase during acute exercise.

References.

THE EFFECT OF 2 MONTH REGULAR AEROBIC TRAINING ON STUDENTS` REST TIME SERUM CALCIUM, PHOSPHORUS AND MAGNESIUM VARIATIONS

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Several reports have shown that duration and/ or intensity of exercise elicit different effects on minerals metabolism and that inadequate status of the body mineral composition can lead to a diminution of performance and endurance both in sportsmen and rats. Magnesium plays an important role in calcium and bone metabolism. Magnesium deficiency alters calcium metabolism, resulting in hypocalcemia, vitamin D abnormalities and neuromuscular hyper excitability (8). On the other hand exercise may increase calcium losses. Phosphorus is also another mineral that is regulated in part by an overflow mechanism (6). When serum levels of phosphorus are high, the kidney typically excretes extra phosphorus (6). Eighty-Five percent of the body’s phosphorus is found in bone, where it binds with calcium to form the mineral hydroxypatite, which confers strength and rigidity to bones.

The purpose of this research has been the investigation of student athletes’ rest time serum calcium (Ca), Phosphorus (P) and magnesium (Mg) variations. Following this purpose, 14 students were selected to take part in this research project. The means and standard deviations of their height, weight, age and body mass index (BMI) were respectively: (175±5.9), (68.27±9.89), (20.07±1.44), (22.11±2.47). Participants trained with incremental continuous running program for 16 sessions with certain and pre-adjusted heart rate intensity and distance. Heart rate intensity was controlled by polar clock. Blood samples were taken from subjects in pre- and post- test in rest condition. Test of running - jugging was performed for determining maximum oxygen consumption (Vo2 max). The analysis of data by SPSS software and paired - sample t test showed that the subjects’ serum Ca, P and Mg concentrations involved fluctuation even after 24 hours had passed from regular body activity and did not return to its original and base clinical norm (P=0.006,P=0.0001 and P=0.0001, respectively). At this point, demand of cells for metabolic functions and repel of electrolytes via sweating increased; therefore, a significant decrease is observed in electrolytes of serum after 24 hours. The results showed the effect of exercise on the serum calcium, phosphorus and magnesium concentrations after 24 hours rest which did not return to baseline levels after a period of recovery (within 24 hours). Also recommended athleties, who participate in regular aerobic activities 2 or 3 times in a week, in addition to providing carbohydrate alimentary sources, take advantage of dairy products, vegetables, meat, fish, chicken, egg, and grains. Mean while, Vo2 max of subjects was significant after 16 sessions (P=0.0001).

THE EFFECT OF AEROBIC TRAINING ON CREATINE KINASE AND LACTATE DEHYDROGENASE REST TIME ON MALE ATHLETES

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Creatine kinase (CK) is a key enzyme, which causes muscular cell metabolism and acceleration in conversion of creatine-to-creatine phosphate and vice versa. Lactate Dehydrogenase (LDH) is also another enzyme, which can be highly found in the cytoplasm of every tissue of the body with different concentration. By performance of athletic activity until exhaustion, some changes occur in muscles and blood such as the decrease in the potential of creatine phosphate and muscle’s ATP, the increase of lactic acid in muscle and blood and glycogen of muscle. CK and LDH are both anaerobic enzymes but it seems that in aerobic and long-term activities, which depend on intensity and duration of training, the stimulation and undulation in both enzymes.

This study aimed at investigating the rest changes of concentration of Creatine Kinase (CK) and Lactate Dehydrogenase (LDH) after aerobic exercise. For this purpose 12 male athletes were selected. Aim fully the subjects performed 16 sessions running exercises during 8 weeks. In the first four sessions, their heart rate was 140-150 and in the last four sessions 170-180 times per minute was controlled by Polar watch. About 3 cc as a blood sample was taken from the subject’s elbow vein before the exercise. In this process, their concentration average of CK and LDH enzymes in the rest mood and also maximum amount of oxygen consumption were analyzed by t-test formula. There was significant difference between CK serum (P= 0.023), LHD serum (P= 0.021) and VO2 max (P= 0.0001) which shows the effects of aerobic exercise on increase of anaerobic enzymes concentration which seems to be as the result of high degree of aerobic training sessions and also the result of muscular damage during the training period and even 24 hours after the stopping exercise and recovery.

With regard to the subjects' maximum consumed oxygen (VO2 max), after sixteen regular aerobic sessions meaningful results were obtained. It seems that regular aerobic trainings can improve athletes’ aerobic capacity and cause increase in their aerobic ability.

THE EFFECT OF AEROBIC EXERCISE ON SECRETION OF TRIODOTHYRONINE (T3), THYROXIN (T4) AND ITS STIMULATING HORMONE (TSH)

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It is a well-known fact that exercise affects the activity of many glands and the production of their hormones. One of the glands affected is the thyroid. Thyroid gland secretes two separate amino acids: triiodothyronine (T3) and thyroxine (T4), whose importance on the regulation of general metabolism, growth, and tissue differentiation as well as gene expression has been known for a long time. This research...
has been conducted in order to study the changes of secretion of thyroid hormone i.e. thyroxine (T4), triiodothyronine triiodothyronine hormone (T3), and also thyroid stimulating hormone (TSH), following an aerobic activity. Group of 10 male university students with over three years experience in different fields of sport were participated in this semi-experimental research. The obtained average and standard deviations of factors such as age, height, weight and body mass index (BMI) are as follows: (23.1±1.65), (171.1±4.51), (68.5±4.8) and (21.4±1.11). The exercise training of this research consisted of 20 minutes of running around the track and field, which were 10 rounds each taking two minutes. Control of the exercise’s intensity was done through monitoring the rounds. In this research the blood samples (5 cc) were taken from participants before and after the aerobic exercise to measure the T3, T4, TSH and the laboratory method RIA was used to analyze and the blood samples. The achieved data from this research was analyzed statistically through using SPSS and MS word 2003. The results showed that aerobic activities did not have any significant effect on the amount of T3 and TSH secretion, although the results proved a basic change in T4. It seems that aerobic activities can have different reactions on the secretion of thyroid hormone while factors like hematocti, plasma decrease, as well as changes in pH of blood and also mental conditions may lead to a significant change in the concentration of hormone. The results of this research showed that the increase in the concentration was caused by the long duration of exercises. In this survey the concentration level of T4 had a 17.04% increase after 20 minutes of aerobic exercise (4000 Meters) which showed meaningful changes in secretion of T4 hormone. The effectiveness of the type of exercise on the secretion of T4 can be the reason for the increase of this hormone.

NEUROMUSCULAR FATIGUE DURING LOW- VS. HIGH-INTENSITY ISOMETRIC CONTRACTIONS OF PLANTARFLEXOR MUSCLES

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The aim of the present study was to compare the fatigue-related changes in soleus motoneuron pool reflex excitability and surface electromyography (EMG) parameters, and maximal isometric voluntary contraction (MVC) force and twitch contraction characteristics of the plantarflexor (PF) muscles during repeatedly sustained low- (30% MVC) vs. high-intensity (70% MVC) isometric contractions. Twelve men aged 21 to 24 years participated in two fatigue tasks on separate days with at least 1-week interval. The fatigue task consisted of three sustained isometric contractions of PF muscles at a target force level until exhaustion separated with 2-min pause between contractions. M-wave (muscle compound action potential) amplitude (Mm), Hoffmann reflex maximal amplitude (Hm) to M-wave amplitude ratio (Hm/Mm), and root mean square amplitude (RMS) and median frequency (MF) of EMG power spectrum were recorded from the soleus muscle. Twitch contraction characteristics of PF muscles were measured by supramaximal electrical stimulation of posterior tibial nerve using square-wave pulses of 1 ms duration. The MVC force of PF muscles was reduced to a greater extent after the low-intensity compared to the high-intensity fatigue task. For the low-intensity fatigue task, isometric twitch peak torque of PF muscles was reduced (p<0.05) after each sustained contraction and during the recovery period. For the high-intensity fatigue task, this parameter was reduced (p<0.05) after the 1st sustained contraction and throughout the recovery period, whereas it did not differ significantly compared to pre-fatigue level after the 2nd and 3rd sustained contractions. The Mm recorded in soleus muscle remained constant immediately post-fatigue and during 15-minute recovery period compared to pre-fatigue level in both fatigue tasks, whereas Hm/Mm was significantly (p<0.05) reduced only after high-intensity fatigue task. The increase in RMS and decrease in MF during isometric contractions was greater (p<0.05) for low-intensity fatigue task compared to high-intensity fatigue task. The present study demonstrated that a reduction in maximal voluntary and electrically elicited force-generation capacity of PF muscles immediately post-fatigue was more pronounced in low- than high-intensity isometric contractions. Low-intensity isometric contractions, repeatedly sustained until exhaustion, resulted in a marked increase in the amplitude and spectral compression of the EMG signal without a significant post-fatigue reflex inhibition of soleus motoneuron pool. Repeatedly sustained high-intensity isometric contractions, however, resulted in post-fatigue reflex inhibition of soleus motoneuron pool and less pronounced spectral compression of the EMG signal during sustained contractions. A failure of neuromuscular transmission-propagation was not evident after repetitive fatiguing isometric contractions.

EFFECT OF PERCUTANEOUS ELECTRICAL STIMULATION OF KNEE EXTENSOR MUSCLES ON ISOKINETIC TORQUE AND POWER PRODUCTION PERFORMANCE

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This study examined the acute effect of a brief high-frequency submaximal percutaneous electrical stimulation (PES) of the knee extensor (KE) muscles on isokinetic torque and power production performance. We tested the hypothesis that the induction of posttetanic potentiation in KE muscles by a conditioning submaximal tetanic contraction evoked by direct PES would increase the concentric isokinetic knee extension peak torque (PT) and average power (AP) at slow and moderate angular velocities. Eighteen male physical education students aged 20-25 years participated in this study. Maximal voluntary isokinetic and isometric unilateral knee extension force production characteristics were measured using Cybex II isokinetic dynamometer. The subjects performed maximal voluntary concentric isokinetic knee extensions at angular velocities of 60 and 180 deg/s in control (CON) trial (without prior PES application), followed by a PES trial after 30 min rest period. In PES trial, a conditioning submaximal (25% of the maximal voluntary isometric contraction force) isometric tetanic contraction of the KE muscles was induced by a 7s direct PES at 100 Hz, interspersed after 3 min with testing of voluntary isokinetic performance. No significant differences in isokinetic knee extension PT and AP were observed between CON and PES trial at 60 deg/s. However, a significantly greater (p<0.05) isokinetic PT (8.9%) and AP (8.2%) were observed in PES trial compared to CON trial at 180 deg/s. There were few studies in which the posttetanic potentiation in human muscles has been induced by direct PES for enhancement of muscle performance. Our previous study (Requena et al. 2005) demonstrated that a conditioning submaximal tetanic contraction of triceps brachii and pectoralis muscles induced by high-frequency PES did not significantly change bench press throw performance. However, a great inter-individual variability was observed in this study. The present data indicate that the application of submaximal PES prior to maximal voluntary isokinetic knee extensions (kicks) can have a positive effect on performance primarily under the lower torque production conditions associated with the faster velocities, but not the higher torque production conditions at the slower velocities. Interpretation of any performance measure must consider the measurement error; this is equally essential in the case of isokinetic dynamometry (Divr
THE ENERGY COST OF ROCK DRUMMING: A CASE STUDY

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The energy cost of various forms of physical activity has received considerable attention (Ainsworth et al., 1993). However, despite being a physically demanding activity that could offer an alternative to more conventional forms of physical activity prescription; drumming has received little attention. The present case study investigated the energy cost of rock drumming during concert performance in a high profile drummer.

Subject was Clem Burke, drummer with the band Blondie (age 52 yr, height 1.80 m and mass 83.6 kg). All testing took place on 18th July 2007 and conducted on stage at the Manchester Apollo Theatre, England. Testing was in two parts, an incremental drumming test performed 6 hours prior to the concert performance, and the concert itself. Incremental test consisted of four 4 min stages followed by a fifth where the subject drummed to volitional exhaustion. Work rate of each stage was controlled via a click track that was audible to the subject via headphones (Sony, Japan). Starting work rate was 110 beats min⁻¹, increasing 20 beats min⁻¹ for each subsequent stage. Oxygen uptake (VO₂) and respiratory exchange ratio (R) were measured throughout using a portable analyser (K42b, Cosmed, Italy), and heart rate (HR) using short range telemetry (S810i, Polar, Finland). Concert HR was recorded throughout. Energy expenditure was calculated using indirect calorimetry from the respiratory data (using the final minute of each submaximal stage). This was used to calculate the relationship with HR using linear regression. This relationship was used to estimate energy expenditure from the concert HR data. Resting metabolic rate was calculated from the 2 min period prior to the incremental test. VO₂peak was defined as the highest 15 s moving average VO₂ during the test.

Incremental test peak HR was 191 b.min⁻¹ and VO₂peak was 2.02 L.min⁻¹ (24.2 ml.kg⁻¹.min⁻¹). Concert duration was 82 min 27 s, which included rest periods between songs and encore. Average HR for the entire concert was 145 b.min⁻¹ (range: 110-179 b.min⁻¹). Estimated energy expenditure from the concert revealed a rate of energy expenditure higher than those previously published for Bannister, E.W. and Brown, S.R. (1968) The Relative Energy Requirement of Physical activity. In Exercise Physiology (Falls, Ex. 25(1): 71-80) warrants further investigation as an area of physical activity.

Data showed that rock drumming is an intense and physically demanding activity. Peak HR was well in excess of age predicted maximum. Estimated energy expenditure from the concert revealed a rate of energy expenditure higher than those previously published for seated drumming (Bannister and Brown, 1968). We conclude that rock drumming demands a high level of energy expenditure and warrants further investigation as an area of physical activity.

References

NEUROMUSCULAR CONTROL OF POWER AND FATIGUE IN DYNAMIC BARBELL SQUAT EXERCISE

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Background The Surface Electromyographic variables of root mean square amplitude (RMS) and muscle fibre conduction velocity (MFCV) have been used to study fatigue and recruitment during isometric exercise. In isometric contractions with no fatigue, RMSs and MFCVs both increase with force due to greater total recruitment and firing rates of motor units (MU). In prolonged submaximal contractions RMS also increases, whilst MFCV decreases, as changes in muscle metabolites slow MFCV, counteracting the influence of increased activation(1). Recently, similar findings have been shown in dynamic contractions, suggesting the potential for analysing MU recruitment and fatigue in resistance exercise(2, 3). The recruitment of fast twitch MU is important for a positive training effect and identifying the degree of central or peripheral fatigue could aid the optimisation of training volume. This study aimed to investigate the effect of load and fatigue on power and MU recruitment during dynamic squat exercise. Methods Nine strength trained male subjects performed 3x3 squats (3Ds) at 50, 75 and 100% of 3 repetition maximum (3RM). Subjects then performed 1 set of squat jumps (SJ) at 50% of 3RM until volitional failure. RMS and MFCV of VL muscle was recorded at 110 and 90° of knee flexion for DS and SJ respectively. MFCV was processed from cross correlation analysis of an electrode array and power derived from barbell displacement. Mean Power and normalised RMS were calculated for the concentric phase of DS and SJ. Results During DS, for 50, 75 & 100% 3RM RMS significantly (p<0.001) increased with load (56.5±12.2, 75.6±15.9, 99.2±15.7 %, while no differences were observed for power and MFCV. During SJ, for the first 3, middle 3 and last 3 repetitions MFCV and power, significantly (p<0.001) declined (6.89±1.94, 6.30±2.02, 5.30±1.81 m.s⁻¹ & 1920±1709±248, 1407±254 W) while no difference was observed for RMS. Summary This study has shown that 1) during DS, RMS increased alongside load while power and MFCV remained the same, suggesting a recruitment strategy may have been employed to maintain optimal power, 2) during SJ, MFCV reduced alongside power, whilst RMS remained the same, suggesting that peripheral rather than central factors may have caused the fatigue. The findings support the potential of RMS and MFCV analysis of resistance exercise.

References
DEVELOPMENTAL CHANGES IN COGNITIVE REACTION TIME

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Athletic training in children is not a simple procedure. Children develop ability during training while training itself affects ability development- as well as development of the central nervous system (CNS). Cognitive reaction is an important component in athletic performance; better understanding of its development should facilitate the design of efficient athletic and educational training plans for children.

Subjects were 6 to 12 year old primary school pupils from the first to the sixth grade (male: 61, female: 83). We sampled from a single private primary school to obtain subjects with comparable (relatively good) economic status and a wide range of physical abilities.

Subjects were instructed to press a button, but only when one of two colored targets appeared on a computer screen before them. These Go and No-go targets appeared intermittently across 100 trials presented for 300 ms duration at intervals of 1500 ms. We presented three discriminative conditions- 1. Simple reaction: Only one target color appeared (100% target). 2. High rate reaction: Target color appeared on 80% of trials. 3. Low rate reaction: Target color appeared on 50% of trials.

The relationship between subjects' age (months), median reaction time and error rates (both omissions and false alarm commissions) in the three target reaction conditions were analyzed using correlation analysis. This protocol was approved by the local facility's ethics committee. Informed consent was obtained after explaining all procedures and their risks to each child.

There were significant correlations between age and median reaction time in all three conditions (simple reaction: \( r = -0.76, p < 0.01 \), High rate reaction: \( r = -0.71, p < 0.01 \), Low rate reaction: \( r = -0.75, p < 0.01 \)). There were also significant correlations in the difference values for High and Low rate reaction minus simple reaction time (High rate reaction: \( r = -0.19, p < 0.05 \) and Low rate reaction: \( r = -0.42, p < 0.01 \) respectively). There was significant correlation between age and error rate in the High rate reaction condition (\( r = 0.23, p < 0.01 \)), but not in the Low rate reaction condition.

In this study, the high rate reaction task appeared to result in automatic button pressing, producing significantly lower reaction times than were found in the reactions to low rate trials. In both high and low rate reactions, the differences relative to simple reaction decreased with age, indicating that cognitive reaction time developed independently of the presumably underlying simple reaction abilities. Error rate also significantly declined with age, but only in the high rate reaction condition. The go/no-go task design has been widely used to examine the inhibitory characteristics of the central nervous system. The present results are interpreted to represent the development of inhibitory processing.

SELF-CONSCIOUS EMOTIONS IN SOCCER PENALTY SHOOTOUTS: CELEBRATE INITIAL SUCCESSES AND YOU WILL HARVEST ULTIMATE WINS

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Pride and shame are self-conscious emotions that are elicited when individuals focus their attention toward aspects of themselves. These emotions function to communicate whether one has lived up to certain social standards or not (Tracy & Robins, 2004). In the current study, we hypothesized that pride and shame would be expressed following potentially high self-focus sport actions: a kick in an important soccer penalty shootout. Research has shown that when participants view still-photographs of actors attempting to express pride and shame, both emotions seem to have distinct and recognizable non-verbal expressions involving body and face (Keltner & Buswell, 1996; Tracy & Robins, 2007). The first aim of our study was to create operational definitions of spontaneously expressed pride and shame and check if these could be used to classify aspects of post-shot behavior displayed in dynamic video images of penalty kicks. The second aim was to investigate whether individual differences in pride after goals are linked to the ultimate outcome of the penalty shootouts.

In total, 267 shots were analyzed from all penalty shoot-outs held in the World Cup and the European Championships. A coding instrument was developed to classify behavior as pride and shame. Chi-square tests were used to test the relationship between pride and game outcome (\( p < 0.05 \)). Results revealed that when players scored (n=202), 50% of them displayed celebratory hand moves. Here, 43% involved moves above head, 28% moves below head, 44% with one hand, and 25% with two hands. In addition, 8% of the players smiled, 7% looked up, 48% looked down, and 1% hid their face. When players missed (n=65), 77% of them looked down, 13% looked up, and 15% closed their eyes. In addition, 48% of the players hid their face, 35% did this with two hands and 12% with one hand. Finally, for all scored penalties, ‘celebratory hand moves’ was positively and significantly related to game outcome (\( p < 0.01 \)). This was also found when directly game-deciding kicks were excluded (\( p < 0.05 \)) and with a trend when kicks taken with an unequal score were excluded (\( p = .11 \)).

Our findings indicate that following a penalty kick, expressions of pride are displayed in response to success and expressions of shame are mainly displayed in response to a failure. Notable exceptions were the typical shame behaviors ‘looking down’ and ‘hiding the face’ that also were observed in response to success. More interesting however, players who show pride following a successful penalty kick seem more likely to ultimately win the penalty shoot-out, also when uneven standings in the shootout are controlled for. Possible reasons may be that displaying pride can create a sense of dominance which increases confidence in one’s own team and decreases confidence in the other team.

References.
ORTHOREXIA NERVOSA IN SPORT: AN EATING DISORDER OR AN OBSESSIVE-COMPULSIVE DISORDER?
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Introduction
The Orthorexia nervosa (ON) is a new food pattern that has recently been related with eating disorders. While bulimic and anorexic patients focus mainly on the quantity of food, people affected by ON obsess on its quality. For this people the food is excessively important in their life. The aim of this study is to determine the incidence of the ON in sportsmen and to verify the association of ON with eating disorders, body image disorders or obsessive-compulsive disorders.

Methods
167 subjects, who regularly train in different sports (45.8% elite team), were enrolled and filled in the ORTO-15, the Eating Disorder Inventory 2 (EDI-2), the Eating Attitude Test (EAT-26), the Body Unessay Test (BUT) and the Yale-Brown Obsessive-Compulsive Scale for Eating Disorders (YBOC-S). Chi-square test, ANOVA (univariate) analysis and Spearman’s correlation were used for data analysis.

Results
Mean score to ORTO-15 test was 36.66±4.25 with no statistical difference regarding sex or level of training. More than 80% of subjects resulted positive to ORTO-15 (cut-off 40) so it was decided to attend a more severe cut-off (35) that gave 40.4% of sportsmen positive to test. There was no association between orthorexia and sex, level of training or kind of practiced sport. Mean scores of EAT-26, EDI2 and BUT were normal. Subjects positive to ORTO-15 also scored significantly higher to EAT-26 (p<0.05) and YBOC-S (p<0.05). No statistical differences were found in EDI-2 and BUT. Spearman’s correlation showed a strong correlation between ORTO-15 scores and prior or actual dieting, EAT-26, Drive for Thinness, YBOC-S and obsessions and compulsive behaviours regarding dieting, purging, physical exercise, weight and somatic control.

Discussion
Orthorexia nervosa is highly frequent among sportsmen despite the sport they practice. Sportsmen affected by ON do not show the characteristic body image alterations that eating disordered patients suffer. ON is specifically associated to obsessive-compulsive disorders and shows a strong correlation with rigid and pathological dietary patterns.

GOAL STRIVING AND AFFECTIVE OUTCOMES IN SPORT: AN EXPERIMENTAL INVESTIGATION OF ATHLETES’ RESPONSES TO SUCCESS AND FAILURE
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Goal setting is promoted as a primary mental skill in sport, however, whilst the benefits of goal setting are recognized, athletes’ responses to success and failure following goal striving have received little attention. Grounded in self-determination theory (Deci & Ryan, 1985), the present study examined the role of motives underlying athletes’ goals in predicting tendencies towards self-aggrandizement following success and self-derogation following failure. The links of these tendencies with perceived enjoyment, tension, and psychological distress were also investigated.

Eighty-six British athletes (59 male, 27 female) were randomly allocated to one of two goal motive conditions and completed two cycle time trials, each with a personally-relevant distance goal. Using written instructions, the autonomous motive condition (n = 43) aimed to promote identified and intrinsic goal striving. In contrast, instructions in the controlled condition (n = 43) aimed to invoke internally and externally pressured goal striving. Manipulated feedback during the cycle trials ensured that participants experienced both success and failure in relation to their goals. Self-report measures of self-aggrandizement (self-praise prompted by an exaggerated sense of self-esteem) and self-derogation (self-criticism resulting from diminished self-esteem) were completed by participants following successful and unsuccessful trials, respectively. Perceived enjoyment, tension, and psychological distress were measured following the trials. Additionally, participants reported their personal motives for striving for each goal.

Manipulation checks showed that the instructions were correctly understood. In contrast to our expectations, the two conditions did not differ significantly on any of the outcome variables (Wilk’s = .97, F (1.78) = .517, p > .05). However, a number of interesting results emerged when looking at personal goal motives. Structural equation modeling analysis supported a model (scaled 2 (13) 15.72, p > .05, CFI = .98, NNFI = .97, RMSEA = .05 (CI = .00-.13), SRMR = .07) in which controlled personal goal motives were positively linked with both self-aggrandizement following success and self-derogation following failure. In turn, both self-aggrandizement and self-derogation were positively associated with perceived tension and psychological distress. Autonomous personal motives were unrelated to self-aggrandizement and self-derogation but were directly and positively linked to enjoyment.

The present study suggests that the personal goal motives athletes’ adopt during goal striving can predict athletes’ self-esteem related reactions following success and failure as well as related affective consequences.

References.

THE RELATION BETWEEN PERFORMANCE AND PERSONALITY AMONG HUNGARIAN ELITE ATHLETES
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A number of factors are tied into understanding, predicting and enhancing athletic performance. The dispositional characteristics like personality characteristics are one of the most important. The clinical sport psychology highlights the importance of personality. This study suggests an approach in the area of personality and performance analysis, which combines the questionnaire and projective tests. Beside this it also reveals the application of the projective tests in the area of sport psychology. The advancement of these is that they are dynamic and they indicate not just the performance, but also the way to it. Therefore the roots of the performance problems can be revealed. The study was conducted among 43 hungarian elite athletes. In the aspect of the sportpsychological measurements I used the following measurements: ACI-28, CSAI-2 (questionnaires), and Wartegg-test and Szondi-test (projective tests). The aim of the questionnaires was to measure the performance anxiety, and the goal of the projective tests was to measure the connected personality characteristics. According to the results I found that among athletes with significant anxiety (p<0.05), the anxiety influences the identity, the development of the emotional-relational life as well as the handling of anxiety and aggression. According to the analysis of the projective
tests, the results reflect similar mental constitution. Sport became an integrated part of the personality, therefore the question of performance has a very emphasized role. It also affects the development of personality, certain areas develop in different time, thus the emotional life sometimes slackened, or even hampered, which influence the social relations. The study describes a different approach of understanding and analysing the relation between performance and personality, and gives a new possibility to the theory and practice of the sport psychology.

THE INFLUENCE OF TIME OF EXERCISE ON DECISION MAKING IN YOUNG BASKETBALL PLAYERS

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INTRODUCTION: The decisional behavior plays a prominent role for the achievement of a high-level performance in basketball. The ecological dynamics perspective considers the decision making as an emergent process that results from the interaction of organismic, environmental, and task constraints (Araújo, Davids & Hristovski, 2006). In the literature, the increasing time of practice is associated to a condition of fatigue that inevitably conducts to a deterioration of the performance. However, recent investigations have shown that task-specific fatigue facilitates decision making in skilled players (Royal et al., 2006). The aim of this paper is to analyse the influence of the time of exercise in the decisional behavior of young basketball athletes, during a training session.

METHOD: Six male basketball players (16-17 years old) participated in this study. The athletes were analyzed in three training sessions of three consecutive microcycles where, during two time slots of each session, they played constrained games of three-on-three that were at the same time recorded. In three different moments of the session they also performed the perception of effort test (Borg, 2001) and the Bosco et al., (1983) protocol that evaluates the anaerobic power. A notational analysis system, composed of several categories, was created to study the decisional behavior of the attacking player in game.

RESULTS: A tendency to increase in the perceived exertion was identified along the training session. In what relates to the anaerobic power production there was a non significant impact of the time of exercise. The quality of decision making increased in the training session, specifically in the ratio shots attempted/ shots converted.

DISCUSSION: The results suggest an adaptation of the athlete to the time of exercise, expressed by the increasing decisional efficiency in the game. Following a constraints-led approach, these results may be interpreted as a self-organizational process, between the different organismic systems, whose solution brings together internal and external constraints to achieve task goals. Moreover, a refinement in the perceptual tuning into the relevant information in the game may have contributed to a better adjustment of the perception-action relationship coupling.

References.

BALL TOSS AS BI-DIMENSIONAL AND TEMPORAL ANTICIPATORY INDICATOR OF TENNIS SERVE DEEP IN A FEMALE PROFESSIONAL PLAYER; STUDY CASE

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The hypothesis assumed in this study considers the ball toss in tennis serves as a performance indicator to the return player. In the studied case, variability of a professional female tennis player (top 60 ranking WTA-Woman Tennis Association) was analyzed during three official matches. A Sony Handycam model DCR-HC23E (Sony Corporation, Japan) was used for the image capture, the software Spadix JRulerPro v.3.0.0.1 to spatial coordinates, and the software CCC-FairPlay Lite v.3.0.14 to temporal data. The sample of 33 serves was examined, and normalized by 4 moments: a) ball leave the hand, b) maximum high of the ball, c) impact with the racquet, and d) position of landing in the service square, all measures were done in spatial (cm) and temporal (s) data. A linear regression model was calculated to predict variables using moment as dependent variable. The resume shows an R=0.89 (p<0.00) to moment dY in relation to the predictors variables (except to variable time of ball toss). Considering that dY report the distance among net and serve line, the results appointments that dY (r=0.86), dY (r=0.81) and dY (r=0.85) can predicts the deep oscillation of service, but just dY (r=0.85) presented p<0.00. We concluded that dY might be applied directly on training protocols and also develop a base to form the knowledge about perception in tennis serve, especially respect psychological constancies and configurations.

PRECOMPETITIVE ANXIETY, GUM CHEWING, AND DIAPHRAGMATIC BREATHING

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The study was designed to examine if differences in the level of somatic anxiety, cognitive anxiety, and self-confidence exist among male recreational basketball athletes who were receiving gum chewing, diaphragmatic breathing, and a control intervention. The Competitive State Anxiety Inventory - 2 (CSAI-2; Martens, Vealey, & Burton, 1990) was administered to 30 recreational basketball athletes from a college in the New England Area. A total of three 3 x 3 mixed factorial Analysis of Variance was computed for the three subscales of the CSAI-2. Additionally, Pearson’s correlation coefficients were calculated for the cognitive anxiety and self-confidence subscales scores and self-confidence and basketball shooting scores. A significant interaction between experimental treatments and testing periods was found in the somatic anxiety subscale. Gum chewing group reported significantly lower levels of somatic anxiety postintervention when compared to the control group. No other interactions between experimental treatments and testing periods in the cognitive anxiety and self-confidence subscales of CSAI-2 were found. No associations between the scores of self-confidence and cognitive anxiety and the scores of cognitive anxiety subscales and basketball shooting performance were found. The results suggest a possibility of applying gum chewing as an alternative technique of somatic anxiety regulation.

References.
WAS SURVEY RELATIONSHIP BETWEEN PHYSICAL FITNESS WITH ANXIETY AND DEPRESSION OF MALE STUDENTS IN THE GUIDANCE SCHOOLS

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Adolescence in reason to intuitive specific problems and family, study and social problems have been more exposed to nervous pressure such as anxiety and depression. Psychological and educational researchers always like to discover new ways for prevention and reduction of psychological disorders among students.

The purpose of this study was survey relationship between physical fitness with anxiety and depression of male students in the Guidance schools.

Statistical population includes students in the Guidance schools and 350 of them were participated in this research. The research method was based on correlation. Data analysis includes descriptive statistical and Pearson Coefficients Correlation. The value of (P<0.01) was considered as significant.

The results of descriptive statistics showed that:
1. students had been similar physical fitness and their situation was sub norm of province. Thus, they hadn’t a favorite situation.
2. at anxiety, average score showed that there were rates of A=anxiety and they hadn’t favorite situation.
3. at depression factor, average score showed that there was a little depression in them.

Hypothesis tests results showed that:
1. There weren’t significant relationship between Physical Fitness with Anxiety and Depression in male Students at Guidance Schools.
2. There were significant relationships between Anxiety and Depression in male students at Guidance Schools.

EFFORT PERCEPTION IN MULTIATHLON ATHLETES

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Introduction Multiathlon is a multisport competition that involves modalities as running, jumping, swimming, cycling, canoeing, throwing, MTB, obstacle running, climbing, skating, apnea, bow and arrow, that occurs in just one day. It is a competition of individual character, and none of the modalities is obligatory, even though exist a minimum number that has to be done according with the category of the competitor. The pursuit of limits is one of the major points of this type of competition, which leads the athlete to a constant overcome of the physical demand and pain. The goal of this study was to evaluate the dimension of pain suffered on male athletes participants of the multathlon 2007 edition in Brazil. Methods It took part in this study 11 male athletes of a total of 27 participants, with ages between 24 and 43 years that participated all of the competition. Was used Borg’s scale in two moments of the competition, on the beginning at 4:00 AM and near the final at 6:00 PM when different types of effort had already taken place. Results The results point out that we present levels of perception of effort that go from somewhat hard to hard, and they reach maximum limits of Borg’s scale of hard to extremely hard, as much at the initial moment of the test as on the end. Some athletes presented a high level of effort in the beginning of the test, indicating a relation between perception of effort and its representation during the competition with high level of physical demand.

Discussion/Conclusion We observe in this study that the variation of the pain threshold among athletes of the same gender, corroborating the affirmation that pain perception besides being subjective it is a cultural construction related with the individual history of life. The high effort level in the beginning of the competition suggests that the perception of the effort is associated with the future representation of the effort, in other words, knowing the fact that still there are going to be lots of different modalities on the competition with different demands, of effort motor skill, this can take them to a competitive stress symptom. That permits us to affirm the existence of a relation among social representation of the effort and it’s perception, as all the athletes that ended the competition conquer first classifications presented some type of lesion, because they disrespect pain as a sign of something’s wrong.

References.

MANIPULATION OF POSITIVE AFFECT IN SPORT CLIMBING USING MUSIC

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Introduction
Pre-competition readiness demands fine tuning of positive and negative affects (Hanin, 2000) in order for athletes to achieve an individual zone of optimal functioning (IZOF). Many coaches use music as an affect manipulator; however, some qualitative studies (e.g., Giacobbi and Weinberg, 2000) have reported that expert athletes already display greater positive pre-competition affect than non-athletic populations. This suggests that music may only bias affect in novices and non-climbers. Thus, this study aimed to 1- investigate differences in affect between non-climbers, and novice and expert climbers, and 2- test the validity of music for the manipulation of affect in climbers. The findings may be used by sport climbers to consider music bias during competition.

Method
Thirty five non-climbers, 33 novice (4c-5c French RSD) and 32 expert climbers (6a to 7c+) completed the I-PANAS-SF (Thompson, 2007) before and after listening to validated valence music (Moare and Oakford, 2002). Differences between four affect scores (positive, negative, pre-test and post-test) at the three levels of expertise were assessed using MANOVA (p < .05) and post-hoc t-tests (p < .02). The effectiveness of affect manipulation by means of music was tested by comparing pre-test positive affect to post-test positive affect and pre-test negative affect to post-test negative affect for three music treatments (positive, negative, no-music) using independent samples t-tests (Bonferroni-adjusted alpha = .025).
Results
The MANOVA test showed significant differences in affect between expertise levels (F[8,188] = 2.25, p = .03, Wilk's lambda = .83, power = .86). The post-hoc t-tests revealed significant differences in positive affect between novices and experts only (p < .02), with novices scoring higher on post-test positive affect (16.3 ± 3.9) than experts (13.6 ± 4.2). Only positive music had a significant influence on affect, whereby positive affect increased significantly (t[30] = 2.49, p = .02) and negative affect decreased significantly (t[30] = 3.34, p = .02).

Discussion
The results confirm that participation in sport is a generator of positive affects, as suggested by Giacobbi and Weinberg (2000), and that only happy music is suitable for attuning positive affect, in agreement with Moore and Oaksford (2002). Novices expressed higher positive affect following the application of the music condition, while affect did not change substantially in experts. Such findings confirm Hanin's (2000) IZOF proposal that experts control their affect in a way that might assure optimal performance. During climbing competitions, the bias of music in the performance of climbers should be acknowledged.

References

THE IMPACT OF EMOTIONS ON PATTERN RECOGNITION OF CLIMBING WALL ROUTES

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Introduction
Previous research on the enhancement of wall route recognition in sport climbing is limited to the study of acquisition of chunked climbing route configurations in the form of affordances (Gibson, 1979; Boschker et al., 2002). Also, the effect of emotions on performance at different levels of expertise has received little empirical attention. Thus, this study aimed to investigate whether emotions have an impact on the ability of non-climbers, novice and expert climbers to recognise climbing wall route patterns. If affect influences performance in climbers, awareness of emotional bias should be brought to the attention of all climbers.

Method
Thirty five non-climbers, 33 novice and 32 expert climbers listened to validated valence music (Moore & Oaksford, 2002). A follow up cognitive task involved pattern recognition of 20 pairs of digitised climbing routes, presented on a computer screen at 16-s delay intervals, and the completion of a post-test inventory of memory and perception methods (Garden et al., 2002). The multivariate effects of expertise level and music condition (positive, negative and control) on pattern recognition scores, method of memorising and method of perceiving were assessed using a 2 x 3 x 3 MANOVA test (p < .05) and Bonferroni post-hoc tests (p < .02).

Results
The results of the MANOVA test were significant (F[6,178] = 12.05, p < .001, partial eta2 = .29, Wilk's lambda = .51, power = 1). There were differences in expertise level regarding pattern recognition scores (F[2,91] = 6.79, p < .002), method of memorising (F[2,91] = 27.98, p < .001) and method of perceiving (F[2,91] = 6.71, p < .001). Differences in pattern recognition scores were only statistically significant between non-climbers and expert climbers (t[65] = 9.01, p < .001) in all music conditions. Positive music improved method of memorising at all levels of expertise compared to negative music, however the differences were not significant (t[31] = 1.27, p = .05). Negative music (1.40 ± .52) was detrimental to functional perception of the wall in experts (t[31] = 27, p < .02) compared to positive music (1.82 ± .41).

Discussion
In agreement with Boschker et al. (2002), expert climbers showed superiority in pattern recognition scores and method of memorising of the climbing wall and suffered no interference from emotions. However, negative music perturbed the perception of the climbing wall in expert climbers; thus, contradicting Gibson’s (1979) theory of perceived affordances. The findings suggest that climbers may remember the functional parts of the route, however under a negative mood even expert climbers may not be able to choose the best route available.

References
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DIFFERENCES IN PERCEIVED EXERCISE BENEFIT AND BARRIER INTENSITIES OF EXERCISING AND NON-EXERCISING FEMALE UNIVERSITY STUDENTS

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Research has identified positive health benefit linked to physical activity (PA) in young and youth adult populations (Buckworth, 2001). An area that has been successful in raising levels of awareness as to the possible antecedent events that contribute to low levels of PA is our understanding of barriers to exercise. Findings have revealed that as barriers to exercise increase the frequency of (PA) participation decreases. However, many studies have failed to obtain a homogenous sample. The purpose of this study was to investigate the differences between exercising and non-exercising female university undergraduates.

A sample of female students (n = 101, Mean Age = 19.16, SD = 1.03) were recruited from a university in the South West of England. Non-exercisers were classified as individuals not meeting the ACSW (2000) recommendation of a minimum of 30 minutes of moderately intense cardio, five days a week. All participants completed the Exercise Benefits/Barriers Scale (EBBS, Sechrist, Walker & Pender, 1967). Independent t-tests demonstrated that exercisers had significantly lower total barrier scores (p < 0.001) and significantly higher benefit scores (p < 0.05). MANOVA's performed on the EBBS barrier/benefit sub-scales demonstrated significant group main effects F (4,116) = 5.885, p < 0.001, F (6,114) = 5.319, p < 0.001, respectively, with exercisers recording higher benefit and lower barrier scores. Subsequent univariate analysis found each of the subscales to be significant with the non-exercisers recording higher barriers and lower benefits. Family encouragement and physical exertion were seen to be the greatest perceived barriers to exercise in both groups while psychological outlook and social interaction the greatest benefits.
As hypothesised there was an overall trend with exercising females recording lower barrier scores and higher benefit scores than their non-exercising counterparts. However, an interesting result obtained from this study was that both groups found physical exertion to be the highest perceived barrier to exercise. This suggests that future interventions should design and focus health promotion strategies towards reducing the perceptions of fatigue and hard work associated with physical exertion.

References

IS GENDER ROLE ORIENTATION A PREDICTOR OF BODY RELATED PERCEPTIONS OF ATHLETES?

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The purpose of this study was to investigate whether the gender role orientation of athletes is related to their body related perceptions. This study was also aimed to determine the differences in body related perceptions with respect to gender role classification.

172 female (M(age)=19.12, SD=4.75) and 157 male (M(age)=21.26, SD=5.52) Turkish athletes from variety of team and individual sports voluntarily participated in this study. Bem Sex Role Inventory, Social Physique Anxiety Scale and Berscheid, Walster and Bohrnstedt Body Image Questionnaire were administered to 329 athletes. Stepwise Multiple Regression procedure was used to determine whether gender role orientation might predict social physique anxiety and body image satisfaction.

Results of Multiple Regression Analysis indicated that masculinity was significantly related to social physique anxiety (R=0.24) and body image dissatisfaction (R=0.48, p < .01) for 329 athletes. The masculinity score predicted 6% and 23% of the variance in social physique anxiety and body image satisfaction, respectively. The results of Stepwise Multiple regression for each sex revealed that both masculinity and femininity were significantly and positively related to body image satisfaction (ß=0.21 and ß=0.30, respectively) for females. However, masculinity was only predictor of body image satisfaction of males (ß=0.44, R2 = 20%, p<0.01). Furthermore, results indicated that femininity was significantly and negatively correlated with social physique anxiety of female athletes (R=0.28, p<0.01) and was the most important predictor of it (R2 = 8%). Beside, either femininity or masculinity was related to social physique anxiety of male athletes. 2 x 4 (Sex: Male/Female x Gender Group: Masculine/Feminine/Androgynous/Undifferentiated) MANOVA was conducted to test the differences in social physique anxiety and body image satisfaction among different gender role categories. MANOVA analysis demonstrated overall significant main effect of sex (Hotelling's T2 =0.14; F (2,196) =13.30; p < 0.01) and gender categories (Hotelling's T2 =0.22; F (6,390) = 7.22, p < 0.01) on body related perceptions. Univariate follow-up analysis indicated that female athletes were less satisfied with their bodies and experienced more social physique anxiety than male athletes (p<0.01). Furthermore, androgynous athletes were more satisfied with their bodies than athletes in other gender role categories (p<0.01).

It can be concluded that gender role orientation of athletes is a valid predictor of their body related perceptions and the contribution of gender role orientation to body related perception is changed with regard to sex.

CONTROL OVER THE LEVEL OF PHYSICAL PREPAREDNESS OF PUPILS OF MULTI-DISCIPLINE SPORTS SCHOOL AS A FACTOR OF GROWTH OF SPORTS MASTERY

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At present, in connection with commercialization of all the spheres of human activity including the sports the price of victories has increased impressively. This induces both trainers and sportsmen to increase the capacity and intensity of training load steadily, which affects the level of physical preparedness that plays a top-priority role. Determining the level of physical preparedness according to the results of motive tests we acquire the possibility to develop lagging physical qualities using the influence of means and methods of physical upbringing. Correction of these qualities will give the possibility to increase sports mastery. For that it is necessary to accomplish the following tasks: first of all, to determine and choose the tests of combined competitions for all the specializations of a sports' school; secondly, to work out a system of evaluation of results according to T-scale; thirdly, to draw up evaluative tables. The work has been carried out on the basis of a combined sports school. At sports school the following kinds of sport are offered: football, fencing, shooting, weight-lifting, biathlon.

The method of testing has been used for determination of level of physical preparedness. The most effective tests have been chosen from a multitude of them. You can conduct these tests both on the sports ground and in the gym.

Testing has been conducted in the form of competitions consisting of three stages from April to November, 2007. At the first stage (April) 243 sportsmen took part. At the second stage (July) 266 sportsmen took part. At the third stage (November) 240 sportsmen took part. During tests control of absolute indices has been conducted, where measurement has been carried out in natural values (meters, centimeters, seconds etc.). The winners of competitions were the sportsmen with high level of physical preparedness, at the same time they had the high level of special training and were rated high in their kinds of sport.

REPORTED USE OF ANABOLIC STEROIDS AND ERGOGENIC SUBSTANCES IN GYM/HEALTH CLUB SETTINGS: ASSOCIATIONS WITH PSYCHOSOCIAL AND EXERCISE BEHAVIOR FACTORS

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Purpose: The aim of present study was the analysis of the association among exercise behavior, psychosocial factors and the use of ergogenic substances in males who exercise in gym settings.

Methods: The sample comprised 147 male subjects (age M=27.4, SD=7.1) y representing individuals that exercise regularly in gym/health clubs in the Lisbon area which have equipment for training with high loads (exercise frequency M=4.3, SD=1.3 times/w; duration M=72.7, SD=27.7 min). Self-report measures evaluated: a) use of ergogenic substances (e.g., nutritional supplements; mass gainers; anabolic...
steroids), b) exercise behavior (frequency, intensity and duration), and c) psychosocial: exercise dependence (EDS-21), drive for muscularity (DMIS) and theory of planned behavior (TPB) about the use of ergogenic substances.

Results: A third of the subjects have declared the use of anabolic steroids (AS), whilst two thirds use ergogenic substances other than AS (mainly mass gainers). This use was associated with exercise dependence, drive for muscularity and the TPB constructs (all p<0.01, except for social norms which were non-significant). Exercise behavior was also associated with the use of AS (duration p<0.05 and intensity p<0.001) and other ergogenic substances (frequency p<0.01 and intensity p<0.001). The subjects with secondary exercise dependency (i.e. high levels of exercise dependence and high levels of drive for muscularity) showed marginally higher use of AS (p=0.071) and higher intake intention (p<0.01). The multivariate analysis, with multiple mediation testing following Preacher and Hayes procedures (2007), showed that intake intentions associations with reported use of AS were not mediated by exercise dependence or drive for muscularity. The multiple mediation analysis with the other ergogenic substances derived in an identical set of results; no mediation of the psychosocial variables on the intake intentions association to the reported use.

Conclusion: The reported use of AS was more than 10% higher than usually reported in the literature (Cole et al, 2003). The reported use of ergogenic substances were associated either to the exercise behavior factors and the psychosocial constructs evaluated in this study. In the latter factors, intake intention, exercise dependence and drive for muscularity were particularly associated to the reported use of ergogenic substances and AS. These constructs should be considered for the evaluation of exercise maladaptations that, paradoxically, are jeopardizing the health of the exerciser.

RELATIONS BETWEEN EXERCISE, QUALITY OF LIFE AND SELF-EFFICACY IN PERSONS WITH AND WITHOUT PHYSICAL DISABILITIES
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Quality of life achievement was the purpose of many researches last years. Many of them examined the importance of quality of life in persons with and without disabilities. Quality of life are universally related to a) personality characteristics (Diener & Lucas, 1999), b) socio-demographic characteristics (Mroczek & Kolarz, 1998, Nolen-Hoecksema & Rustling, 1999), c) factors such as positive and negative affect, stress, physical health (Morris, 1999) and d) subjective life satisfaction (Berger & Molt, 2001). The purpose of the present study was to investigate the relations between exercise, quality of life and self-efficacy, in persons with and without physical disabilities. A sample of 375 persons in a range between 19 to 63 years old (Mage=33.5, SD=9.7) participated in the study. Of the participants, persons with physical disabilities were 182 (men=135, women=47) and without disability were 193 (men=137, women=62). The 53.3% (N=79) of people with disabilities and the 52.8% (N=102), of people without disabilities remarked that participated in physical activities. Participants completed questionnaires concerning quality of life, self-efficacy and exercise behavior. The results indicated that according to quality of life, exercise, persons with and without physical disabilities differed significantly in the values of physical health and self-efficacy but there were no differences in mental health. Between people participated or not in physical activities, appeared significant differences in quality of life and self-efficacy. Participants in physical activities indicated higher values comparing with no participants. Moreover for the individuals with and without disabilities, correlations were high between exercise behavior, quality of life and self-efficacy. The results indicate the effect of participation in physical activities in improvement of quality of life and self-efficacy in persons with and without physical disabilities.

References.

DROP-OUT IN RHYTHMIC GYMNASTICS: AN EXPLORATORY INVESTIGATION
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Every year about 35% of athletes withdraws from the sport (Riewald, 2003). The drop-out is typically between 10 and 17 years (Gould and Horn, 1984), age in which rhythmic gymnastics reach the best results. Aims of this study were to focus reasons for drop-out in Rhythmic Gymnastics and to identify gymnasts’ morphological and psychological characteristics for predicting persistence in competitive sport career.

Sixty dropouts elite gymnasts (33 international and 27 national level gymnasts) were administered a modified questionnaire about drop-out reasons. The questionnaire examined the following variables: drop-in age, drop-in motivation, training amount per week, age and morphological characteristics at the time of the best competition results, and reasons for exercise adherence. According to most studies (Johns et al, 1990, Weiss and Petlichkoff, 1989) concerning the drop-out phenomenon, socio-psychological aspects were the most frequent reasons of drop-out. The drop-out reasons for international and national gymnasts respectively were the following: morphological change (10.0%, 13.5%), lack of free time (19.0%, 15.0%), study (13.5%, 13.5%), injury (7.0%, 8.4%), lessenng of motivation (15.0%, 20.0%), lack of competitive success (2.0%, 5.0%), relationship problems with coaches (7.0%, 3.4%), age (10.0%, 2.0%), diet (2.0%, 0.0%), family (2.0%, 0.0%), lack of sports structures (2.0%, 3.4%), anxiety before competition (0.0%, 2.0%), and other reasons 19.1%, 15.2%

Data were analyzed using a t-test to verify significant differences between group answers. The drop-out’s product moment correlation was used to examine the relationship between persistence in competitive sport career and investigated variables. Significant differences between international and national gymnasts were found for training amount (p<0.01), age of the best results (p<0.05) and age of drop-out (p<0.01). The results revealed a significant correlation between the drop-in age (r=0.597 p<0.05), the training amount per week (r=0.447 p<0.05), the age of the best competition results (r=0.426 p=0.05) and the persistence in competitive sport career. Lack of motivation and of free
The results are discussed with reference to the conceptualization and measurement of transformational leadership, and informing these relationships. However, performance level was shown to moderate the relationship between transformational leadership, team cohesion, and performance level. Furthermore, results demonstrated that the leadership behaviours of coaches on how their leadership behaviours may influence cohesion depending on level of performance.


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MEASUREMENT OF TRANSFORMATIONAL LEADERSHIP AND ITS RELATIONSHIP WITH COHESION AND PERFORMANCE LEVEL

It is established that coaches’ leadership behaviours play an important role in successful sporting performance (e.g., Gould, Greenleaf, Chung, & Guinan, 2002). However, within the sport context, the conceptual and theoretical examination of these leadership behaviours in relation to transactional and transformational leadership theory is limited (see Rowold, 2006). Given the predominance and relevance of this theory in other contexts (e.g., Rafferty & Griffin, 2004), the lack of research in sport is surprising. In an attempt to bridge this research gap, the present study developed, and explored, the validity of a transformational leadership measure for sport. Further, the relationship between transformational leadership, team cohesion, and performance level was examined.

It is established that coaches’ leadership behaviours play an important role in successful sporting performance. Research Quarterly for Exercise and Sport, 73, 175-187.

Three hundred and nine club standard ultimate frisbee players (Mean age = 24.3 years, SD = 3.9) completed an adapted version of Hardy, et al’s in press Transformational Leadership Inventory and the Group Environment Questionnaire (Carron, Widmeyer, & Brawley, 1985). Confirmatory Factor Analysis revealed factorial and discriminant validity for the leadership inventory, with certain leadership behaviours discriminating between high and low performance level. Furthermore, results demonstrated that the leadership behaviours of fostering acceptance of group goals, high performance expectations, and individual consideration significantly predicted task cohesion; and fostering acceptance of group goals significantly predicted social cohesion. However, performance level was shown to moderated these relationships.

The results are discussed with reference to the conceptualization and measurement of transformational leadership, and informing coaches on how their leadership behaviours may influence cohesion depending on level of performance.


Examining the Sub-Components of Transformational Leadership. The Leadership Quarterly.


EFFECTS OF MENTAL TRAINING IN THE LEARNING OF A COMPUTER PSYCHOMOTOR TASK

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The primary aims of the present study were to investigate whether individualized imagery interventions had an effect on the learning of a motor task. Measures of the learning output were velocity and error frequency of a motor task, namely, in a computer car race game. Thirty-six undergraduate students (M age = 21.66 years, SD = 1.46) volunteered for the present study. The majority of the sample was majoring in Sport Sciences. Participants were not financially reimbursed for their participation and volunteered to be in the study. Written informed consent was obtained from each participant after he/she had read a letter of information and had any questions answered satisfactorily. Participants’ trials were conducted in a laboratory, accompanied only by an investigator. Upon completion of a first trial set and initial evaluation participants were randomly assigned to one of three groups, two experimental groups and a control group. Experimental group 1 was submitted to a motor training process; experimental groups 2 to a motor and mental practice program and the control group doesn’t have any activity between initial and final evaluation. Group 1 completed 10 sessions of 6 game trials with a 2 min of interval between each trial. Group 2 practice in the same conditions but mental imagery training took place after the completion of each trial followed by a 3 min interval. An imagery script was created for imagery practice. The script included two minutes silence with the following MG-M images: image of movements and feelings during race preparation, mental race practice and imaging arriving at the end of the race. The intervention was administered to the participants separately in a quiet and comfortable place and lasted for around eight and a half minutes. We found significant differences between Experimental Groups and the Control Group (p<0.009) favoring the Experimental Groups. However we didn’t found significant differences between the motor practice group and the motor and imagery practice group disfavoring the hypothesis that imagery facilitated the performance in this particular task. This study provides preliminary evidence for practitioners who wish to employ imagery interventions to enhance performance.

VISUAL PERCEPTION AND VISUAL-MOTOR INTEGRATION IN CHILDREN WITH DEVELOPMENTAL COORDINATION DISORDER

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Background: The purpose of this study was to explore the performance of visual perception and visual-motor integration in children with developmental coordination disorder (DCD), and the relationship between.
Methods: Fifteen children with DCD, aged 9–10 years, and 15 age- and sex-matched normal children were selected and assessed with Movement Assessment Battery for Children (Movement ABC), Test of Visual-Perceptual Skills (non-motor)–Revised (TVPS-R), and the Beery-Buktenica Developmental Test of Visual-Motor Integration (VMI), with Supplemental Developmental Tests of Visual Perception and Motor Coordination.

Results: The results showed that children with DCD performed significantly worse than normal children for all tests, except for Visual-Figure Ground subtest in TVPS-R and Motor Coordination subtest in VMI. Especially, these clumsy children in Taiwan performed more poorly on Visual Discrimination and Visual-Form Constancy subtests in TVPS-R. But, the deficits of all TVPS-R and VMI subtests were not common to all children with DCD. Finally, for both groups, there was a significant moderate correlation between visual perception and visual-motor integration, indicating that visual perception problems are associated with motor ability.

Conclusions: The above-mentioned findings confirm most of the previous studies that children with DCD have poor perceptual and motor performance. However, the heterogeneity of children with DCD, and the task differences of specific instruments should be further examined.

Key words: developmental coordination disorder, visual perception, visual-motor integration

PERSPECTIVES ON THE DEVELOPMENT OF COACHING EXCELLENCE: A QUALITATIVE INVESTIGATION INTO PSYCHOLOGICAL FACTORS OF COACHING CONCEPTS OF PROFESSIONAL SOCCER COACHES IN JAPAN

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The purpose of this study was to describe the developmental process of perceptions of coaching concepts of professional soccer coaches in Japan. Participant selection was limited to coaches of professional soccer club in Japan who had accumulated a minimum of five years top league level of coaching experience. Participants were further limited to full-time coaches, defined as having 60% or more of their work allocated to coaching tasks. Six professional soccer coaches in Japan served as participants for this study. Their average age was 46.3 years old, and they had an average of 9.7 years of coaching. In-depth, open-ended interviews were conducted with each coach. Interviews ranged between 60 to 90 minutes, were tape recorded with the permission of the participants. The interviews were systematically transcribed verbatim from audio tapes immediately after the completion of each interview, and total of 549 meaning units were extracted from the data set. The data was decontextualized using an inductive procedure for analyzing unstructured qualitative data (Colt, Salmela, Barra, & Russell, 1993). The inductive analysis process resulted in regrouping these interview transcripts into three categories (recognition of self-change, refinement of coaching skills, and cultivation of players’ mind) and sub-categories (pondering, self-accept, awareness, vision, rationalization, feedback, communication skills, decision making of players, responsibility, and self-coaching).

All of the participants faced a lot of problems and built up their unsuccessful experiences throughout their coaching career. Consequently, they realized the needs of self-change to develop their coaching expertise. Evidence of the coaches’ mental conflicts to the coaching activities with players also surfaced throughout the training and game.

This study found significant agreement between the perceptions of the concepts on how coaches evaluated their coaching activities in relation to performance enhancement of players and how this support affected their development of coaching excellence. The strong relationship between recognition of self-change, refinement of coaching skills, and cultivation of players’ mind indicates that coaches direct themselves to commit to deliberate practice as a way of constructing the coaching mental model.

MOTIVATION FOR SPORT IN ITALIAN COMPETITIVE AND RECREATIONAL ADULTS

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Introduction

The study aimed at investigating the motivation to sport participation of Italian competitive and recreational adults in relation to gender, age and level of sport participation.

Methods

The Sport Motivation Scale questionnaire (Pelletier et al. 1995) was administered to 988 subjects (193 female and 300 male competitive swimmers, 194 female and 301 male recreational fitness participants) divided in 2 age groups (25–34 and 35–44 yrs). To test significant differences, a 2(gender) × 2(age) × 2(activity) MANOVA with seven subscales of motivation as dependent variables was applied.

Results

No significant difference emerged for gender. A main effect was found for age (Wilks’ Lambda=7.974= 4.7 <p<.05 np2=.03), with significant effects for Stimulation (F(7,974)=8.2 p<.05 np2=.01) and Amotivation (F(7,974)=11.7 p<.05 np2=.05). The 25–34 yrs showed higher values than competitive athletes. Recreational men showed higher Introjected Regulation and lower Amotivation with respect to their fitness counterpart. While women competitive showed higher Introjected Regulation than men competitive, the opposite picture was observed for fitness participants. Recreational men showed higher Amotivation than women while no difference emerged for competitive athletes.

Conclusion

According with the others study in Italian competitive and recreational adults (De Pero et al. 2003, Amici et al. 2007) gender does not represent a relevant factor to sport motivation. Independently from type of activity younger individuals showed high intrinsic motivation and low external motivation (Brustand,1988). The high Introjected Regulation of competitive women and recreational men indicate that they train to feel in good shape. Moreover, men involved in fitness feel not skilled enough for their training (Deci,1975). Finally, the higher External Regulation of recreational individuals reflects their need for external approval.

References.


TRAINING RELATED BEHAVIOURS AND SELF-TALK DURING COMPETITION IN COMPETITIVE SWIMMERS

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Although athletes spend most of their time practicing in training, sport psychology research in training settings is scarce. During practice athletes face a number of physical and psychological demands, such as strenuous training and pressure to achieve optimum performance. If athletes are not able to handle these demands in the controlled environment of training, then negative feelings and cognitions might affect their competitive performance during competition. The purpose of the present study was to examine the relationships between training-related behaviours and positive and negative self-talk athletes experience during competition. Participants were 71 competitive swimmers (mean age 16.66 ± 2.75 years, mean competitive experience 7.20 ± .40). Participants completed in training the Training Related Variables Questionnaire (TRVQ; Woodman, et al., submitted), including 3 subscales (distractibility, coping with adversity, and quality of preparation). Subsequently, they completed in three occasions after the conclusion of competitions the Automatic Self-Talk Questionnaire for Sport (ASTQS; Zourbanos, et al., 2007). The questionnaire assesses 2 broad dimensions of self-talk, positive and negative, each including 4 subscales (positive: psych-up, confidence, anxiety control, and concentration; negative: worry, somatic fatigue, disengagement, and irrelevant thoughts). Cronbach’s alpha ranged from .68 to .77 for the TRVQ, and from .83 to .95 for the ASTQS.

Correlations were calculated to examine the relationships between training variables and self-talk for the three competitions. The analysis showed that (a) distractibility had low to moderate negative correlations with positive self-talk (r ranging from -.27 to -.46), and low positive correlations with negative self-talk (r ranging from .11 to .22); (b) coping with adversity and quality of preparation had low to moderate positive relationships with positive self-talk (r ranging from .35 to .36 for coping with adversity, and from .22 to .32 for quality of preparation), and low to moderate negative relationships with negative self-talk (r ranging from -.01 to -.16 for coping with adversity, and from -.14 to -.35 for quality of preparation). Overall, the results show that training habits are related to the content of self-talk during competition. The findings, in one hand stress the importance of adequate preparation and planning in training, and on the other highlight the need of further research to explore issues related to training.

References:


PENALTY-KICK DIRECTION IN SOCCER IS INFLUENCED BY MORE THAN SIMPLY GOALKEEPER POSITION

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Masters and colleagues (2007) showed that a goalkeeper can, by standing marginally left or right of goal centre, bias a penalty taker to kick to the side with the greater area, confirming the idea that penalty-kick direction is influenced by goalkeeper position. Based on the proposal that human decision-making is shaped by perception of affordances, including those of other people (see Mark, 2007) we hypothesised that the goalkeeper’s future action possibilities are captured by more than simply position in the goal, but that the goalkeeper’s posture in the goal captures important informational constraints for penalty kick direction.

In an experimental study we asked ten participants to view 60 slides on a touch screen monitor. In each slide, a figure of a goalkeeper was positioned on the goal line and in the centre of the goal in one of three postures: a neutral goalkeeper posture, a goalkeeper slightly leaning to the left, or a goalkeeper slightly leaning to the right. Participants indicated, as quickly and as accurately as possible, where they would shoot the penalty by simply touching the screen. Results showed an effect of posture on the direction of the penalty, F(2,18) = 403.72, p < .05, partial eta-squared = .98. In the neutral goalkeeper position participants placed 41% of the penalties to the right of the goalkeeper, and 59% of the penalties were placed to the left of the goalkeeper. In the leaning goalkeeper postures on the other hand all penalties were positioned in the direction opposite to that of the goalkeeper’s posture.

In a second experiment we manipulated both the goalkeeper’s posture and its position in the goal. We asked ten different participants to view 420 slides of the three goalkeeper postures positioned at one of seven displacements to the right or left of the centre. Again participants indicated where they would place the penalty by touching the screen. Results showed a main effect of goalkeeper posture and position on the direction of the penalty, respectively F(2,18) = 106.29, p < .05, partial eta-squared = .92, and F(6, 54) = 35.46, p < .05, partial eta-squared = .80, as well as an interaction between posture and position on the direction of the penalty, F(2,108) = 7.32, p < .05, partial eta-squared = .45.

The current study indicates that when deciding where to place a penalty kick footballers take into account more than merely a goalkeeper’s position in the goal or which side to the goalkeeper affords the greater surface area. Rather, in their judgement footballers consider the future action possibilities afforded by the goalkeeper.

References:


PRELIMINARY VALIDATION OF THE PORTUGUESE VERSION OF THE EATING INVENTORY FOR ATHLETES

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Purpose: The aim of present study was the preliminary validation of the Portuguese version of the Cuestionario de Hábitos Alimentarios del Deportista (CHAD), a Spanish language inventory to measure athletes’ eating behaviors.

Methods: The sample gathered 150 subjects (age M=21.1; SD=5.1 y; 88 females) from different competitive sports (although 70% were gymnasts). The CHAD is composed by 34 items evaluated with a 6 point Likert scale (1- Completely Disagree to 6 - Completely Agree). The original version measures 5 dimensions and was elaborated by Dosil and Dias (2006). The Social Physique Anxiety Scale (Hart et al, 1989), PRELIMINARY VALIDATION OF THE PORTUGUESE VERSION OF THE EATING INVENTORY FOR ATHLETES

Thursday, July 10th, 2008

14:15 - 15:15
Body Image Assessment (Williamson et al, 1989), for females the Drive for Thinness subscale of the Eating Disorders Inventory - 2 (Garner et al, 1991) and for males the Drive for Muscularity Scale (McReary & Sasse, 2000) were also used to gather data for the concurrent validation. In addition the assessment battery included demographic and body status self-reported items. The harmonization method was the translation-retrospection supervised by a three-member jury. Factor analysis, internal consistency, correlations with additional body image constructs and comparative tests between genders were calculated.

Results: We forced the 5 factor structure of the original instrument and obtained a solution with 65.7% explained variance. The dimensions replicated the original factor structure with the following dimensions: i) Weight Gain Anxiety (e.g. If I eat too much I regret it afterwards; 12 items, alpha Cronbach=.92); ii) Body Image Worries (e.g., I'm always thinking about my body; 6 items, alpha=.87); iii) Irritability (e.g., If the coach speaks about weight matters, I feel anxious; 7 items, alpha=.92); iv) Satisfaction/Dissatisfaction with Body Image (e.g., I'm satisfied with my appearance, 5 items, alpha=.79); and v) Dieting (e.g., When the season ends, I keep practicing so that I don't gain weight, 4 items, alpha=.84). These dimensions were positively correlated with the SPAS score (.23<r<.53, p<.005), BSD (.25<r<.46, p<.002), Drive for Thinness (.35<r<.51, p<.001), whilst no correlations with the drive for muscularity were found. Women scored higher in all dimensions of the CHAD (p<.05) with the exception of Satisfaction/Dissatisfaction with Body Image, where no differences were observed. The SPAS and BSD scores were also higher among women when compared to the men athletes (p<.001).

Conclusion: The results show that the preliminary version of the Portuguese CHAD is psychometrically sound, both in construct and concurrent validity. Further analysis should be conducted with confirmatory factor analysis and test-retest procedures. This measure presented a promising tool for screening eating habits among athletes that should help the detection of athletes' maladjustments toward their eating behavior and body image.

VALIDATION AND TRANS-CULTURAL ADAPTATION OF THE CHILDREN'S ATTRACTION TO PHYSICAL ACTIVITY (CAPA) SCALE IN ADOLESCENTS

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Objectives: The purpose of this study was to adapt and validate the Spanish, German and French translation of the short CAPA scale (Brustad, 1998), in order to facilitate and expand the use of the instrument, so far only available in English and Latin American Spanish.

Background: The original CAPA scale (Brustad, 1993) consists of 25 items and was developed to measure children's interest in and attraction to, physical activity and specifically, to assess their emotional response to anticipated physical activity. Later, Brustad (1998) derived a 15-item scale from the 5 original CAPA subscales (peer acceptance, physical exertion, games and sports, liking of exercise, and the importance of exercise), retaining the 3 best items from each of the subscales and documenting better validity and reliability (alpha = .85-.95). All items were scored in both versions on a 4-point response format using Harter's (1982) structured alternative approach.

Methods: A total of 368 students (14-17 years) from Luxembourg (N=168, fluent in German and French) and Spain (N=200) were recruited into a pilot study in order to check the item comprehension of the translated 15-item CAPA scale and evaluate the psychometric characteristics in each language. In a second study, a sample of 950 students from both countries responded on an adapted version of the same scale.

Results: Using Harter's structured alternative format, internal consistency coefficients did not support strong reliability across the 5 subscales (alpha = .34-.59; overall alpha = .58). A rephrased and restructured 15-item scale increased the Cronbach alpha coefficient up to .94. Correlations among the subscales confirmed the scale's construct validity.

Conclusions: The findings through the psychometric characteristics support the use of the adapted version of the short CAPA scale in Spanish, German and French for assessing adolescents' attraction to physical activity.

References.


EFFECTS OF HYPEROXIC INHALATION ON ENDOCRINE PARAMETERS ASSOCIATED WITH PSYCHOLOGICAL STRESS

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Background: Psychological stress activates the hypothalamic-pituitary-adrenal (HPA) axis and the sympathetic-adrenal-medullary (SAM) system (1,2). Salivary cortisol (s-cortisol) as a biomarker of the HPA axis, and salivary α-amyrase (s-α-amylase) and chromogranin [s-chromogranin A] as biomarkers of the SAM system have been examined in previous psychophysiological studies. Hyperoxia increases parasympathetic activity (3), indicating that exposure to hyperoxia regulates the SAM system. Therefore, we hypothesized that hyperoxic inhalation regulates the SAM system leading to a suppressed sympathetic activity, including a decrease in s-α-amylase activity and s-chromogranin A concentration. In this study, we investigated the effects of hyperoxic inhalation on the secretion status of psychological stress-induced biomarkers (s-cortisol, s-α-amylase, and s-chromogranin A). Methods: Eight healthy young males (22-24 years) performed a simple mathematical calculation (15 minutes × 2 sets, with a 5-minute interval between the sets). After the task, the subjects inspired either normal air (NA trial) or 100% O2 (hyperoxia; HO trial) for 30 minutes. Salivary samples were collected before (baseline) and after (post-point) the task, and after inspiration of normal air or 100% O2 for 30 minutes (post-30). As control, the subjects remained sat for 65 minutes and inspired normal air without the calculation task, and salivary samples were collected at the same points as the experimental trials. Results: The task caused a tendency to increase in s-cortisol and s-chromogranin A concentrations and s-α-amylase activity at post-point compared with the control. At post-30, s-cortisol concentration did not decrease to the baseline level both with and without hyperoxic inhalation. Salivary chromogranin A decreased to the baseline level at post-30 with and without hyperoxic inhalation. At post-30, s-α-amylase activity in the HO trial decreased to the baseline level. However its activity remained high in the NA trial and the level was significantly higher than that in the HO and control trials. Although the secretion of s-α-amylase and s-chromogranin A showed a tendency to increase after the task, their individual levels did not correlate with each other. Conclusions: These results suggest that hyper-
FOOT TYPE AND ANKLE SPRAIN IN VOLLEYBALL PLAYERS, WHAT RELATIONSHIP? A CASE-CONTROL STUDY

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Ankle injuries are frequent in volleyball players. They might be related to several factors, such as the foot type.

Aims: Determine the prevalence of the foot type and ankle sprains by the foot type, evaluate the functional instability of ankles after sprains according to foot type, observe the changes of foot morphology after the sprain.

Methods: Transversal retrospective case-control study. The sample contain 110 individuals (55 controls IC and 55 cases IC, volleyball players) with a unilateral sprain history. The Viladot classification was used to provide the foot morphology classification using a mirror box, Functional instability was accessed using "Ankle joint Functional Assessment Tool". Results: There weren't differences on foot type between the two groups IC: normal feet (NF) = 44.5%, planus feet (PF) = 14.6%, cavus feet (CF) = 29.1%, CA: NF = 41.8%, PF = 7.3%, CF = 42.7%, p = 0.21). There was a correlation between foot type and ankle sprain, in C sample IC: NF = 47.3%, PF = 18%, CF = 34.5%, CF = 7.018, p = 0.03); no correlation was observed between foot type and functional instability, in both samples, but the sprains of the CA had more instability (C = 22.7 + 3.7, CA = 20.8 + 3.7, p = 0.004). In both samples the majority of the feet were similar to the contra-lateral (C = 72.7%, CA = 63.6%), however, we found a statistically significant difference in group C (injured foot was more planus than not injured foot, C = 25.5%, p = 0.001).

Conclusion: Didn't exist correlation between practice of volleyball and foot morphology. There is a correlation between foot type and sprains on general population, which is not observed in volleyball. Athlete's sprains were more instable, but didn't exist correlation between foot type and functional instability. In Controls injured feet were different from not injured feet, this wasn't observed on athletes sample.
**LOW-VOLUME GRIP EXERCISE TRAINING PREVENTS IMMOBILIZATION-INDUCED DECREASE IN PEAK BLOOD FLOW DURING EXHAUSTIVE GRIP EXERCISE**


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**PURPOSE:** To determine whether strength and endurance exercise training once or twice weekly during upper limb immobilization (IMM) preserves muscle blood flow response.

**METHODS:** Sixteen male volunteers participated in the experiment after having been approved by the institutional ethical committee and obtained a written informed consent. They were divided into three groups (Immobilization, IMM-G (n=5); IMM with endurance and strength training IMM+TR1/w of once weekly, IMM+TR1/w-G (n=5); and IMM with endurance and strength training IMM+TR2/w of twice weekly, IMM+TR2/w-G (n=6)). Strength training consisted of intermittent isometric (2 sec on /2 sec off) contractions (70% of maximum voluntary contraction (MVC), 10 times), whilst endurance exercise (EEx) training consisted of contractions with one repetition per 1 sec. at 30% MVC. Non-dominant arm was immobilized with a cast for 3 weeks. Exercise training was performed during IMM once or twice a week. EEx test and MVC measurement were performed before and after IMM. The blood velocity and vessel diameter (D) of the brachial artery were measured using ultrasound Doppler and B-mode methods at rest and immediately after EEx test. Blood flow (BF) was calculated from the blood velocity and D. Changes in BF (ΔBF) were calculated by subtracting resting BF from BF immediately after EEx test.

**RESULTS:** The IMM+TR1/w and IMM+TR2/w were effective for preventing the decrease in MVC (IMM-G: 40 kgw, on average, for pre, 32 kgw for post, IMM+TR1/w-G: 40 kgw for pre, 37 kgw for post, IMM+TR2/w-G: 42 kgw for pre, 44 kgw for post). The IMM+TR1/w and IMM+TR2/w were not effective for preventing the decrease in endurance performance IMM-G: 66 sec for pre, 58 sec for post, IMM+TR1/w-G: 49 sec for pre, 53 sec for post, IMM+TR2/w-G: 54 sec for pre, 66 sec for post). Resting D did not show any significant change pre- and post-IMM for three groups IMM-G: 3.7 mm for pre, 3.39 mm for post, IMM+TR1/w-G: 3.98 mm for pre, 3.94 mm for post, IMM+TR2/w-G: 4.02 mm for pre, 4.09 mm for post). Resting BF did not show any significant change pre- and post-IMM for three groups IMM-G: 73 ml/min for pre, 71 ml/min for post, IMM+TR1/w-G: 83 ml/min for pre, 74 ml/min for post, IMM+TR2/w-G: 89 ml/min for pre, 119 ml/min for post). The IMM+TR2/w was effective for the decrease in ΔBF immediately after EEx test, but IMM+TR1/w was not effective IMM-G: 466 ml/min for pre, 279 ml/min for post, IMM+TR1/w-G: 326 ml/min for pre, 263 ml/min for post, IMM+TR2/w-G: 309 ml/min for pre, 495 ml/min for post).

**CONCLUSION:** Low-volume grip exercise training once weekly during IMM periods was not effective in preserving peak muscle BF, but the training twice weekly was effective.

**THE THERAPEUTIC ROLE OF VOLUNTARY EXERCISE AFTER FLUID PERCUSSION INJURY**

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Brain trauma is associated with long-term effects on cognitive function, which likely reside on the acute events after the onset of the injury such as changes in synaptic plasticity. We designed a study to test the hypothesis that voluntary exercise promotes the recovery after fluid percussion injury (FPI). 28 Sprague Dawley adult male rats were divided into 4 groups (sedinentary-sham, sedentary-FPI, exercise sham, exercise-FPI) to test the validity of our hypothesis. FPI was induced to caudal cortex, which was removed for biochemical assays, including the measurement of proteasome activity and the protein contents of the 20S alpha subunit of proteasome complex, early gene Zif 268, Synapsin I and the level of carbonyl groups. We found that FPI resulted in an increase in proteasome activity which suggests the involvement of protein degrading system in recovery of protein damage induced by FPI. The content of 20S subunit of the proteasome and the activity of the complex changed with parallel fashion indicating that proteasome complex remained relatively intact during injury. The early gene Zif 268, suggested to regulate the specific activity of proteasome, and indeed the activity change of proteasome followed the changes that were measured in Zif 268 content. This underlines the possible regulatory role of Zif 268 on proteasome during traumatic brain injury. Exercise facilitated the recovery of damaged proteins from injured brain since the carbonyl concentration decreased significantly in those rats which could do exercise after FPI. This could be an important mean since increased carbonyl level has a deteriorating effect on brain function. Synapsin I plays a vital role in synaptic plasticity, and our data revealed that exercise significantly attenuated the FPI-associated decrease in Synapsin I content.

The data of the present study suggest that the early gene Zif268 regulated proteasome pathway play an important role in the recovery process of FPI induced brain damage. Our results revealed that voluntary mild exercise could be a therapeutic tool after traumatic brain injury.

**COMPARATIVE ANALYSIS OF MUSCLE STRENGTH IN 13-14-YEAR OLD HUNGARIAN STUDENTS**

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Nowadays more and more harms are threatening our health, as a result of changing lifestyle. It is true mainly for children. Nutrition (malnutrition or obesity, inactive lifestyle) has such consequences the effects of which can be perceived in the changes of body build (morphology), or in the drastic changes of spending leisure time. The initial body carriage problems (loose/incorrect carriage), are being followed by the statement of the differences between the variables when the Sign-probe was used as a statistical procedure. Beside that the calculation of percentage was applied to state the correct execution. As a summary of our results it can be stated that half of the students were able to execute those tests successfully which examined the static strength. A similar result was...
obtained when the dynamic variables were calculated. It proved the supposition that if a divergence, a dysfunction can be obtained in the static of the students, and then it can be observed in the dynamics as well. Hungarian PE special literature examines mainly the dynamics and not enough attention is paid to the static. It means that a harmony would have to be found between the static and dynamic exercises, and the tests investigating dynamic and static muscle strength, because only this way can a true picture be obtained about the functional activity of a child.

**INTRA AND INTER-EXAMINER RELIABILITY OF PECTORALIS MINOR RESTING LENGTH MEASUREMENT, USING THE PALPATION METER**

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**INTRODUCTION:** Shortening of the pectoralis minor reduces the posterior tilt and increases medial rotation of the scapula during arm elevation [1]. This has been described as the same kinematics patterns of individuals with impingement syndrome symptoms [2,3]. Objective: To evaluate the intra and inter-examiner reliability of pectoralis minor resting length measurement, using the Palpation meter device.

**MATERIALS AND METHODS:** Subjects: 9 males and 10 females, age range 20.8 ± 1.8, without any complaints or shoulder pain history. Materials: Palpation meter (measurement device) and a screen cover. Procedures: Subjects were asked to relax their shoulders, arms and neck while in standing position. Anatomical references for the attachments of the pectoralis minor muscle were marked [1], and then the pectoralis minor resting length was measured using the Palm device. The collection of the data was made by a second researcher, responsible for uncovering the screen and noting down the data, with the objective of blinding the evaluator. Measurements were taken in three days, with a 48 hours interval between assessments. The first and second test days were conducted by the main evaluator and both measurements were compared to obtain the intra-examiner reliability. The third day was conducted by the second evaluator and data was compared to the second measurement of the first evaluator to obtain the inter-examiner reliability. Data Analysis: An intra-class correlation coefficient test was used. Values of the first and second test days were compared for intra-examiner reliability and values of the second and third test days were compared for inter-examiner reliability.

**RESULTS:** Intra-examiner reliability of the test was .88 (p<0.05) and inter-examiner reliability was .85 (p<0.05).

**CONCLUSION:** Pectoralis minor resting length measurements using the Palpation meter device and this methodology, presents good inter and intra-examiner reliability.

**EXERCISING METHODS FOR FEMALE-STUDENTS WITH VARIOUS FORMS OF VEGETATIVE DYSFUNCTION**

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**Introduction.**

The students are a particular social group exposed to numerous harmful health effects due to a specific lifestyle. On entering a university an individual changes his/her social status and behavior, mentality and pattern of study. A student has to strain him/herself both physically and emotionally and needs a lot of stamina, especially in the first years of study. Our research aimed to theoretically prove and work out a differentiated approach to PT-classes for female students with health problems depending on the type of vegetative dysfunction and their physical endurance.

We stated the following research problems:

1. To define the profile of vegetative regulation, cardiovascular fitness and hemodynamics of students with poor health;
2. To practice our method.

**Material and Methods.**

During our research we used the following materials and methods: theoretical analysis and summarizing of scholarly works; cardio-rhythmography; endurance test; anthropomorphic measurements; measurements of blood pressure, circulatory dimensions, monitoring, educational experiment; methods of mathematical statistics.

The subject of our research is the physical education of students of special medical groups in higher education establishments. The research was carried out from 2004 to 2007.

**Results and Discussion.**

Our research has shown up different types of vegetative regulation among women-students: 52.7% have the sympathetic type, 24.5% have the parasympathetic type, and 22.8% have the balanced type of higher nervous activity regulation. These data allowed us to divide the women-students into the groups and to regulate the level of physical activity during the university PT-classes. The students were treated individually, it means that physical endurance and type of vegetative dysfunction of the students were taken into consideration. The work-out for women-students with sympathetic type included steady running in the aerobic regime combined with dynamic exercises. Women-students with parasympathetic type felt better after interval running in the aerobic regime combined with statodynamic exercises. The work-out for women-students with balanced type needs more detailed approach to means and methods of physical education.

**Conclusions.**

The introduction of our method in PT-classes for women-students with health problems allowed us to optimize the processes of vegetative regulation and improve their physical endurance. The number of female-students with low physical endurance decreased from 70% to 10.1%, the number of students with high physical endurance increased from 9.1% to 47.3%.
PHYSICAL REHABILITATION OF YOUNG SPORTSMEN WITH LOCOMOTOR APPARATUS DISORDER

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Introduction.
The problem of children locomotor apparatus disorder is topical all over the world, what’s why the World Health Organization considers diseases of musculoskeletal system as the priority scientific research in the years 2000-2010. Recently osteopathy, desmopathy and soft tissue involvement have become more common among the children who go in for sports. The opinion that our locomotor apparatus was strengthened through exercising used to be commonly accepted but it has been disproved by a number of specialists. Functional deterioration of locomotor apparatus among sportmen can lead to orthopedic trauma and structural diseases of muscles, tendons and viscera internals.

Our research aimed to develop and scientifically prove the physical rehabilitation program for young sportmen with locomotor apparatus disorders.

The topics under discussion are:
1. Locomotor apparatus fitness of 8-12 year-old sportmen doing different sports;
2. The positive effect of our rehabilitation program on the morphofunctional state of locomotor apparatus.

Materials and methods.
The research was carried out for 3 years (2004-2006). There were two hundred and fifty-five 8-12 year-old participants with locomotor apparatus disorders, the residents of Krasnodar Territory.

For making a diagnosis we used the following methods: visual examination, palpation, somatometry and if it was needed X-ray study and ultrasonic investigation.

Results.
A medical rehabilitation program for LAD treatment has been worked out for experimental group of children. This program includes diagnostic monitoring, intensive correction system, stabilization, effect potentiation system, and preventive control.

The intensive correction system of LA disorders including synergetic reflexotherapy and individual therapeutic exercises was proved to be more effective in comparison with therapeutic exercises designed on the basis of the traditional methods of LAD treatment. The vital signs of amelioration are motility of dorsal spine and exercise tolerance of back and abdominal muscles. The gain of LA morphofunctional characteristic in the experimental group of 8-12 year-old children was more significant and speedy than in the control group.

Conclusions.
1. Locomotor apparatus disorders among young sportmen have increased recently. Diagnostics and rehabilitation of young sportmen is one of the major problems of sports medicine.
2. The research proves that the intense LAD rehabilitation program of sportmen is more effective than the traditional corrigent curative gymnastics.

RELATION BETWEEN FORCED VITAL CAPACITY AND THE LEVEL IN SPINAL CORD INJURIES

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In spinal cord lesions, the conductivity of the signals through the spinal cord is harmed and, therefore, it compromises the nerved muscle. This causes a deficiency in the respiratory system, which can acquire a restrictive disorder since both the inspiratory and expiratory muscles become compromised as a function of the level and the type of the lesion. This paper aimed to establish a scale which, based solely on the information about the individual’s lesion height, enables one to determine the approximate value of the reduction of the Forced Vital Capacity (FVC), i.e. to know what the percentage of expected reduction in the lung volume is for the harmed individual with respect to the non-harmed individual. The research was conducted on a group of 23 subjects with spinal cord lesion, being 22 male and one female, with average age of 28.5 years (ranging from 20-49 years), sport practicers and non-practicers, without compromised lungs nor pneumonia or recent lung diseases. All subjects were able of performing the tasks required for the examination. The evaluated subjects were divided as follows: Group A, high cervical lesion (C3-C5), 3 participants (13%). Group B, low cervical lesion (C6-C8), 3 participants (13%). Group C, high thoracic lesion (T1-T6), 8 participants (34.8%). Group D, low thoracic lesion (T6-T12), 8 participants (34.8%). Group E, sacral and lumbar lesion (L1-5S), 1 participant (4.4%). In the research, a portable Micro Medical spirometer was used, model Microlab 3500, together with the software Spida V v 4.1, operated by the researcher who is a technician in spirometry, a title which was conceded by the Brazilian Society of Pulmonology and Tisology (SBPT). The exams were analysed by a pulmonologist entitled by the SBPT. Data was gathered only once via the spirometer, according to the norms of the American Thoracic Society (ATS) (1987), after three trials and the highest FVC value was used for the study, according to the reference values by Knudson et al (1983). Within Group A, the average FVC value with respect to the predicted values was 48.3% (ranging from 47-50%). Within Group B, the observed average value was 64.6% (52-80%).Within the subjects of Group C, the average FVC was 75.6% (63-90%) and, at last, within Group D, the average was found at 77% (67-86%). The obtained results showed a direct relation between the reduction in the lung volume for the harmed individual with respect to the non-harmed individual, even with a standard average reduction for each harmed segment. However, within each evaluated segment, there was high amplitude in the obtained values among the participants, suggesting that individual factors, such as anatomical variations in the respiratory system and differences in lesion shape, degree and intensity, yield different ventilation alterations. Moreover, these results also suggest that an individual analysis of each patient is necessary when one wants to determine the spirometric values.
INJURIES ON AMATEUR PRACTITIONERS OF BODYBOARD EPIDEMIOLOGICAL STUDY

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Introduction.
Bodyboard is extremely difficult to evaluate, due to the environment where it takes place. This environment is influenced by a series of factors (the action of the winds, the sea streams, the type of sea and the gravitational action of the moon over the tides). These are all factors that the athlete is exposed to, and determine the conditions in which the practise of this modality occurs.

Purpose.
The main objective was to determine the semi-annual prevalence (Nov/06 - Apr/07) of injuries in amateur bodyboarders and to characterize the pattern of it’s occurrence (distribution by anatomic region and severity; frequency by gender, age, expertise level; the impact of the injuries on the activity and their evolution) for analyse potential associated factors of risk.

Methods.
A cross-sectional, descriptive and retrospective survey, by means of a validated and pre-tested self-completing questionnaire information was collected on the bodyboarder characterization, bodyboard activity and occurrence of injuries. 115 questionnaires were distributed on the beaches where bodyboard is more frequent and we collected 110 full answers (approbation: 96.5%).

Results.
The sample was formed mainly by male bodyboarders (71.8%) males and 28.2% females). The average age was 23.06 ± 5.68 years (12-50 yrs). The largest percentage of athletes (54.55%) had between 19 and 25 years, it is a predominantly young-adult sample. During the 6 months under review, were about 91 injuries. The lower limb was the corporal segment more injured, (37.9%), however, the head was the anatomic region more injured (17.2%). All the injuries occurred during the sessions (100%). Insufficient corporeal heating was the most mentioned cause of injury (48.2%). Expert athletes present an injury risk about 3.26 times greater (OR=3.259; CI=1.423-7461), than beginning or intermediate athletes.

Discussion.
Bodyboard has become an aquatic sport with a demanding increasing level, at the level of development of maneuvers and specific gestures, implying a higher performance and dedication by the bodyboarder. The practice of bodyboard may involve some risks that we need to understand for implementation preventive strategies.

Conclusion.
At least 1 of every 2 bodyboarders on the Portuguese beaches suffered an injury in a 6 months period. The analysis of associated risk factors is important for promote prevention strategies.

EFFECT OF HIGH VERSUS LOW-INTENSITY RESISTANCE TRAINING ON POST-EXERCISE HYPOTENSION IN MALE ATHLETES

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The purpose of this study was to compare the effects of High versus Low-intensity weight training (HIWT versus LIWT). 85 versus 42.5 % 1RM, respectively, with same lifted load in each session, on the postexercise systolic and diastolic blood pressure response. Ten male bodybuilders with previous experience in WT were evaluated during three non-following days in bench press, biceps curl, military press, and leg press. On the first day, one repetition maximum (1RM) was determined for each exercise, and then 85% and 42.5 % of 1RM respectively were selected as used load in these exercises. On the second day, four sets × six repetitions of each exercise with 85% of 1RM (HIWT) were performed. On the last day, four sets × twelve repetitions of each exercise with 42.5% of 1RM (LIWT) were performed. Rest interval period between the sets and exercises was two-minutes in all sessions. Systolic blood pressure (SBP) and diastolic blood pressure (DBP) were determined before and up to 60 minutes postexercise. Two-way analysis of variance (ANOVA) with repeated measures was used followed by the Scheffe’s post hoc test (P<0.05) to compare SBP and DBP between and within groups. HIWT induced significant reductions in postexercise SBP during all measures, while after LIWT program significant reductions showed only in the 20 and 30 minute. HIWT program lead to significant decreases in DBP in 10 , 20 , and 30 -min, but LIWT program elicited a significant reduction only in 30 -min. It can be concluded that WT program can reduce SBP in postexercise, and it seems the higher load is necessary for that effect to occur. Also WT program with higher load seems to have more effects on SBP than DBP.

SODIUM AND FLUID REPLACEMENT DURING PROLONGED EXERCISE IN THE HEAT MAY BE BENEFICIAL IN PREVENTING THE APPEARANCE OF EXCISE ASSOCIATED MUSCLE CRAMPS

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The aetiology of exercise associated muscle cramps (EAMCs), defined as ‘painful, spasmodic and involuntary contractions of skeletal muscle during or immediately after physical exercise’ has not been clarified.

PURPOSE: To investigate the effects of sodium containing sports drinks consumed during prolonged exercise in the heat (30°C), as a response to the environmental, electrolyte and dehydration theories of EAMCs.

METHODS: Thirteen physically active but not trained males (age 24.5±3.1 yr, height 1.78±0.08 m, weight 77.9±10.4 kg) completed a 3-hour exercise protocol (consisting from 30 min intervals of walking and cycling), a set of calf raises(8x30 repetitions) and 45 min of steep, brisk walking (5.5 km/h, 12% grade), while consuming one of the experimental drinks: HNa (carbohydrate-electrolyte drink containing 36.2 mmol/L sodium); LNa (carbohydrate-electrolyte drink containing 19.9 mmol/L sodium); Wat (mineral water containing <0.3 mmol/L sodium) and Plac (placebo of distilled water with a non caloric and Na containing colour and flavour). The experimental drinks were administered every 30 minutes in the first phase and every 15 min in the third phase to balance fluid losses due to sweating.
RESULTS: HNa and LNa prevented mild hyponatremia (serum sodium below 135 mmol/L) that was observed during Wat and Plac. Plasma volume decline was fully prevented during HNa and LNa, while in Wat and Plac trials a reduction of approximately 2% was observed. None of the volunteers experienced muscle cramping, although four of them reported pre-cramping signs, like muscle stiffness, muscle twitching and irritating pain on the gastrocnemius muscle. Furthermore, three out of these four subjects developed these signs during either the Plac or Wat trial, while the fourth subject developed the same signs during the LNa trial.

CONCLUSIONS: Data suggest that low levels of sodium in the blood may cause pre-cramping signs and eventually lead to the appearance of exercise-induced muscle cramps, during prolonged exercise in the heat.

SHORT-TERM IMMOBILIZATION AND RECOVERY AFFECT SKELETAL MUSCLE BUT NOT COLLAGEN TISSUE TURNOVER IN HUMANS

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Not much is known about the effects of immobilization and subsequent recovery on tendon connective tissue. The aim of the present study was to analyse the effect of a 2 week period of immobilization and a recovery period of the same length, on the turnover of tendon connective tissue. The microdialysis technique was used for this purpose. Muscle CSA and strength was measured in order to evaluate the design of the study. The cross sectional area (CSA) of m. triceps surae decreased by 6% (p<0.001) and the strength in the immobilized calf muscle decreased by 9% (p<0.05) in relation to the 2 weeks of immobilization. Two weeks of recovery only resulted in an increased CSA (6%, p<0.01), whereas strength remained reduced (p>0.05). No change in Achilles tendon CSA was detected. The systemic concentrations of PINP (serum) and CTx (urine), indirect markers for collagen synthesis and degradation, respectively, were unchanged in relation to 2 weeks of immobilization and subsequent remobilization. Tendon collagen turnover, measured as the peritendinous concentrations of PINP and ICTP (an indirect marker for collagen degradation), was unchanged after the 2 weeks of immobilization. PINP increased significantly (p<0.001) in relation to 2 weeks of remobilization (ICTP not measured).

Immobilization reduced muscle size and strength, while tendon size and collagen turnover was unchanged. Recovery resulted in an increase in muscle size, however, strength was unchanged. Tendon size did not change with 2 weeks of recovery, although collagen synthesis was increased, which could indicate that the tendon experience an increased load during remobilization. Thus, 2 weeks of immobilization is long enough to induce significantly changes in muscle tissue, whereas tendon tissue seems to be more resistant to a short period of immobilization.

THE INFLUENCES OF ACUTE EXERCISE TO LEFT VENTRICULAR DIASTOLIC FUNCTION IN THE ELDERLY - A NONINVASIVE EVALUATION

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Background: With aging, cardiac function especially left ventricular (LV) diastolic function reduces. Furthermore, LV diastolic function tends to decline irrespective of LV systolic function in the elderly. Although attenuated response of LV systolic function to exercise in the elderly has been reported, it is not fully elucidated the influence of exercise to LV diastolic function in the elderly. The purpose of this study was to evaluate the influence of acute exercise to LV diastolic function in elderly men.

Methods: Eleven healthy elderly subjects aged 68.7±4.2 years volunteered to participate in this study. Fifteen healthy young subjects aged 26.5±2.3 years were used as a control. All subjects underwent a symptom-limited incremental exercise on a cycle ergometer using a ramp protocol. Echocardiographic evaluation was performed before exercise, immediately after exercise, and at the 15, 30, 45, 60 minutes after exercise. LV diastolic function was evaluated by using pulsed-wave Doppler echocardiographic indexes: early diastolic mitral inflow velocity (E), E deceleration time (DcT), atrial systolic mitral inflow velocity (A) and their ratio; E/A. Furthermore, early diastolic mitral annular velocity (E') was determined by tissue Doppler imaging. Repeated one-way and two-way ANOVA were used for intragroup and for intergroup comparison. A post-hoc test was done using Bonferroni.

Results: Resting systolic and diastolic blood pressures were significantly higher in the elderly subjects than young subjects (p<0.01). Inspite of normal LV ejection fraction (EF), E/A was significantly lower (p<0.01) and E/E' < 15 ml inferior to that of young subjects (p<0.01, p<0.01). The increase in heart rate (HR), the decrease in total peripheral resistance (TPR) and the increase in LVEF from baseline to after exercise were significantly smaller in the elderly subjects (p<0.01, p<0.01, p<0.01). The decrease in E/A from baseline to after exercise was significantly smaller in the elderly subjects (p<0.01). The increase in E/E' was not significant from baseline to after exercise except immediately after exercise and similar in the both groups.

Conclusion: The present study confirmed that resting LV diastolic function reduced in the elderly. The increase in LVEF with acute exercise in the elderly was smaller than the young subjects probably because increase in HR and decrease in TPR with exercise were smaller in the elderly. Although resting LV diastolic function reduced, further deterioration after acute exercise was not demonstrated in the elderly.

THE RELATIONSHIP BETWEEN MUSCLE STIFFNESS AND ELECTROMYOGRAPHIC RESPONSE OF THE QUADRICEPS MUSCLE DURING REPETITIVE MAXIMAL ISOKINETIC KNEE EXTENSION EXERCISE

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The purpose of this study was to investigate changes in muscle stiffness and surface electromyography (EMG) active parameters (mean frequency, MNFHz) throughout 100 repetitive maximal isokinetic knee extension exercise. Methods: Nineteen healthy subjects performed 100 isokinetic knee extensions. EMG signal with surface electrodes were recorded from the vastus lateralis, the rectus femoris and the vastus medialis of the right thigh and peak torque (PT) were measured with biodex for each contraction. The MNF of the EMG were calculated with FFT (Fast Fourier Transform) for each contraction. Quadriceps muscle stiffness of the anterior thigh were measured with knee extended before and after contraction. Results: MNF of each muscle and the PT were decreasing respectively. The MNF of the rectus femoris showed consequently higher correlation coefficients with PT than the vastus lateralis and the vastus medialis. The muscle stiffness for each muscle after exercise increased compared with the stiffness before exercise (p<0.05). There was high correlation the stiffness and the MNF of the rectus femoris(r=0.58, p<0.05). Conclusion: The reduction of MNF and PT showed muscle fatigue during repeti-
live maximal isokinetic knee extension exercise, and there was correlation between them (IMNF and PT) and muscle stiffness. So muscle stiffness would be a land mark for muscle fatigue.

ASSOCIATION OF MUSCLE RELATED FACTOR POLYMORPHISMS AND THIGH MUSCLE CROSS-SECTIONAL AREA IN JAPANESE POSTMENOPAUSAL WOMEN

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Background

Share of older women among the Care Needs is larger than older men, account for 70% of Care Needs in Japan. The loss of lower limb muscle mass with age is a risk factor of fall, fracture and physical frailty, often make the Care Needs. There are only a few studies the examination of the genetic factor related to muscle mass in older. However, the previous study showed to explain genetic factor affected 56% for muscle mass in middle aged and older. Therefore, it seems that the investigation of the gene that affect for muscle become profitable information for the older. Moreover, we need to consider the non genetic factor, such as physical activity and nutrition, when consider the relationships between genetic factors and muscle mass.

The primary purpose of this study was to investigate the relationships between muscle-related gene polymorphisms and thigh muscle cross-sectional area in Japanese postmenopausal women.

Methods

One hundred-nine healthy Japanese postmenopausal women (64.1±6.0 years old, 53.0±6.6 kg, BMI=23.2±2.6 kg/m^2) participated in this cross-sectional study. Thigh muscle CSA was measured using magnetic resonance image. alpha-actinin -3 (ACTN3), interleukin-15 receptor A (IL-15RA), angiotensin converting enzyme (ACE) and Akt genotype were determined using real-time PCR with DNA extracted from blood. Daily physical activity was measured using a uniaxial accelerometer for 1 week. Dietary intake was assessed by nutritionist from a continuing survey of food intake by individuals for 3 days.

Results

In ACTN3 genotype, thigh muscle CSA of subjects was significantly difference, in contrast, there were not find a association between IL-15RA, ACE and Akt genotype and thigh muscle CSA of subject. ACTN3 was classified XX (alpha-actinin-3 protein absence) genotype and RR+RX (alpha-actinin-3 presence) genotype by reference to previous study. Despite, there were not significant differences in age, height, body weight, BMI, physical activity and daily protein intake between the groups, the thigh muscle CSA of subjects was significantly smaller in the XX genotype compared with the RR+RX genotype.

Conclusion

We have demonstrated that ACTN3 polymorphism effected on thigh muscle cross-sectional area in Japanese postmenopausal women.

EFFECT OF AEROBIC IN COMBINATION WITH RESISTANCE TRAINING ON THE LEVEL OF LEPTIN FOR ELDERLY WOMEN

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Introduction: After menopause, the rates of death from the coronary heart disease (CHD), type 2 diabetes mellitus and lipid abnormality have been reported to increase for women. It has been reported previously that regular aerobic in combination with resistance training can improve the blood lipid profile and the body composition in healthy elderly men. Aerobic in combination with resistance training may affect to prevent the disease for elderly women.

PURPOSE: The aim of this study is to investigate the effect of aerobic in combination with resistance training on the adipocytokine, glucose and lipid metabolism in healthy elderly women.

METHOD: Fourteen elderly women (training group=8; control group=6) participated in this study (64.8 ± 4.7 age). Aerobic in combination with resistance training was performed for three times per week in the training group. Aerobic exercise was cycled on ergometers was set at 75% of the targeted heart rate for 30 minutes. Resistance exercise was selected to stress the major muscle groups in the following order (squat; leg extension; leg curls; abdominal crunches; and low back muscle). Plasma leptin, adiponectin, glucose, insulin, insulin resistance (Homeostasis Model Assessment), total-cholesterol, high-density lipoproteins cholesterol, low-density lipoproteins cholesterol, triglyceride, and body composition were measured before and after the training.

RESULT: In the training group, the levels of plasma leptin and the body fat were significantly decreased (p<0.05), and fat free mass significantly increased compared with before training (p<0.05). Those of plasma adiponectin, glucose and lipid metabolism were not changed during 8 weeks training. However, those of plasma leptin and body composition were not changed in the control group compared with before and after the training.

CONCLUSION: The level of leptin was significantly decreased without decreasing body weight. It is suggested that aerobic in combination with resistance training decrease the level of leptin by improving body composition.

EFFECTS OF PHYSICAL ACTIVITY DURING CHEMOTHERAPY TREATMENT - A LONG TERMED INVESTIGATION

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Introduction.

Chemotherapy is known as standard medication in palliative cancer care. However, most patients suffer from side effects like immobility and fatigue symptoms. Physical exercise has been recognized as one effective approach to facilitate the coping process of chronic diseases. Therefore the present study tried to evaluate the effects of physical activity on aerobic capacity and quality of life during ongoing chemotherapy treatment.

Methods:

Ten patients (54 +/- 12 yo.) with histological confirmed cancer diagnosis and ongoing chemotherapy participated in this longitudinal study. Quality of life (EORTC: QLC-30) and aerobic capacity were examined before participation in individualized exercise programs. The questionnaire contains 30 items and was scored according to the manual. Scales that were used in this study included the five functional scales, the global health status quality of life scale and the nine symptom scales from the core section of the EORTC QLC-C-30. All subjects performed a graded exercise test on a calibrated cycle ergometer with 3 min stages, an initial power output of 0W and increments of 25W. Breath-by-breath ventilation and beat-to-beat heart rate were monitored by mobile devices (Oxycon Mobile, Jaeger, S810, Polar).
All standardized measurements were repeated after 1 and 3 months. Statistical analyses were conducted using SPSS. Non-parametric testing (Friedman-test) was selected to determine significant differences in cancer quality of life scales and aerobic capacity measures. In all analyses, a P-value < 0.05 was considered statistically significant.

Results:

Results show a significantly enhanced aerobic capacity (VO2max) after 4 (24.09 vs. 26.62 ml x min-1 x kg-1, p<0.01) and 16 weeks (24.09 vs. 27.37 ml x min-1 x kg-1, p<0.05) of exercise training. The analysis of the EORTC-questionnaire demonstrated significant (p<0.05) increases in social (81.6% vs. 88.4% vs. 96.6%) and physical functioning (85.3% vs. 90.6% vs. 95.3%) in relation to the pre-training status. Patients furthermore reported a significant (p<0.05) reduction (20%) of fatigue symptoms after 16 weeks of training.

Conclusions:

Cancer patients are harmed through the explicit side effects of chemotherapy treatment. Physical activity provides an opportunity to be proactive against cancer. Not only a physical enhancement results, also quality of life and social functioning improved with physical activity. Thus, moderate exercise training seems to support the coping process with chemotherapy treatment specific side effects. Currently there are increased requirements to inform patients, physicians and cooperating professionals about the exceptional advantages of physical activity even in the very early stages of cancer treatment. Health platforms, maybe via internet, should be installed to reach and inform the patient shortly after diagnosis and to encourage them, to participate in adequate physical activity right at the beginning of the cancer treatment.

CHANGES IN STRESS AND RECOVERY RELATED TO INJURY IN YOUNG ELITE SOCCER PLAYERS

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Several studies have described risk factors for injury in soccer players. Andersen and Williams developed a model that focuses on psychosocial factors (1). This model states that psychosocial factors (i.e. daily hassles) contribute to the stress response causing physiological and attentional changes (i.e. increase in muscle tone, distractibility). These changes make athletes more susceptible to injuries. In the present study it was hypothesized that injured soccer players have more stressful events and less recovery related activities.

Thirty-seven young elite soccer players (Mean ± SD. Age (years) 16.5 ± 1.2, Height (cm) 177.0 ± 7.8, Body weight (kg) 66.5 ± 8.7 Body fat (%) 8.5 ± 2.1) participated in this study. Stress, recovery and injury were monitored over one competitive season. The Dutch version of the Recovery Stress Questionnaire for athletes (RESTQ-Sport) was used monthly to assess the stress-recovery state of players (2). The RESTQ-Sport consists of twelve general and seven sport-specific stress and recovery scales. Subjects were asked to indicate how often stressful events and recovery related activities occurred during the last four weeks. The members of the medical staff recorded injuries according to recent recommendations (3). Data were analyzed using multilevel modeling, with RESTQ’s subscales as dependent variable and injury or no injury as factor.

During the study period 163 injuries were reported of which 98 were time loss injuries and 65 required medical attention. The total incidence was 19.25 injuries per 1000 playing hours. In sum, 342 RESTQ’s were completed. Injured soccer players scored higher on the injury scale (p<0.05). No significant differences were found on the other general and sport specific stress and recovery scales.

It can be concluded that, with exception of the injury scale, injured soccer players do not differ in stressful events and recovery related activities. Thus, moderate exercise training seems to support the coping process with chemotherapy treatment specific side effects. Cancer patients are harmed through the explicit side effects of chemotherapy treatment. Physical activity provides an opportunity to be proactive against cancer. Not only a physical enhancement results, also quality of life and social functioning improved with physical activity. Thus, moderate exercise training seems to support the coping process with chemotherapy treatment specific side effects.

EFFECTS OF THREE DIFFERENT WATER TEMPERATURES ON DEHYDRATION IN COMPETITIVE SWIMMERS

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Athletes perform trainings and races in a wide range of environmental conditions, as cold/hot ambient temperatures, high/low altitudes and high/low relative humidity. Physical activity can induce significant changes in body temperature (core and skin temperature), depending on environmental conditions, clothing/equipment, kind of sport practiced, intensity and duration of the exercise. The present study examined the effects of three different water temperatures (23, 27 and 32°C) on body temperature, fluid balance, performance, leukocyte formula, skeletal and myocardial muscle damage markers in competitive athletes swimming 5 km in an indoor swimming pool.

Nine male competitive swimmers swam 5 km with water at the temperature of 23, 27 and 32°C. Immediately before (Pre) and after (Post) each trial a sample of blood and urine were collected, body weight was recorded, rectal and skin temperature were measured. The rectal temperature absolute variation (Post-Pre) in the 23°C trial was significantly lower than in the 27 and 32°C trials, and the variations between Post and Pre skin temperature in the 23 and 27°C trials were significantly lower than the 32°C one. The Post urine volume output was not significantly different in the three trials, although the variation in urine specific gravity between Pre and Post sampling of the 23°C trial was significantly lower than in the 27 and 32°C ones. Plasma volume increased and the cellular volume decreased in all three conditions. The dehydration percentage was the highest in the 32°C and the lowest in the 23°C trial. There were no significant differences in leukocyte formula percentage and serum markers of skeletal (CPK, LDH) and myocardial (CK-MB) muscle damage in relation to water temperature. In the 27°C trial it was recorded the best chronometric time. Swimming in elevate water temperature without fluid replacement resulted in dehydration, but the 5 km swimming distance was not enough to induce a serious dehydration to impair performance in the competitive swimmers.

References:


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References:

THE IMPACT OF L-CARNITINE INGESTION ON PHYSIOLOGICAL, MOTORIC AND SUBJECTIVE INDICATORS OF MUSCULAR REGENERATION AND CELLULAR DAMAGE

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Objective: Studies on the influence of carnitine on cellular damage after strenuous eccentric exercise showed attenuated markers of cell disruption suggesting a possible beneficial influence on regeneration and cell protection. The aim of this study was to further investigate the possible influence of carnitine on parameters of cell damage and regeneration.

Methods: 10 healthy subjects (24.8 ± 1.7 yrs) participated in the study. Using a double blinded cross-over design subjects performed 2 times a protocol of 2 runs (a 10 km run plus a 10 x 400m run with 1 week in between in a randomized order). 2 weeks before and during both run protocols subjects ingested either 3 g carnitine (V) or placebo (P) per day in a randomized order with a 2-week wash out period in between. We analyzed capillary actin concentration and creatine kinase (CK) activity as indicators of muscle damage at baseline (after 2 weeks of V or P ingestion prior to any running) and 24 hrs (actin and CK) as well as 48 hrs (CK) and 72 hrs (CK) after each run. Blood lactic acid concentration (La) was measured at rest and directly after the 10 km runs, as well as 5 min after each 400 m run. Jumping performance was determined using a squat and drop jump test before, immediately after and 72 hours after each run. Muscle soreness was assessed using the Visual Analog Scale (VAS) prior to each run and on three consecutive days.

Results: La, jumping performance, and VAS values were unaffected by carnitine intake. CK was lower (p<0.05) at baseline and 24 hrs after the 10 x 400m run series in V as compared to P. No group differences for CK could be detected prior to and after the 10 km intervention. Actin was measurable at baseline in most of the subjects, however remained below the detection limit 24hrs after exercise in some subjects, showing no clear pattern.

Conclusion: The main findings of the investigation include unaffected La increments after short intensive and longer-lasting runs and no effect on jumping performance and on perceived muscle soreness by orally ingested l-carnitine. CK seemed to be slightly reduced after short intensive runs under verum, indicating a possible protective effect on the muscle cells. But as baseline values have already been attenuated under this condition, and we did not control for training loads 2 weeks prior to baseline, the underlying mechanisms are unclear. One possible explanation could be the well described vasodilatative property of l-carnitine resulting in enhanced blood flow and an attenuated activity of the purin metabolism during exercise, leading to a lower production of muscle membrane destructive metabolites. In contrast to some other studies using muscle trauma patients, actin seems not to be usable as a valid and reliable parameter for the determination of muscle damage in healthy sports men and women. Further research is required to investigate the underlying mechanisms causing a possible membrane protective effect of l-carnitine.

STRENGTH TRAINING AND THE MENSTRUAL CYCLE: A PILOT STUDY ON MUSCULAR STRENGTH, MACROSCOPIC AND MICROSCOPIC PARAMETERS

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Purpose: The menstrual cycle is divided into 2 main phases, the follicular and the luteal phase. Each phase is characterized by a certain profile of different hormones. Menstrual cycle specific regulation of many hormones is not clear so far. This is especially true for the interaction between estradiol, human growth hormone (hGH), and IGF-1, all of them possible anabolic hormones on the level of the muscular cell and therefore important supporting factors during strength training. We, therefore, decided to conduct a pilot study in order to investigate possible different effects of follicular phase-based (FT) versus luteal phase-based (LT) strength training on strength parameters, muscle volume and muscle cell type and diameters.

Methods: Two healthy eumenorrheic women (P1, P2) completed a strength training program for 3 menstrual cycles (approx. 12 weeks). Exercises included biceps curl, triceps press, leg extension, leg curl, calf raise and hip extension. The subjects performed FT with muscle groups of the right side of the body and LT with muscle groups of the left side of the body. FT was organized 4 times a week in the follicular phase and once a week in the luteal phase, and LT was organized 4 times a week in the luteal phase and once a week in the follicular phase. Maximum isometric force (ISOmax) and maximum dynamic force (DYNmax) were measured for each major muscle group prior to, during (5 times per cycle), and after training. Muscle diameters (DM) were measured by means of ultrasound in all respective muscle groups, and muscle fiber composition, fiber diameters and numbers of cell nuclei were analyzed in muscle biopsies from the musculus vastus lateralis of both legs, prior to and after the training program.

Results: Mean ISOmax values of all muscles increased by 29% after FT as compared to 19% after LT. Mean DYNmax values of all muscles increased by 46% after FT and by 38% after LT. Mean DM of all muscles increased by 5.3% after FT and by 3.3% after LT. Analysis of fiber composition revealed unclear results. Fiber diameter, however, showed clear trends: type II muscle fiber diameters increased more after FT as compared to LT. Values were: P1 type Ila: 53/64 um, type Iib: 39/55 um; P2 type Ila: 43/57 um, type Iib: 37/49 um; LT: P1 type Ila: 64/54 um, type Iib: 48/42 um; P2 type Ila: 62/59 um, type Iib: 47/49 um. Type I fibers showed unclear developments.

Moreover, the increase in cell nuclei numbers was higher after FT (P1: +5.4%, P2: +20%) as compared to LT (P1: -19%, P2: +6.5%).

Conclusions: A follicular phase-based strength training showed more pronounced effects on muscle strength as well as macroscopic and microscopic parameters as compared to a luteal phase-based training. This is probably due to the specific hormonal milieu during each phase of the cycle. More subjects have to be included in order to further analyze menstrual cycle specific training effects.

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REHYDRATION AFTER EXERCISE UNDER HOT ENVIRONMENT: EFFECTS OF BEER VS WATER

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Introduction.
Beer is characterized for its low alcoholic content and notable amount of low molecular weight maltodextrins, amino-acids, minerals, B group vitamins, anti-oxidants, and carbohydrates. Hence, moderate intake of beer could be an alternative in the restoration of fluid balance after exercise-induced dehydration.

Aim.
To determine the effectiveness of beer intake (660 ml) in restoring fluid balance after exercise-induced dehydration compared with the effect of water intake.

Material and methods.

In a cross-over study design, sixteen healthy male volunteers (age: 21.1 ± 1.4 years, VO2max: 55.9 ± 3.6 ml min kg⁻¹) performed two randomized trials separated by a 3 weeks interval. In each trial the subjects exercised at 60% of maximum aerobic speed in hot environment during 60 minutes (35 ± 1 °C, 60 ± 1% relative humidity). After the exercise bouts, the subjects rest for 2h in a separate chamber at the same environmental conditions and were asked to drink 660 ml of beer plus water ad libitum (trial B+W), whereas in the other trial the participants were allowed to drink only water (trial W). The subjects were weighted before exercise, after exercise and after 2 h of rehydration. Additional measured variables included fat free mass (measured by dual-energy x-ray absorptiometry), percentage of change in plasma volume and thirst scale. Urine volume and fluid intake were collected during the rehydration period.

Results.

A decrease of 2.4 ± 0.3% of their body weight was observed. A decrease in fat free mass and plasma volume occurred after exercise in the heat (all p < 0.001), whereas thirst score increased significantly after exercise in both trials (all p < 0.001). During the rehydration period, there were no differences in the amount of fluid intake between trials (1660 ± 587 vs 1644 ± 620 ml in B+W and W, respectively, p = 0.09). The urine volume was also similar in both trials (281 ± 374 vs 223 ± 245 ml, in B+W and W, respectively, p = 0.70). After two hours of rehydration, the subjects recovered 1.3% and 1.6% of body weight in the B+W and W trials, respectively (p = 0.29). Fat free mass and plasma volume increased significantly after the rehydration period in both trials (fat free mass = 0.09% ± 1.5% vs 1.3% ± 12%, plasma volume = 3.3% ± 5.2% vs 5.1% ± 7.9% in B+W and W, respectively, all p < 0.001) and thirst score decreased at pre-exercise levels.

Conclusion.

The results of the present study suggest that beer could be an alternative effective post-exercise rehydration drink in healthy moderately trained young adults, even under hot environment. Thirst was not enough for stimulating voluntary drinking and recovering full body weight loss. In addition, it is important to highlight that the messages related to the benefits of moderate consumption of alcohol have always been addressed to adult populations.

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THE EFFECTS OF EXERCISE INDUCED MUSCLE DAMAGE ON SENSORIMOTOR AND NEUROMUSCULAR PERFORMANCE IN MALES

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Optimal functioning of the musculature in a timely manner is paramount to the dynamic stabilisation of synovial joints. It is plausible that exercise-induced muscle damage (EIMD) might be an important determinant of the extent of injury-risk and influence performance capabilities including muscle activation patterning and sensorimotor control at the extremes of the joint’s range of motion. The aim of this study was to assess the effects of EIMD on sensorimotor and neuromuscular performance in males. Peak force, electromechanical delay, sensorimotor performance (force error relative to a ‘blinded’ target) capabilities and descriptive markers of EIMD (perceived muscle soreness, passive hip flexibility) were assessed in ten male subjects (age: 20.9 ± 2.3y; height: 1.78 ± 0.06m, body mass: 72.3 ± 7.4kg [mean ± SD]) prior to and at 0.5h, 24h, 48h, 72h following a damaging exercise protocol incorporating six sets of 10 isokinetic eccentric contractions of the ipsilateral knee flexors. Neuromuscular and sensorimotor assessments were completed at 30 degrees of knee flexion. Results showed that while performance capabilities remained constant in the control period and contralateral control leg, the EIMD intervention provoked reduced performance of the involved leg compared to pre-intervention levels in peak force (35.7%: 259.2 ± 69.8 N versus 166.7 ± 45.1 N [pre- versus post-48h], F(4,36) = 3.3, p <0.05), passive hip flexibility (22.5%: 0.268 ± 0.083 m vs. 0.205 ± 0.064 m [pre- vs. post-72h], F(4, 36) = 10.9, p <0.001), electromechanical delay (52.7%: 55.1 ± 5.2 ms vs. 84.0 ± 5.9 ms [pre-versus post-48h], F(4,36) = 6.5, p <0.01) and sensorimotor performance (5.8%: 10.3 ± 3.7% vs. 6.1 ± 5.9% [pre-versus post-24h], F(4,36) = 5.9, p <0.05). Performance capabilities had not recovered significantly 72 hours after the damaging protocol. The EIMD-related sensorimotor and neuromuscular performance deterioration was prominent for 72 hours and was sufficiently large to raise concerns about a commensurate loss of capability for rapid and dynamic stabilisation of synovial joints during episodes of threat from injury.

PHYSICAL ACTIVITY AND MENTAL HEALTH IN AN ELDERLY COHORT

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Objective:

The aims of this study were: 1. To assess the prevalence of self-reported depressive symptoms in an elderly German cohort and 2. to investigate associations between self-reported physical activity and self-reported depressive symptoms in this cohort. Methods:

In a monitored prospective cohort study [German epidemiological trial on ankle brachial index, getABl], 6880 unselected patients >65 years were followed up by 344 representative primary care physicians in Germany since November 2001. In the 5-year follow up, 2120 patients (median age 76; 70-94 years; 53.7% women) of the cohort were interviewed about their level of physical activity (defined as activity of moderate intensity for at least 30 minutes per session; 1: no activities or active for less than once per week; 2: active for 1-3 times per week, 3: active for >3 times per week).

The 15-item geriatric depression scale (GDS-15) was used to measure self-rated depressive symptoms. The following questions of the GDS-15 have been analysed: Are you basically satisfied with your life? (GDS1), Do you feel that your life is empty? (GDS3), Are you in good spirits most of the time? (GDS5), Do you feel happy most of the time? (GDS7), Do you think it is wonderful to be alive now? (GDS11) and Do you feel full of energy? (GDS13). Every single item allows splitting the cohort into two groups: people who answered yes (1) and people who answered no (0). The Wilcoxon two-sample test was used for every item to reveal significant differences in activity level between Y and N. Only persons who answered the respective questions were included in the analyses. In all cases these were more than 95% of the patients.

Results:

57.4% of patients reported a high activity level (level 3), 23.2% an intermediate activity level (2), and 19.4% reported to be inactive (1). 94.1% of patients were basically satisfied with their lives, 8.4% felt that their life is empty, 91.7% were in good spirits most of the time, 88.6% felt happy most of the time, 91.2% thought that it is wonderful to be alive now and 80.3% felt full of energy. Significant differences in activity...
Twenty-nine basketball teams of the 1st and 2nd regional division participated in this investigation. A valid self-reported questionnaire was used to determine demographic data, sports specific injuries and potential risk factors in relation to AKP.

Methods:

The study was carried out in the context of an international hockey tournament (4 Nations Cup 2008) in Argentina. 18 elite female field hockey players (2 goalkeepers (G), 5 defenders (D), 6 midfield players (M) and 5 forwards (F)) of the German Field Hockey Women’s National Team were recruited for this study. Prior to the tournament individual maximal heart rates (HRmax) and the maximal oxygen consumption (VO2max) were measured using a treadmill run-test to exhaustion. Heart rate was monitored continuously during 4 matches of the tournament using the Polar® Team System.

Results:

VO2max for the different positions were: G: 47.07 ± 1.3 ml/kg, D: 50.1 ± 3.0 ml/kg, M: 50.5 ± 3.4 ml/kg and F: 46.4 ± 2.0 ml/kg. There was no significant difference between the positions D, M and F (p> 0.05). Even if the mean heart rate values are expressed as percentage of maximum individual heart rate, there are no differences between the positions (p> 0.05). Two-way ANOVA revealed no significant changes in mean heart rates in the progress of the tournament.

Conclusion:

The present study confirms the results of a previous investigation of heart rate profiles of the German Women’s National Team at the 4 Nations Cup 2006 (Franke et al., 2007). Field hockey is determined by high physiological demands for all field players independent of their position. A more detailed view at the physiological factors that determine position specific hockey performance is necessary to optimize tournament preparation. Especially position specific patterns in motion frequency and changes in repeated-sprint-performance over consecutive games should be observed in detail. Changes in heart rates could not be observed during the tournament as a possible measure of fatigue.


PREVALENCE AND ASSOCIATED RISK FACTORS OF ANTERIOR KNEE PAIN IN BASKETBALL PLAYERS USING A SELF-REPORTED QUESTIONNAIRE

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Background

Sports involving running, jump-landing maneuvers and sudden decelerations are at high risk for anterior knee pain (AKP) [1]. AKP is suggested to encompass all pain-related problems of the anterior part of the knee and is a common overuse injury in basketball [2]. Data on prevalences and associated risk factors of AKP in basketball are limited [1].

Objective

The objective is to determine point, lifetime and 1-year prevalence and associated risk factors of AKP in basketball in Flanders in both men and women.

Design

A cross-sectional study was set up.

Setting and participants

Twenty-nine basketball teams of the 1st and 2nd regional division participated in this investigation. A valid self-reported questionnaire was used to collect demographic data, sports specific injuries and potential risk factors in relation to AKP.

Methods

Eventually, 201 subjects (86 female and 115 male) participated and were asked to fill in a self-reported questionnaire. Prevalences and 95% Confidence Interval (CI) were calculated to analyse differences between divisions and gender regarding AKP. A logistic regression was used to predict the probability of occurrence of AKP given certain risk factors. The most significant independent variables identified in the univariate stage of analysis were then entered into a multivariate logistic regression equation. Odds ratios (OR) with 95% CI were reported for the multivariate analysis. Level of significance was set at 95%.

Results

The self-reported 1-year prevalence of AKP was 56%. Most common pathologies were Patellar Tendinopathy (26.8%) and Patellar Femoral Pain Syndrome (11.3%) (CI 95%).

Male basketball players were significantly more prone to AKP compared to their female counterparts and male players of the 2nd regional division significantly sustained more AKP in comparison with the 1st regional division whereas in female, the 1st regional division significantly sustained more AKP. Other factors such as age, length, BMI, gender, level of play, were not significantly related to AKP in basketball. Players who played with high-top basketball shoes were 3 times less likely to sustain AKP (OR = 0.38 [95% CI:0.18-0.85]).
Conclusion

High-top basketball shoes could have an influence on the prevention of AKP. These results are promising in the prevention of AKP in basketball players but further research on this topic is necessary.

References


THE EFFECTS OF PHYSICAL ACTIVITY ON VISFATIN, GHRELIN AND APELIN LEVELS IN PATIENTS WITH TYPE 2 DIABETES MELLITUS

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Objective-Aim: Growing evidence support the beneficial effects of physical activity on cardiovascular (CVI) system. Novel members of adipocytokines such as visfatin, ghrelin and apelin have recently emerged as CV risk factors strongly related with adverse events. The aim of this study was to determine the influence of physical activity on traditional and novel CV risk factors in patients with type 2 diabetes mellitus (T2DM).

Methods: A total of 98 individuals (30 males, 68 females) with T2DM, already receiving antidiabetic medications (metformin), but with poor glycemic control (HbA1c>6.5%) participated in this study. The mean age and the mean duration of T2DM were 61.33±5.58years and 4.92±2.6 years, respectively. All the patients were overweight (BMI>25kg/m2), without any diabetic complication and none was receiving lipid lowering treatment. Physical activity was evaluated according to the kcal/min expended and the weekly frequency of exercise, using a valid questionnaire. Physically active patients were considered those who reported non-occupational physical activity > once/week (at least 30 min/time). According to the above criteria patients were stratified as active (n=24) or sedentary (n=74). Clinical parameters: body-mass index (BMI), waist-hip ratio (WHR), blood pressure (BP) and biochemical parameters: fasting plasma glucose (FGP), Hba1c, total cholesterol, HDL, LDL, triglycerides, fasting insulin, insulin-resistance index (HOMA-IR), hsCRP, visfatin, ghrelin and apelin were determined. For statistical analysis we used Student’s independent t-test and linear regression analysis (p<0.05).

Results: Concerning anthropometrical characteristics, glycemic profile (FGP, Hba1c), lipid parameters and apelin we did not detect significant differences between active and sedentary patients (p>0.05). In comparison with sedentary group, active group showed lower levels of hsCRP (1.87±0.52mg/L vs 3.01±1.33mg/L; p=0.008), fasting insulin (10.07±4.21mU/L vs 12.99±5.18mU/L; p=0.033), HOMA-IR (5.92±3.91 vs 7.6±±3.62, p=0.038), visfatin (9.51±5.21ng/ml vs 27.4±17.4ng/ml; p<0.001) and ghrelin (8.05±3.02ng/ml vs 11.43±3.07ng/ml; p=0.033) levels. In the linear regression analysis after adjustment for age, sex and BMI the aforementioned differences between active and sedentary diabetic patients remained significant (p<0.05).

Conclusions: Physical activity suppresses inflammatory milieu, along with beneficial effects on novel CV risk factors, indicating an alternative cardioprotective mechanism in patients with T2DM.

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EFFECT OF POST-EXERCISE HEAT TREATMENT ON ECCENTRIC CONTRACTION-INDUCED MUSCLE DAMAGE AND MUSCLE SORENESS IN OLDER PEOPLE

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For older people, it is important to establish safe and effective strength training strategy. Recent studies suggested that heat treatment at one day before eccentric contractions could inhibit muscle damage and muscle soreness after eccentric contractions. The mechanisms are still unknown but the inhibitions might be associated with an induction of heat shock proteins. Moreover, heat treatment immediately after eccentric contractions may increase muscle blood perfusion and promote recoveries from muscle damage. The purpose of the present study was to clarify the effect of post-exercise heat treatment on eccentric contraction-induced muscle damage and muscle soreness in older people.

Sixteen untrained older male and female subjects (64 ± 4 yrs) volunteered to participate in this study. They were randomly assigned to Con (n = 8) or Post-H (n = 8) group and were asked to perform 30 repetitions of maximal isokinetic eccentric contractions (ECC, 10 reps x 3 sets) of non-dominant elbow flexors at angular velocity of 30 °s-1 by means of isokinetic dynamometer. Immediately after ECC, the Post-H group underwent a microwave hyperthermia treatment (150 W, 20 min) to the same arm. Muscle soreness, serum creatine kinase activity, serum insulin-like growth factor-1 concentration, range of motion of elbow joint, upper arm circumference and maximal isometric strength were assessed for 4 days after ECC. As the results, the range of motion of elbow joint of Post-H group was significantly greater than that of Con group (P < 0.05), although there were no differences in the other markers of muscle damage and soreness between Con and Post-H group. These results suggest that a heat treatment immediately after ECC on skeletal muscles could be effective to suppress an increase of muscle stiffness after ECC in older people.

ROLE OF PHANTOM AND T2C IN TEAM SPORTS

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Every now and then the Lentiini Combined Method has been used instead of the original Phantom Method to study the sportmen proportionality. Therefore the aim of the present study was (1) to compare these two methods; (2) to test the Lentiini Combined Method in 34 (N) male handball players, aged 23.65 ± 4.76 years, of two different teams participating in the Portuguese Professional Handball League. The anthropometric measures were taken in accordance to ISAK as described in Fragoso & Vieira (2005). by a group of anthropometrists accredited by ISAK (International Society of the advance of Kinanthropometry). Microsoft Office Exel 2007 and SPSS 15.0 for Windows were used to analyze the anthropometric data. The statistic methods used were descriptive statistic, T-student test, ANOVA one-way and a post-hoc test (LSD). The results showed: (1) the Lentiini Combined Method normalized the data pulling the results closer to the mean Z ratio.
values; (2) the proportionality constant of 170.18 of the Phantom Model emphasizes the heterogeneity of the samples when height is a competitive advantage; (3) allows similar statistical results; (4) the use of the present technique reduces the complexity of the proportional calculations.

Poster presentations (PP)

PP-SM02 Sports Medicine 2

RESISTANCE TRAINING IN THE TREATMENT OF THE METABOLIC SYNDROME: A META-ANALYSIS
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Background: Aerobic endurance training is generally recommended for people with diabetes mellitus type 2 (T2DM). Resistance training (RT) has been shown to improve muscle strength in both healthy elderly individuals and individuals with chronic disease and improve insulin-stimulated glucose uptake in patients with impaired glucose tolerance or manifest T2DM. Objectives: The purpose of this systematic review is to evaluate randomized controlled trial (RCT) data on the effects of RT on the metabolic clustering in patients with abnormal glucose metabolism. Search strategy: 13 RCTs were identified through MEDLINE and EMBASE from January 1990 to December 2006. Selection criteria: We included all RCTs comparing RT with a control group in patients with abnormal glucose regulation. Data analysis: Weight mean differences between the post-intervention values of the intervention and control groups were used to analyze the size of the intervention effects. All data were analyzed with a software program (Review Manager 4.2.10) of the Cochrane Collaboration. Main results: Glycated hemoglobin was reduced by 0.5% HbA1c with RT I:0.5%. HbA1c WMD, 95% confidence interval (CI) -0.59 to -0.43. This is both clinically and statistically significant (P < 0.00001). Fat mass was reduced statistically significant by 3.0 kg with RT I:3.04 kg WMD, 95% Cl -3.73 to -2.35, P < 0.000001). A RT intervention resulted in a significant lowering of plasma TG by 11.45 mg/dl, total CHOL by 3.07 mg/dl, LDL-C by 11.05 mg/dl, and systolic blood pressure (SBP) by 6.57 mmHg compared with the controls, but there was no significant difference between groups in HDL-C and diastolic BP. Conclusions: This meta-analysis shows, that RT is contributing to decreasing major risk factors for the metabolic syndrome, such as obesity and insulin resistance and should be recommended in the management of T2DM and metabolic disorders. This study confirms that RT does not increase BP, as it was once thought, and might even have potential benefits on resting systolic BP. Improved glycemic control, decreased fat mass, improved blood lipid profiles and decreased BP are important for reducing microvascular and macrovascular complications of people with IGT or T2DM.

THE BENEFIT OF STRENGTH TRAINING ON ARTERIAL BLOOD PRESSURE IN PATIENTS WITH TYPE 2 DIABETES MELLITUS MEASURED WITH AMBULATORY 24-HOURS BLOOD PRESSURE SYSTEMS
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Background: To give a better representation of blood pressure (BP), while patients are engaging in their usual activities, an ambulatory 24-hour BP monitoring (ABPM) has substantial appeal. ABPM provides automated measurements of brachial-artery pressure over a 24-hour period and provides a highly reproducible circadian profile. The purpose of this investigation was to evaluate the effect of strength training (ST) on BP in patients with type 2 diabetes mellitus (T2D) and to obtain new and important information on BP profiles over 24 hours by using an ABPM. Material and Methods: We recruited ten patients (mean age: 59.7 ± 7.3) from our Diabetes Department who participated in a 4-month systematic ST program on three non-consecutive days of the week. The ST program consisted of exercises for all major muscle groups. The numbers of sets for each muscle group were systematically increased from 3 at the beginning of the program to 4, 5 and finally 6 sets per week at the end of the program. The ABPM equipment (oscillometric Model Mobil-O-Graph® CE 0434) was applied before and after 4 months training period. Routine HbA1c levels were measured using standard techniques. All subjects performed a cycling test to measure maximum oxygen uptake (VO2peak) and maximum workload (Wmax) before and after the training period. Maximal strength was determined by one repetition maximum (1RM) in kg for the bench press, bench pull and leg press exercises, using the Concept 2 Dyno®. Results: Analysis of the pooled day and night time data showed a significant reduction of mean arterial BP (from 93.8±19.2 to 90.6±14.3 mmHg; p<0.01) after 4 months ST (-3.4% mmHg). VO2peak (p<0.05), W max (p<0.05), 1RM for all exercises, using the Concept 2 Dyno®. Results: Analysis of the pooled day and night time data showed a significant reduction of mean arterial BP after 4 months of ST, measured with the ABPM system. In conclusion, these results suggest that ST may not only increase muscle strength, but also decrease BP and perhaps the risk of future CVD development.

ANKLE INSTABILITY AMONG IRANIAN ELITE PROFESSIONAL ATHLETES
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Objective: Football, basketball, and wrestling are very popular sports in Iran. However, comprehensive information about the prevalence of injuries among professional athletes in these sports is rare. Therefore, the purpose of this study was to examine the prevalence of ankle instability in elite professional Iranian football and basketball players as well as freestyle and Greek-Roman wrestlers.

Methods: 229 male athletes with an average of 23 years old who were invited to the Iranian national training camp (freestyle wrestlers, N=58; Greek-Roman wrestlers, N=68; football players, N=61; basketball players, N=62) during 3 years, participated in this study, voluntarily. Anterior drawer test and tilt test were used to assess ankle instability and mortise view X-ray was performed to confirm clinical diagnosis.

Results: The results showed that the prevalence of the ankle instability was 8.2%, 5.9%, 14%, and 7.3% among free style Wrestlers, Greek-Roman Wrestlers, football players, and basketball players, respectively.

Conclusion and discussion:
The prevalence of ankle instability among Iranian elite professional athletes is relatively high. The prevalence of this chronic injury in football is higher than Basketball and Wrestling, it could be because of higher percentage and intensity of impacts and trauma in football. Strengthening and flexibility exercises; ankle joint protection; and correct diagnosis, treatment and rehabilitation by acute ankle injuries, could prevent this chronic impairment.

PLASMA LIPOPROTEIN AND ADIPONECTIN LEVELS BEFORE AND AFTER DIET/EXERCISE PROGRAM IN OBESE GIRLS

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Introduction.
Several studies indicate that obesity is a major independent risk factor for cardiovascular disease. In this survey, we studied the effects of three interventional programs: diet restriction (D), individualized exercise training (E) and diet plus exercise (D+E) on body weight, metabolic parameters and adiponectin, in obese adolescent girls.

Methods.
The longitudinal intervention study of a 2-month D (500 kcal/day), E (90 min at Lipox max point -intensity of maximal lipoprotein oxidation as determined by indirect calorimetry,- 4 days/week) and D+E (combination of D and E) programs was performed in 18 obese girls (Age 13.2 ±0.3, BMI = 30.4 ± 3.2). Body weight, body mass index (BMI), body fat, waist circumference, homeostasis model assessment (HOMA-IR) index, fasting levels of cholesterol, lipoproteins and circulating adiponectin, were measured in all subjects before and after programs.

Results.
After the program period, in obese subjects of D+E group, body weight (73.1±9.5 vs 78.9±10.8 kg), body fat (27.1±6.6 vs 33.7±4.2 kg), waist circumference (91.1±7.8 vs 96.8±5.4 cm), HOMA-IR index (2.5±3.7 vs 4.5±2.2), total cholesterol (3.82±0.56 vs 4.48±0.49 mmol/l), low-density lipoprotein cholesterol (2.11±0.23 vs 2.79±0.22 mmol/l) and TC/HDL-C ratio (3.21±0.19 vs 4.31±0.42 mmol/l) were significantly lower, and high-density lipoprotein cholesterol (1.19±0.16 vs 1.04±0.09 mmol/l) and adiponectin (3.4±1.6 vs 2.2±1.1 mg/ml) were higher than in either R or E groups. Diet/exercise improved the ability to oxidize lipids at exercise (crossover point: + 18.5 ± 3.4 % Wmax; p<0.01, Lipox max: + 89.7 ± 19.7 mg/min; p<0.01). In D+E group, significant correlations were found between changes in body weight and adiponectin and between changes in TC/HDL-C and Lipox max.

Conclusions.
These findings show that the association of a diet restriction with an individualized exercise training at Lipox max point is necessary to improve simultaneously weight loss and the metabolic parameters. This kind of intervention may be the optimal approach for the prevention and management of childhood and adolescence obesity and the decline of cardiovascular risk factors present in this population.

THE STATE OF MIND DURING PUTTING AND RECOVERY: CAN HEMISPHERIC ASYMMETRIES SHOW DIFFERENCES?

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Purpose: There are several investigations about hemispheric asymmetry using the EEG in the preparation period of a motor task to show event-related differences depending on skill level. Less is known in sports sciences about the hemispheric variations of different states such as activation and recovery measured continuously. In order to examine if those variations in central activation patterns can be detected by an asymmetry score a putting-recovery-paradigm with expert and novice golfers was accomplished.

Methods: Nine male expert golfers (25.4±3.9 years; 84.3±8.5 kg; 188.3±3.8 cm) and nine male novice golfers (24.6±3.4 years; 82.6±3.1 kg; 184.3±7.2 cm) volunteered in the study. The experts were characterized with a handicap of 7.2±7.1; 8.0±3.9 years of golf experience in comparison to the experts.

Results: Beside a significant better performance in the expert golfers (p<.001) there were no significant differences in the asymmetry scores depending on skill level. Statistical analysis showed rather a main effect in condition for Theta F3:F4 (p<.05), Alpha 2 C3:C4 (p<.01), Alpha 1 T3:T4 (p<.01) and Beta 1 T5:T6 (p<.05) and an interaction in time x condition for Alpha 1 P3:P4 (p<.03) as well as an interaction in condition x group for Beta 1 P3:P4 (p<.05).

Conclusion: These findings suggest that hemispheric activation during golf putting is not influenced by skill level. In contrast different activation states can be detected by an asymmetry score. Differences in the asymmetry score from performance to recovery are discussed as changes in verbal-analytic and visuo-spatial demands. A decreased ratio from putting to recovery at the temporal electrode positions (T3 T4) in the frequency band Alpha-1 is supported by known decreased visuo-spatial demands in the recovery phase. How ever, using this analyse method it remains unclear how the spectral power at every single electrode position develops from putting to recovery. In summary, the asymmetry score represents a manageable method to give a survey of the state of mind and thereby the way golfers are engaged during putting and recovery.

SAFETY MEASURES IN GOLF - THE ACTUAL SITUATION CONCERNING ACCIDENTS (INJURIES AND DAMAGES) AS REVEALED BY A QUESTIONNAIRE SURVEY OF GOLF COURSES A POSSIBLE MEASURES TO PREVENT THEM

(1)St.Marianna University, (2)Tokyo University, (3)Aichi Mizuho College, (4)Toyama University, (5)Musashino Art University, (6)Ewha Women’s University, (7)Meiji University, (8)Tokai University, Japan

Objective.
We have identified the actual situation concerning accidents and emergency medical services in golf course in the last time through questionnaire survey we sent to more than 2,400 Japanese golf courses during the 21 years. This time, in order to survey the safety situation in Australia district golf courses, we distributed questionnaires to 543 golf courses in "Tokai and Kiriki" district.

Method.
The survey was performed between April 2005 and March 2006. Six questions were as follows: 1) Frequency of ambulances dispatched to the golf courses in a year. Reasons for calling an ambulance 2) Established cooperative arrangement with neighboring hospitals Distances to recommended hospital departments and travel time 3) Emergency medical care available at the golf course and crisis control system. 4) Annual incidence or accidents among golfers.

Results.
(Ambulance calls) Out of 673 golf courses, 102 replied. The response rate was 15%. With respect to the month, there were requests in January (10.7%), April (7.6%), May (15.5%), June (6.9%), June in May (7.6%), June in June (10.7%), in July (16.1%), in August (26.9%), in September (7.6%), in October (8.4%). 14 in November (10.7%), 19 in December (14.6%), respectively. These results indicated that ambulance calls were most frequent in July and June in all regions.

(Emergency medical care system) Concerning emergency medical care procedures at golf courses, 41 golf courses (31.5%) said that "cooperative arrangements with a given medical institution are in place", while 89 courses (68.4%) replied that they had "no fixed cooperative arrangements". About half of the golf courses did not have an established system for cooperating with a given medical institution in case of an emergency. Looking at practical emergency care procedures in the case of an emergency on the golf courses, 62 golf courses (47.6%), the majority had a designated member of staff who would be expected to take charge. 66 courses (50.7%) did not. Seventy-seven 36 courses (27.6%) held training courses for their staff in emergency care, but 81 courses (62.3%), the majority, provided no emergency training.

(Accidents to golfers) Accidents to golfers involving golf balls and clubs had been experienced at 69 golf courses (53%) and had not been experienced at 61 (46.9%). 60 golf courses (46.1%) had experienced accidents due to falls and slips, while 69 (53%) had not. There were 3 accidents resulting in death at 3 golf courses (2.3%) last year. Since the golf courses had been in operation, there had been 36 fatal accidents in total.

Golf is not so physically demanding for middle aged golfers who are receiving sufficient exercise. For this reason they will habitually play additional other sports if they want to improve more score and skill level. This study clarified that middle aged golfers who habitually engage in additional other sports considered golf to be good for their health.

INJURIES ON GYMNASTS: EPIDEMIOLOGICAL STUDY AT PORTUGUESE NATIONAL LEVEL
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Introduction.
Gymnastics, as a very demanding sport, both physically and psychologically, leads to a bigger injury predisposition for athletes. To determine the annual prevalence of injuries in competitive gymnasts (Trampoline, Acrobatics, Rhythmic and Artistic Gymnastics), at a national level, during the 2005/2006 season; and to characterize its incidence pattern, severity and associated risk factors. This epidemiological knowledge during the practice of gymnastics will allow the development of adequate strategies for injury prevention and the management of risk factors.

Methodology.
A cross-sectional, descriptive and retrospective survey was implemented, through a self-answer questionnaire that was validated and tested. Information was collected in regard to the general athletes' characterization, the practiced sport and the number of sustained injuries. A total of 991 questionnaires were sent to 38 gym clubs throughout the country, with a response rate of 35.2%.

Results.
150 athletes sustained injuries with an annual prevalence of 43.0%, from a sample of 349 gymnasts (21 clubs of national level), with a very young age (average 13.34 yrs). Injuries are more frequent in artistic gymnastics (62.7%), than in Acrobatics (45.6%), and Trampoline or Rhythmic gymnastics (36.2%). The lower limb was the most injured body region (49.6%), in particular the knee, ankle, toe and fingers. Almost four out of ten of the injuries showed recurrence or chronic behaviour. The level of practice with combination of technical elements was the biggest cause for the injury. Gymnasts 15 years and older, with larger amounts of practice time and higher training loads, present a bigger risk for an injury (p<0.05).

Discussion.
The results are comparable with other studies at international level and suggest a high injury risk during the practice of gymnastics. They point towards the need for the continuous intervention of physical therapists. Also, they alert health professionals and coaches to be aware of the risk factors that are associated with the injury incidence. The analysis of associated risk factors is important to promote better prevention strategies.

CHANGES IN SOME ANTHROPOMETRIC, CIRCULATORY AND BLOOD PARAMETERS AS A RESULT OF ANABOLIC-ANDROGENIC STEROID ABUSE IN STRENGTH-TRAINING SPORTSMEN
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Today professional and non-professional athletes abuse anabolic androgenic steroids (AAS) to enhance performance and also to improve physical appearance. Anabolic steroids are wide spread among bodybuilders. AAS are taken orally or injected, typically in cycles of weeks or months. There are many studies on the hazard effects of the AAS abuse (1,2,3).

The aim of this study was to investigate the changes in some anthropometric, circulatory and blood parameters which occur as a result of anabolic-androgenic steroid abuse in elite bodybuilders on national and international level.

One of the best Bulgarian bodybuilding team (n=10) was investigated. The study was performed from October (at the beginning of the preparatory period) to March (at the beginning of the competition period). During this six-month period the following anthropometric, circulatory and biochemical parameters were measured twice: body mass and BMI, 4 skinfolds, the circulatory response during incremental workload (100W/3 min, 150W/3 min, 200W/3 min), blood cholesterol (CHOL), HDL-cholesterol (HDL), triglycerides (TG) and the liver
In the examination of human back pain disorders it can be helpful to use biomechanical devices to find characteristic patterns in bipedal standing.

The videorasterstereographic Formetric®-System is known as gold standard for back shape analysis and reveals parameters that describe posture characteristics like sway back, bent slightly over or normal posture and even posture deviations to the left or right side. On the other hand foot pressure distribution patterns should be associated with characteristics of human standing and can be measured on a pressure platform (Pedoscan®).

A sample of volunteer back pain patients (n=185, 116 females, age 49.6 years (+/-14.3), height 1.68 m (+/-0.07), weight 68.1 kg (+/-12.4); n=185) were examined in normal upright standing by means of back shape analysis (Formetric). The volunteers were examined first in normal upright standing by means of foot pressure distribution (Pedoscan) and immediately after-vards in a positive way: foot pressure analysis serves some extra information in analysis of spine shape and posture by means of videorasterstereography.

We conclude that there is no statistical evidence for any correlation between the posture analysis devices: foot pressure distribution is plane) and R = 0.21 and R square = 4%, SEE = 7.01.

A multiple regression for the pedobarographic parameters shows following coefficients R = 0.24 and R square = 6%, SEE = 4.03 (frontal rotation (forwards-backwards) correlates with trunk inclination: C = 0.19 either (p=.145).

The results are expressed as mean ± SEM (n), of ADULT (AD), OLD (OLD) and OLD-TRAINED (OLD-TR) animals. In summary, these preliminary results indicate that exercise (moderate training) induces a stimulation of the adherence (AD 36.7 ± 8.2 [3]; OLD 45.8 ± 10.1 [6]; OLD-TR 83.3 ± 12.9 [6]; AD vs OLD-TR p<0,05) and chemotaxis (AD 35.3 ± 4.3 [7]; OLD 53.9 ± 13.7 [7]; OLD-TR 129.2 ± 13.1 [7]; AD vs OLD-TR and

**References.**


2. Bahkrie M et al

**POSTURE ANALYSIS BY MEANS OF PEDOBAROGRAPHY AND VIDEORASTERSTEROGRAPHY: BIVARIATE AND MULTIPLE CORRELATION ANALYSIS**

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University Hamburg, Germany

In the examination of human back pain disorders it can be helpful to use biomechanical devices to find characteristic patterns in bipedal standing.

The videorasterstereographic Formetric®-System is known as gold standard for back shape analysis and reveals parameters that describe posture characteristics like sway back, bent slightly over or normal posture and even posture deviations to the left or right side. On the other hand foot pressure distribution patterns should be associated with characteristics of human standing and can be measured on a pressure platform (Pedoscan®).

A sample of volunteer back pain patients (n=185, 116 females, age 49.6 years (+/-14.3), height 1.68 m (+/-0.07), weight 68.1 kg (+/-12.4)); n=185) were examined in normal upright standing by means of foot pressure distribution (Pedoscan) and immediately after-vards in a positive way: foot pressure analysis serves some extra information in analysis of spine shape and posture by means of videorasterstereography.

The volunteers were examined first in normal upright standing by means of foot pressure distribution (Pedoscan) and immediately after-vards in the same manner by means of back shape analysis (Formetric). The relative foot pressure distributions anterior-posterior resp. mediolateral (%)served as dependent variables for Pedoscan. Pelvis tilt, pelvis rotation, trunk imbalance, trunk inclination and vertebral side-deviation as well as rotation (rms, max right, max left) were taken for back shape analysis (Formetric).

Bivariate (Pearson-correlation, Spearman-correlation and contingency coefficient) and multivariate analysis (multiple linear regression, fixed factors) were calculated to examine correlation and prediction capability.

The mediolateral sway in the foot pressure distribution correlates significantly (p<0.05) with trunk imbalance: r = 0.15 (rs = 0.13). That means an explanation of variance of 2%. The anteroposterior sway in the foot pressure distribution correlates significantly (p<0.05) with trunk inclination: r = -0.15 (rs = -0.12). That means an explanation of variance of either 2%. There are no other statistically significant correlations between foot pressure variables and back shape parameters. Classified results (+/0/-1) lead to an analysis of contingency coefficients. There are no new findings. For the frontal plane the pressure distribution (right-left) correlates with trunk imbalance: C = 0.19 (p= 0.141). For the sagittal plane pressure distribution (forwards-backwards) correlates with trunk inclination: C = 0.19 either (p=0.145).

A multiple regression for the pedobarographic parameters shows following coefficients R = 0.24 and R square = 6%, SEE = 4.03 (frontal plane and R = 0.21 and R square = 4%, SEE = 7.01).

We conclude that there is no statistical evidence for any correlation between the posture analysis devices: foot pressure distribution is independent of posture parameters by means of back shape analysis.

In a positive way: foot pressure analysis serves some extra information in analysis of spine shape and posture by means of videorasterstereography.

**MACROPHAGE FUNCTION IN OLD RATS SUBMITTED TO A MODERATE AEROBIC TRAINING**

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Disorders of immune function are one of the reasons why elderly people are more prone to infection and cancer, and why these diseases are more difficult to control. An effective method for knowing, preventing or retarding age-related decline in immune function would have impact on clinical and public health. It is well known that moderate physical exercise could have a positive influence in the immune response, so an appropriate regular regimen of moderate exercise might help elderly people to preserve immune function. Macrophages play a crucial role in immune response, as first line defense and act through several mechanisms destroying bacteria, parasites, viruses and tumor cells. Considering the importance of macrophage for the immune response, the possible positive influence of exercise in this cell, we evaluated function of macrophages obtained from elderly rats submitted to a moderate exercise training.

Adult rats (AD), 2 - 4 months, were kept without exercise. The old rats, 15 - 18 months, were divided in two groups, the first one (OLD) without exercise and the second, submitted to aerobic swimming training (OLD-TR) for six weeks. Macrophages were obtained from the intraperitoneal cavity of the rats and we determined macrophage functions by the study of phagocytic, adherence and chemotaxis capacity and hydrogen peroxide and nitric oxide production.

The results are expressed as mean ± SEM (n), of ADULT (AD), OLD (OLD) and OLD-TRAINED (OLD-TR) animals. In summary, these preliminary results indicate that exercise (moderate training) induces a stimulation of the adherence (AD 36.7 ± 8.2 [3]; OLD 45.8 ± 10.1 [6]; OLD-TR 83.3 ± 12.9 [6]; AD vs OLD-TR p<0,05) and chemotaxis (AD 35.3 ± 4.3 [7]; OLD 53.9 ± 13.7 [7]; OLD-TR 129.2 ± 13.1 [7]; AD vs OLD-TR and
OLD vs OLD-TR p<0,05), improving macrophage function in old rats. We also found increased hydrogen peroxide, umol / hour x mg protein-1 (AD 15.9 ± 2.2 (4); OLD 16.9 ± 2.5 [7]; OLD-TR 56.3 ± 7.5 [5]; AD vs OLD-TR and OLD vs OLD-TR p<0.05) and nitric oxide production, uM (AD 43.8 ± 4.3 [6]; OLD 41.6 ± 6.2 [6]; OLD-TR 76.7 ± 12.6 [7]; OLD vs OLD-TR p<0.05) in old trained rats. These changes in macrophage function can help the immune system to cope with bacterial infection and tumor development in elderly subjects, and exercise can be an effective method for preventing or retarding age-related decline in immune function.

MACROPHAGE GLUTAMINE METABOLISM IN OLD RATS SUBMITTED TO A MODERATE AEROBIC TRAINING

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It is well known that moderate physical exercise have a positive influence in the immune response, so an appropriate regular regimen of moderate aerobic exercise might help to preserve immune function in the elderly. Macrophages play a crucial role in immune response, acting as first line defense and destroying bacteria, parasites, viruses and tumor cells through several mechanisms. Considering the functions of macrophage in immune response and the fact that glutamine metabolism is a very important source for energy and for synthetic activity in immune cells, we evaluated glutamine intermediary metabolism of macrophages obtained from elderly rats submitted to a moderate aerobic exercise training.

Adult rats (AD), 2 - 4 months, were kept without exercise. The old rats, 15 - 18 months, were divided in two groups, the first one (OLD) without exercise and the second, submitted to aerobic swimming training (OLD-TR) for six weeks. Macrophages were obtained from the intraperitoneal cavity of the rats and we determined glutamine metabolism through glutamine consumption, profile of CO2 production by radiolabelled glutamine (Decarboxylation) and Glutaminase maximal activity.

The results are expressed as mean ± SEM (n), of ADULT (AD), OLD (OLD) and OLD-TRAINED (OLD-TR) animals. The results obtained indicate that moderate exercise do not induce alterations in the glutamine consumption (nmol / hour x mg protein-1: AD 1.40 ± 0.35 [7]; OLD 0.97 ± 0.21 [15]; OLD-TR 0.43 ± 0.08 [6]) and glutamine decarboxylation (nmol / hour x mg protein-1: AD 4.28 ± 0.70 [15]; OLD 2.39 ± 0.52 [7]; OLD-TR 1.69 ± 0.17 [6]). The study of Glutaminase maximal activity showed a decrease of the maximal activity in OLD rats and increase in OLD-TR rats (umol / minute / mg protein-1: AD 6.70 ± 2.15 [14]; OLD 3.90 ± 0.74 [7]; OLD-TR 13.98 ± 2.39 [5]; AD vs OLD and OLD vs OLD-TR, p<0.05). The increase in Glutaminase maximal activity could reflect a possible raise in glutamine use, explaining the increase in macrophage and immune functions from animals trained in a schedule of moderate aerobic exercise.

THE PREVALENCE OF MENSTRUAL DISORDERS AMONG ELITE BOSNIAN FEMALE ATHLETES

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The Female Athlete Triad refers to interrelation among low energy availability, menstrual dysfunctions and bone mineral density. Objectives: To examine the prevalence of menstrual dysfunctions, as a cardinal sign of the Triad, in 84 Bosnian elite athletes and non-athletes control.

Method: Group of athletes was comprised of 34 ball-game players (basketball and handball-National league champions), 27 athletics (17 national team short and long race runners) and 23 dancers, aged between 14 and 25. The control group comprised 31, similarly aged girls, not engaged in any sports activity. We used very detailed questionnaire to determine menstrual profile. Definitions of menstrual disorders (primary amenorrhea, secondary amenorrhea, oligomenorrhea and delayed menarche) were in accordance to ACSM Position Stand. The Female Athlete Triad 2007 [1].

Results: The prevalence of primary amenorrhea was significantly higher in the group of athletes (12/84) than in control group (10/31). The highest prevalence of primary amenorrhea was found in group of athletics girls (8/27). Menstrual irregularities, secondary amenorrhea and oligomenorrhea were reported in 9 of 84 and 11 of 84 athletes, respectively. Five secondary amenorrhoeic and eight oligomenorrhoeic were in athletics (runners) group. No menstrual disorder recorded in control, non-athlete group. The mean age of menarche was substantially delayed (p<0.05) in group of athletes (13.34 ± 1.3) compared to control group (12.73 ± 1.2).

Conclusion: Menstrual irregularities were more frequent in group of Bosnian elite female athletes than in control and the highest prevalence was in runners group.

References:

EFFECTS OF HEAVY RESISTANCE-TRAINING IN WHEELCHAIR ATHLETES

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Introduction
In several studies with wheelchair athletes endurance training was analyzed, whereas in most experiments forearm ergometer exercise was used. In contrast, little is known about strength training in subjects with spinal cord injury (SCI), especially in high performance athletes. Accordingly, the aim of this study was to evaluate the effects of upper body heavy-resistance-training in wheelchair athletes.

Methods
Sixteen male subjects participated in this study - eight with SCI and eight healthy physical education students conversant with strength training. The subjects participated in an eight-week programme consisting of heavy-resistance exercise performed twice per week. Each training session consisted of 10 to 12 repetitions and 5 sets. All exercise sessions were individually supervised. Subjects’ performances were tested three times: before starting the eight-week program, after finishing the training program and one week afterwards. Movement speed was analysed in a smith machine by measuring maximal velocity and maximal acceleration of the barbell. Maximal strength and rate of force development were assessed by measuring force-time curves in isometric condition. Moreover, we evaluated one repetition maximum (IRM) and Strength endurance (repetitions with a weight representing 60% of the individual IRM). Furthermore, we tested 10m-sprinting performance in wheelchair athletes.

Results
Overall, both groups achieved very similar results. In all parameters we measured an improved performance in post-testing - in wheelchair athletes as well as in physical education students. But the level of significance (<=0.05) was not reached in all pre-post comparisons.

In most strength and power parameters wheelchair athletes show a tendency to a higher profit from the strength training used in this study. But using analyses of group differences only the comparison of effects on rate of force development showed a significant advantage for wheelchair athletes (p=0.01). In 10 m-sprinting performances we found no improvement due to strength training.

**Discussion**

Our data indicate that the effects of heavy resistance-training on strength and power properties in upper extremities are similar in wheelchair athletes and physical education students. In contrast to hitherto assumptions about minor adaptation capacities to training exercises in SCI-patients our study showed clear adaptations to strength training in athletes with SCI. Some wheelchair athletes participating in this study had a spinal cord injury at the level of the cervical vertebrae leading to impairments affecting functional abilities of upper extremities. Nevertheless, they showed strong improvements in nearly all strength and power parameters due to heavy resistance-training.

In conclusion, we suggest that heavy resistance training should be of increasingly importance in wheelchair sports to enhance performance in competition and in daily life activity.

**ANALYSIS OF PSYCHOPHYSIOLOGICAL CONDITIONS OF YOUNG ATHLETES INCLINED TO USING ALCOHOL AND DRUGS**

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**Introduction.** Express-analysis of tendency to using alcohol and drugs for athletes is an important practical and social task. The most common tests are being done using blood analysis, but this approach is quite complicated for everyday sport activity.

**Method of study.** Electro Photon Capturing Analysis (EPC) based on Gas Discharge Visualization (GDV) technique [1] allows measuring the stimulated by electromagnetic field electron and photon emission of human skin. Testing takes 5-7 minutes for a person and can be made in any premises, including training and competition facilities.

**Results.** 120 patients (98 men and 22 women) suffering from chronic alcoholism were studied compared with more than 600 athletes of different levels in sports with high endurance. Averaged age was 24 +/- 6 years. Computer analysis of data using image and artificial intelligence analysis allowed to reveal a set of features of the measured parameters specific for young people inclined to using alcohol and (with high probability) drugs. A set of pathological changes in the psychophysiological condition of athletes using alcohol was found.

The following EPC parameters were correlated with other clinical features:
1. high coefficient of stress in EPC (97 %) was corresponded to high clinical psychology stress (in 98 % of cases);
2. weak pictures with high background; energy deficiency and misbalance of the head zones (96 %) was corresponded to polyneuropathy (75 %);
3. misbalance with energy deficit (90 %) was corresponded to myocarditis anemia (44 %);
4. absence of ECP signal and strong misbalance (84 %) were corresponded to gastritis, enteropathy, hepatitis, cirrhosis (40 %);
5. misbalance. energy deficit with rings on the 4th fingers (64 %) was corresponded to liver increase and dystrophy, pancreatitis (62 %);
6. strong outbursts and many blocks (86 %) were corresponded to myopathy, contraction of musculoskeletal system (70 %).

**Conclusion.** The EPC technique can take a unique position in express-analysis of athletes health and psychological state. This opens broad perspectives for deep scientific research for the developing of new practical technologies.

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INHIBITORY RESPONSE ABILITY IN CHILDREN WITH DEVELOPMENTAL COORDINATION DISORDER: A PSYCHOPHYSIOLOGICAL STUDY OF THE POSNER PARADIGM
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Purpose: The purpose of this study was to identify and compare attentional, decisional, and motor processing stages of brain activity, as revealed by event-related potentials (ERPs) concerning with deficient inhibitory response ability in children with developmental coordination disorder (DDC) and typically developing children.

Methods: Behavioral performance and ERPs measures were recorded and compared during a variant of the Posner paradigm in 12 typically developing children and 18 DDC children screened with Movement Assessment Battery for Children (Movement ABC). All children reacted to visual targets preceded by a spatial cue.

Results: Children with DCD had significantly longer reaction time than typically developing children whatever the cue-target combination, as well as an elongated interval between the N2 ERPs and the motor response. Children with DCD showed significantly slower N1 latency and smaller P3 amplitude evoked after the target stimuli. Finally, the anticipatory process reflected from the slow negativity (contingent negative variation/readiness potential: CNV/RP) that preceded the target was significantly weak in the DCD children.

Conclusions: These results demonstrated deficits in inhibitory control and abnormalities in brain processes during the performance of a visuospatial attention shifting paradigm in children with DCD.

Key words: developmental coordination disorder, event-related potentials, Posner paradigm

TRAINING TIME AND REST-ACTIVITY ANALYSIS IN NEW YORK CITY MARATHON ATHLETES
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Training can represent an important synchronizing factor that influence the circadian system (1). Exercise can be a strategy to mitigate the problems associated with transmeridian travel. Aim of this study is to verify if the adjustment of circadian rhythm induced by a training program, carried out before a transmeridian flight, can reduce the jet-lag symptoms.

Eighteen volunteers (13 males + 5 females) flew from Milan to New York and back, in occasion of the New York City Marathon, 14 of them participated to the marathon.

Individual training programs were planned for all of the 14 athletes. For a month before the flight, the athletes carried out their training divided. E (Evening), 9 athletes who carried out a training during the evening (19:00-21:00), M (Morning), 5 athletes who carried out a training during the morning (07:00-09:00). Training schedule: at least 3 times a week of 1 hour or more running training sessions (50-60% VO2max). Before the flight, the 2 groups trained for 5 consecutive days with the same intensity, in New York they all carried out the training in the morning. A third group, C (Control), was composed by 4 non-athletes who didn't trained before the flight and didn't participate to the marathon.

Rest-activity monitors were recorded by Actigraph for 3 days before the flight Milan-NewYork (PRE), for 24 hours during the first day in New York (NY1) and during the second day in New York (NY2). The data were analyzed using the actigraph software for the activity and sleep analysis. Activity analysis appraises the activity average score and the cosine peak. The analysis pointed out that activity levels in the M group are higher in New York (NY) than in Milan (PRE), while in the E group are lower. In the C group, activity levels don’t change in NY respect to Milan and are lower than in the M and E group. The before flight cosine peak values are statistically significant different between athletes training in the evening (h 16.19) and in the morning (h 12.07) in PRE data but not in NY1 and NY2. Sleep analysis, carried out to appraise Movement and Fragmentation Index (MFI), demonstrated statistically significant differences between groups M, E and C. In each group, the after flight MFI values were calculated as a percentage of the before flight MFI. In the C and M groups the MFI increases after the flight, while in the evening group the MFI decreases.

In E group the evidence of decreased activity in New York, compared to PRE data, can be explained by the fact that the evening trained subjects had a better sleep quality respect to the morning trained athletes who showed an increased activity levels in NY. Further confirmation of this findings is done by MFI index: it confirms an objective better rest after a EW flight for the subjects that trained in the evening before the travel.

Key words: developmental coordination disorder, event-related potentials, Posner paradigm

GENDER DIFFERENCE IN IRONMAN TRIATHLON PERFORMANCES
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Introduction: The gender difference in endurance performance has received considerably attention in recent decades but most of studies have focused on running (e.g. 1, 2). Physiological and morphological gender differences such as percentage body fat, oxygen carrying capacity and running economy may be responsible for gender difference in running performance. Less information is available on gender differences in swimming (3) and cycling on level terrain (4) when the body does not act against gravity. The gender difference in triathlon however, has received little attention and is poorly understood. Triathlon represents an interesting model because gender differences can be analysed for three endurance disciplines separately and also collectively. The aim of the present study is to examine the gender difference in swimming (3.8 km), cycling (180 km), running (42.2 km) and overall performances at the Hawaii Ironman Triathlon of elite males and females.

Methods: Average swimming, cycling, running and overall time performances of the top 10 males and females at the Hawaii Ironman Triathlon were analyzed from 1981 to 2007.
Results. Hawaii Ironman Triathlon overall performance time of both males and females decreased rapidly from 1981 and then plateaued to present day. The average gender difference in total time for the Hawaii Ironman Triathlon was 12.8 +/- 1.4 %. Average gender difference in time for swimming (10.5 +/- 3.1 %) was significantly lower compared with differences for cycling (P<0.05, 12.8 +/- 2.1 %) and running (P<0.01, 13.4 +/- 3.0 %).

Discussion. Since the appearance of the Hawaii Ironman Triathlon in 1981, elite male and female triathletes improved their performances in the three disciplines. However from late 1980’s, swimming, cycling, running and overall performances plateaued in both males and females despite improvements in training, equipment, and nutrition strategies. Gender difference in time performances in the three disciplines remained relatively constant during the last 25 years. The reduced gender difference in time for swimming compared with cycling and running may be explained by morphological (body fatness) gender differences. In addition, greater leg muscle mass and aerobic capacity in males compared to females may represent an advantage during cycling and running. Gender differences in the Hawaii Ironman Triathlon total performance, is unlikely to change in the future due to the biological gender difference.

References.

ACUTE AND CHRONIC EFFECTS OF CIGARETTE SMOKING ON OXIDATIVE STRESS IN TAEKWONDO ATHLETES
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The purpose of this study was to examine the oxidative stress of smoking on Taekwondo athletes. Sixteen volunteers Taekwondo athletes were recruited from 2003 Taiwan National College Games were divided into non-smoking group (n=8) and smoking group (n=8). The subjects of smoking group must be a habitual of smoker for over one year. Subjects of smoking group were asked to smoke a cigarette immediately after competition. Blood sample were obtained before and after competition. The results showed that malondialdehyde (MDA), superoxide dismutase (SOD), glutathione peroxides (GPx), creatine kinase (CK), and the lactate dehydrogenase (LDH) concentrations were no significant differences between groups before and after competition. It was found that all of these values were out of the normal range compared to normal population. It is concluded that there were no acute and chronic effects of smoking on oxidative stress in Taekwondo athletes. This might be a high oxidative stress background before competition.

EFFECTS OF 12 WEEKS BADMINTON TRAINING ON HEMATOLOGICAL INDICATORS, MORPHOLOGICAL CHANGE OF ERYTHROCYTES, AND MUSCLE DAMAGES
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The purpose of this study was to investigate the effects of 12-weeks badminton training on hematological indicators, morphological changes of erythrocytes, and muscle damages. Thirty-five healthy middle-aged women volunteered for this study and participated in the badminton exercise for 1hr a day at 60~70% intensity of HRH(Heart Rate Reserve) 4 times per week. Blood samples were collected pre-exercise, immediately post-exercise and recovery 1hr in antecubital vein before and after training. RBC (Red Blood Cell), WBC (White Blood Cell), CPK(Creatine Phosphokinase) and LDH(Lactate Dehydrogenase) levels were increased significantly and these changes were continued after 12-weeks training. Hb (Hemoglobin) and Hct(Hematocrit) levels were not changed by a bout of exercise and 12-weeks training. ESR (Erythrocyte Sedimentation Rate), PBS (Peripheral Blood Smear) morphology and ammonia levels were increased significantly by single bout of exercise. However, these changes were not detected after 12-weeks training. Briefly, although the reduction of CPK, LDH levels were not found, reduction of PBS morphology, ESR and reduced amount of ammonia levels were detected, which are considered direct indicators as hemolysis. These results demonstrate that the magnitude of hemolysis were reduced by 12-weeks exercise training.

THE INFLUENCE OF INGESTION GLUCOSE BEFORE GRADED EXERCISE TO EXHAUSTION ON SALIVA IGA CONCENTRATION IN HYPOXIA AND NORMOXIA ENVIRONMENT
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Purpose. Exercise and environment stress might induce immune system responses. The study was to examine the effect of glucose drink before exercise in hypoxia and normoxia environment on saliva Iga concentration. Methods: Four male college students completed 4 experimental trials. Subjects were asked to ingest either glucose drink (75g/250ml) or placebo drink 30min before exercise on a cycle ergometer either in the hypoxia or normoxia environment. The exercise intensity initiated from 75W and increased 25W every 3 min until volitional fatigue. The hypoxia environment was set at 15%O2 in a normal baric hypoxia chamber. Saliva samples were collected for 2 min at fasting, before exercise, post exercise and 1 hour post exercise. Results: There were no significant differences in saliva Iga concentrations and saliva flow rate between trials. Conclusions. The current data suggested that saliva Iga concentrations did not affect either ingesting carbohydrate or graded exercise to exhaustion in hypoxia environment.

MAGNETIZATION TRANSFER CONTRAST MR IMAGING OF PATELLAR CARTILAGE UNDER SIMULATED WEIGHT BEARING
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Introduction
Magnetization transfer contrast (MTC) is an imaging method which creates issue contrast in a different manner as T1 and T2 relaxation time by the exchange of magnetization between macromolecular protons and bulk water, via cross relaxation or chemical exchange. Therefore, it may be beneficial to evaluate articular cartilage using MTC because it has abundant macromolecules, and its function should be specified by macromolecular protons. The purpose of this study was to evaluate the quantitative effects of MTC under weight bearing within the patellar cartilage.

Methods
This study comprised five healthy volunteers and 10 knees. MR imaging was performed with a 0.2T MR imaging system with a knee coil. Gradient recalled echo (GRE) and GRE-MTC sequences to obtain transverse axial images of patellar cartilage were performed to all subjects for 90sec. GRE sequence was TR=500msec, TE=14msec, FA=30deg. The off-resonance sinc pulse was set at a frequency offset of 1.2KHz from the free proton resonance with a duration of 10msec and an amplitude of 12.7x10-6T as preparation for MTC images. GRE and GRE-MTC images were obtained with and without weight bearing. The volunteers performed 15kg simulated weight bearing using special device in the MR machine. The quantitative analysis of patellar cartilage was performed with Ms/Mo between with and without weight bearing. Ms/Mo was calculated as follows: Ms/Mo = SNR with MTC / SNR without MTC, where SNR is signal-to-noise ratio.

Results
Medial and lateral facet of patella cartilage had mean Ms/Mo of 0.90±/-0.03 and 0.89±/-0.05, respectively, before weight bearing. The Ms/Mo of lateral facet with simulated weight bearing decreased by 0.83±/-0.05 and recover by 0.89±/-0.05 and 0.9±/-0.06 at rest after weight bearing (0&8min). On medial facet, Ms/Mo also changed by 0.87±/-0.05, 0.88±/-0.05 and 0.88±/-0.04. However, these changes were not significant (p>0.05).

Discussion/Conclusion
We investigated the quantitative effect of MTC in patellar cartilage to evaluate the influence of weight bearing. The Ms/Mo in patellar cartilage slightly changed between with and without weight bearing in healthy subjects. This result suggests that water content or hydrate states within patellar cartilage changed by weight bearing. The MTC technique would be a promising method to elucidate the effect of weight bearing on articular cartilage.

MOUNTAINBIKE INJURIES IN WORLD-CUP AND RECREATIONAL ATHLETES
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Introduction
Within the disciplines of bicycling, the popularity of mountain-biking has increased the most. Despite the rising sales and growing numbers of participants, little is known about the discrepancy between typical injuries associated with this sport in world-class and recreational athletes. Therefore the present study investigated the incidence and frequency of injuries in moutainbike sports among competitive and recreational athletes.

Methods
In a retrospective study mountain-bike athletes were interviewed by means of a standardized questionnaire with regard to sports injuries and damages within the previous two years. The study was carried out in the context of world cup racings (Austria, Spain, Switzerland) and public sporting events (Germany). An injury was defined as one preventing the athlete from at least 1 day of mountain biking. In addition subjects were requested to describe the situation that led to the accidents and the protective equipment regularly used. The evaluation of time relative injury-rate was carried out under consideration of class and competition discipline.

Results
Overall 75% of the distributed questionnaires returned completed by 107 World-Cup (39 female, 67 male, 23.1y) and 134 recreational athletes (17 female, 117 male, 27.4y). Approximately 80% of the World-Cup and about 50% of the recreational athletes reported at least one severe injury. World-Cup downhill athletes (1.08 injuries/1000 h) show a more than doubled time-related injury-rate in comparison with Cross-Country athletes (0.39 injuries/1000h). Injuries of the lower (47% vs. 35%) and upper extremity (40% vs. 41%) show comparable prevalence for competitive and recreational cyclists. In the group of recreational athletes open wounds dominate, competitive athletes demonstrate a significant higher fracture-rate (p<0.01). Within the World-Cup athletes head injuries stand out (n=40).

Conclusion
Although World-Cup participation does not result in essential injury-increase, the downhill discipline is characterized by a higher injury risk. Presumably in view of the performance orientation, there is a higher degree of risk readiness. Despite the riding performance and the obligatory safety equipment a remarkable number of bone and head injuries results. In recreational athletes injury preventive measures should address personal factors like risk readiness and anticipation of certain risk situations, and improve the acceptance of protective wear.

Poster presentations (PP)
PP-S001 Sociology 1

A PROPOSAL TO IMPROVE THE MEASUREMENT OF RELATIVE AGE EFFECT IN SPORT
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Recently, a growing body of research has considered the relationship between athletes’ month of birth and their achievement at the highest level of practice. These studies are based on the concept of ‘relative age effect’ (RAE). This term refers to the difference in age between children in the same age group. Thus, although a child born in January is 11 months older than a child born in December of the same year, both children are grouped in the same age category in an age-based system with January 1st as cut-off date. The RAE has been viewed as discriminating against players born late in the competition year. Basically, differences between children who belong to the same age category but who differ in age up to almost one year could result either in a volunteer dropout of the youngest players, or in an official selection of the oldest players to participate to high level training. Those two phenomena are likely to facilitate an elite career for older players. Among elite adults, this process is reflected by a similar
imbalance in players’ birthdates distribution, with an over-representation of players born during the months following the cut-off date, and an under-representation of players born during the months preceding it. In the literature, the presence of the RAE is determined by testing whether there is a difference between the expected theoretical number of players and the observed number. The theoretical number being calculated from the national population from which the sample of players is taken. This implies therefore that, a priori, we postulate that the distribution of licensed of a particular sport’s dates of birth is the same as the one of the national population. Indeed, apart from some very rare exceptions, the future elite players come from the population of licensed. In order to have a true discrimination, the distribution of the licensed player’s population must be identical with the distribution of birth among the global population of the country. Nevertheless, this assumption has never been verified yet. Using data from the whole French basketball licensed players (n = 443,711), we found a statistically significant RAE.

Those results indicate that the traditional method to evaluate and interpret the RAE cannot always be effective and introduces bias in the conclusions on the phenomenon. Indeed, in the case of French basketball, an unequal distribution already exists among the whole of licensed. In order not to introduce bias into the analysis of the RAE, it is proper to take as the expected theoretical distribution, all licensed rather than the global population of the country studied.

If an unequal distribution already exists among the whole population of players, it is normal by mimicry that one finds it again among elite players. Taking into account the global population of the country, one could be led to hastily conclude that there was discrimination due to the system of recruiting to professional pathways.

ALCOHOL USE, ALCOHOL-RELATED PROBLEMS, PSYCHOLOGICAL HEALTH, AND SPORT PARTICIPATION IN HONG KONG CHinese ADOLESCENTS

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Recently, there has been growing concern about the alcohol drinking habits of adolescents involved in sport, relative to their non-sporting peers. Lorente, et al. (2004) for example, demonstrated that participation in sports (particularly team sports) was associated with increased alcohol consumption in a sample of French teenagers. Similar results have been reported in other Western populations (e.g., Peretti-Watel, Beck, & Legleye, 2002), but none have focused on Eastern populations in which attitudes to alcohol use and sport participation may be very different. Thus, one of this study’s primary aims was to examine the relationship between sport participation and alcohol use in a sample of Chinese adolescents.

Adolescents (N = 1081), from nine secondary schools in Hong Kong, completed a battery of questionnaires examining behavior, health, and beliefs, in classroom settings. The sample was cross-sectional and represented a wide social range. The data were collected as part of a larger study investigating the social behaviors and psychological health of Chinese adolescents. All participants completed a Chinese language version of the Social and Health Assessment (Weissberg, et al., 1991) in normal (quiet) classroom settings and gave informed consent prior to completing the questionnaire pack. A trained research assistant clarified the meaning of questions when necessary.

Contrary to previous research in Western populations, no difference was found between high and low sport participation for alcohol use. Both groups demonstrated equally low alcohol index scores that suggested relatively low levels of alcohol consumption (i.e. no more than one or two drinks in the past thirty days). Despite the low levels of alcohol use, sport participation was associated with binge drinking and alcohol-related problems were more frequent in the high sport participation group, and high alcohol intake was associated with increased probability of alcohol-related problems. Adolescents were more likely to be drunk, get involved in fights, and be arrested if they frequently participated in sport. This finding is novel and suggests that negative reactions to alcohol use may vary with frequency of sport participation. Greater frequency of alcohol use was correlated with pro-aggressive beliefs and poorer psychological health. Girls tended to report poorer psychological health than boys. Boys believed that aggression was more acceptable than did girls.

References

A SURVEY ON BREACHES OF MANNERS AMONG JAPANESE GOLFERS -COMMENTS OF GOLF COURSE MANAGERS

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[Introduction]
The R&A Golf Rules declare the importance of etiquette and manners as the “spirit of golf” at the beginning of Chapter 1. The rules also state that those who have acted in a way considered as a serious violation of etiquette should be expelled from the game as a penalty according to Article 33-7. In light of these facts, this study was conducted to clarify the current status of golfers’ observance of etiquette and manners, which should indicate their essential quality. More specifically, a questionnaire survey was conducted among golf course managers across the country to have them answer two questions: “Does a breach of manners often occur these days?”, and “If so, what does such a breach involve?”

[Methods]
A questionnaire was mailed to 1,893 golf courses in Japan. Responses were collected from 902 courses (response rate: 47.6%).

[Results]
The answer “A breach of manners often occurs these days” accounted for 80.8%, and the total number (M.A.) of breach cases was 1,236 (cumulative). The collected responses were all categorized and summarized. The most common behavior mentioned as a breach included “slow play” (25.0%), “violation of the dress code” (21.0%), followed by “not repairing divots and ball marks” (10.8%), “filtering of cigarette butts and waste” (9.9%), “not repairing the bunker” (5.3%), “smoking during the game or in a non-smoking area” (4.9%), “driving the golf cart onto the fairway or in a reckless manner, breaking or overloading the cart” (2.8%), “cancelling at the last minute or without notice in the case of rain” (2.4%), “being late for the start time” (2.3%), “shooting into the preceding group” (2.3%), “golf manners in general” (1.8%), “using cell-phones during the game or in a prohibited area” (1.5%), “not repairing the turf” (1.1%), “individual practice on the
A total of 193 people responded to the questionnaire (14.5% response rate).

<table>
<thead>
<tr>
<th>Research subjects</th>
<th>- men: 75.1%, women: 24.9%.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Age)</td>
<td>- 20-29: 38.9%, 30-39: 30.6%, 40-49: 21.2%, 50-59: 6.7%, 60-69: 1.6%.</td>
</tr>
<tr>
<td>(Academic background)</td>
<td>- university graduate: 47.2%, high-school graduate: 18.1%.</td>
</tr>
<tr>
<td>(Instructing career)</td>
<td>- 0-5 yrs: 28.0%, 6-10 yrs: 26.9%, 11-15yrs: 14.0%, 16-20yrs: 11.9%, over21yrs: 18.6%.</td>
</tr>
<tr>
<td>(Instructing item)</td>
<td>- training: 50.3%, swimming: 34.7%, aerobic dance: 11.4%.</td>
</tr>
<tr>
<td>(Working status)</td>
<td>- permanent employee: 78.2%, non-permanent employee: 21.8%.</td>
</tr>
<tr>
<td>(Daily instructing hours)</td>
<td>- 0-5 hrs: 78.8%, 6-10hrs: 9.3%.</td>
</tr>
<tr>
<td>(Early attendance)</td>
<td>- yes: 88.6%, no: 9.8%.</td>
</tr>
<tr>
<td>(Late shift)</td>
<td>- yes: 86.5%, no: 13.0%. (Night duty) - yes: 10.4%, no: 83.4%.</td>
</tr>
<tr>
<td>(Day off)</td>
<td>- irregular: 37.8%, Sunday: 22.3%, Monday: 17.1%, Tuesday: 4.7%, Wednesday: 3.1%, Thursday: 7.3%, Friday: 3.1%, Saturday: 4.7%.</td>
</tr>
<tr>
<td>(In-house health checkup)</td>
<td>- provided: 83.4%, not provided: 16.6%.</td>
</tr>
<tr>
<td>(Retirement age system)</td>
<td>- present: 79.3%, not present: 20.7%.</td>
</tr>
<tr>
<td>(Is your job meaningful?)</td>
<td>- “Yes”: 81.9%, “No”: 6.2%, “Neutral”: 11.9%.</td>
</tr>
<tr>
<td>(Until when do you think you can continue the job?)</td>
<td>- “Until my 60s”: 40.4%, “Until my 50s”: 23.8%.</td>
</tr>
<tr>
<td>(What about job prospects?)</td>
<td>- “Further development”: 45.1%, “Seeking another direction”: 39.4%, “Maintaining the status quo”: 11.4%, “Declining”: 11.4%, “No idea”: 0.5%.</td>
</tr>
<tr>
<td>(Are you thinking of a job change?)</td>
<td>- “Yes”: 17.1%, “No”: 45.1%, “Neutral”: 35.2%.</td>
</tr>
</tbody>
</table>

It was found that 72.5% of the commercial sports leaders had some qualifications. “Fitness Leader” of the Japan Health Promotion & Fitness Foundation was the most common qualification, followed by “Fitness Practice Leader” of this foundation, “C-class Instructor” and “CPR” of the Japan Red Cross Society, “Swimming Teacher” of the Japan Sports Association, “NSCA-CPT” of NSCA Japan, “Teacher’s Licenses of Health and Physical Education of Secondary Schools” of the Ministry of Education, Culture, Sports, Science and Technology, “ADI” (Aerobic Dance Instructor) of the Japan Aerobic Fitness Association, “Sports Programmer” of the Japan Sports Association etc. In addition, more than half of them (53.9%) answered that they were going to obtain some qualification in the future.

MARKETING AT SPORTING GOODS SHOPS IN JAPAN -RELATIONS WITH AGE OF OWNERS AND NUMBER OF EMPLOYEES-

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Introduction

In recent years, the Japanese sporting goods retailing industry has been suffering economic slowdown (Matsushita,1998). We previously presented the current status of sporting goods shop management in Japan and its challenges (Horie,et al.,2006)(Kita,et al.,2006). This study was intended to characterize the marketing strategies of sporting-goods stores in Japan based on the age of owners and number of employees.

Methods

From the 17,949 retail sporting goods shops listed in Japan, 880 shops were selected at random for this survey. Survey period was June 1 through August 31,2005. The questionnaire was delivered by mail and responses were collected by mail. Responses were collected from 180 sporting goods shops (percentage of respondents: 20.5%). All data were analyzed using unpaired t-tests. All in cases p<0.05 was considered statistically significant.

Results

The major findings are shown below:

Owners aged 49 or younger revealed a significantly higher rate of using "posters" as a means of advertisement than those aged 50 or older. (p<0.05) Owners aged 49 or younger showed a significantly higher rate of using the "Internet" as a means for market research than those aged 50 or older. (p<0.05) Owners aged 50 or older demonstrated a significantly higher rate of not conducting market research than those aged 49 or younger. (p<0.01) Owners aged 49 or younger revealed a significantly higher rate of using "others" as a means for market research than those aged 50 or older. (p<0.01) Owners aged 50 or older showed a significantly higher rate of emphasizing the "trend of leisure" as a standard for stock composition than those aged 49 or younger. (p<0.01) Owners aged 49 or younger...
demonstrated a significantly higher rate of answering that they would “increase the volume of stock procurement” as a measure for profit increase than those aged 50 or older. (p<0.01) Shops with 30 or more employees were noted to show a significantly higher rate of using “newspapers” for market research. (p<0.01) A comparison of shops per number of employees identified significant differences in the rates of using “newspaper leaflets” (p<0.01) and “direct e-mails” (p<0.05) as a means of advertisement. It is our future task to conduct more focused, in-depth research based on these results.

References.

THE ROLE OF THE SPORT AND PHYSICAL EDUCATION IN THE CONTEMPORARY SOCIETY FROM THE GLOBALIZATION PHENOMENON VIEW POINT

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Introduction
From the overall view point, in the 58/5/2003 Resolution of the U.N.O. it is said that: sportive activities represent an ideal field to promote and develop the motivation and self exceed of the individual; sport represents an opportunity of each individual to evaluate himself, sport facilitates each person to become the only responsible for his own future, and give it a mean; sport will be the mirror of life, with the perspective of the human continuity, the tolerance and understanding for a world with universal values of peace, friendship and collaboration.

Content, methodology
All the activities proceed all over the world in 2005 on the occasion of The International Year of Physical Education and Sport Concept promotion, and after, emphasized the contribution of the two activities in order to achieve the U.N.O. objectives for development. The decree of the international year created the unique opportunity to convince the political and social area the power / role of the sport to capture the attention and to rally the individuals, organizations, communities and common public to accomplish objectives.

We conceived our approach as an applicative and sociological research, materialized in answers to the following questions:
- who has the responsibility to promote the Physical Education and Sport valences?
- which are the objectives concerning the professional training of the domain specialists in order to comprise the benefits of the Physical Education and Sport in social life?
- what is the trend of the domain in the globalization politics?

Conclusions
- promotion responsibility belongs to the domain specialists, all the specialists from other domains that serve physical education and sport domain: teachers doctors, psychologists, sociologists, nongovernmental and governmental institutions for sport and those with competence in physical education and sport area;
- the objectives of the professional training are reflected in the globalization concept, where all the social life domains will be approached from their universality perspectives;
- the reflection in social plan is materialized in the strategy of changing the battle field to the ground field.

References.
2. Memorandum of understanding, (2005), International Olympic Committee;

FAIR PLAY AND GLOBALIZATION IN SPORTS

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In our age, what are understood from globalization are reduced functions of national governments, disappearance of the borders and most importantly free circulation of the capital in the international arena without encountering any obstacles. As a result of these, the materialist world-view displaces all manners of humane constituents in the whole world and in all areas of the culture. Besides, considering the identity issue and the loneliness of human beings of our age, sports is not an apparent reality, instead it can be called “image producing”. These socio-cultural changes have removed the contents of Fair Play concept which is an Olympic ideal. Concepts like peace, brotherhood/sisterhood, sportsmanship, friendship, compliance with the rules, not taking advantage of the opponent’s disadvantage, joy of playing with the opponent instead of defeating replaced the greed of money and profit, professionalism, doping, trade, politics, total circulation and rating concerns and trade marking. Also as a result of multi-national companies’ interference in the sports arena, winning at the cost of whatsoever, getting more profit, competing against others instead of themselves, being superior, etc. has replaced the fair play manner radically. Ideology of globalization in the direction of sport has lost it’s characteristics of being a demonstration of peace, brotherhood/sisterhood, and friendship. China being the host of 2008 Olympics where huge violations of human rights are seen, displays how globalization negatively affected the Olympic soul. Because, China with a population of 1 billion 250 thousand, whets the sports industry’s appetite. Globalization is not only causing the fair play manner to be sacrificed for economic profits sake, but also as signs the nationalism to the use of market economy. Globalization endangers the “start equity” in sports at the beginning. In this context, fair play concept should be considered in a macro level, instead micro. Considering fair play in a micro level means to abstract the sports from its economic dimension. In this perspective, fair play concept should be considered as pluralistic, instead of particularistic. Considering fair play in a pluralistic manner will play a significant role in removing inhuman exploitation in sports industry. To permit sports indus-
try workers to organize themselves into a labor union, not to keep workers salary low, to comply with daily working hours are important provisions for the operator of sports industry. The consumers of the sports industry also have important responsibilities. Sports consumers should make sure that products or services that they get are produced under social conditions.

**EDUCATION AND WELFARE PROVISION IN PROFESSIONAL FOOTBALL ACADEMIES IN EUROPE: SOME SOCIOLOGICAL COMMENTS**

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In the wake of England’s failure to qualify for the 2008 European Championships in Switzerland and Austria, an abundance of ex-players, managers, ex-managers and journalists have clamoured to offer their thoughts and ideas on the reasons behind the seemingly poor qualifying campaign. In this regard, some critics have pointed towards the shortcomings of the professional football academy system in England at producing the necessary talent, suggesting that the English academy system should take on the form of the academy systems around the world, particularly those in Europe. This paper, therefore, seeks to examine how these wider European developments are impacting upon the day-to-day operations of professional football academies in England, and especially the educational and welfare provisions young players receive therein. In doing so, the paper provides a comparative analysis of English and other European professional football academy systems.

**“PROMOTING GIRLS’ SPORTS PARTICIPATION” - A QUESTION OF POWER AND NORMALISATION**

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Sport is an essential identity-producing arena and gender is a crucial part of the identities shaped and formed there. Previous research claims that the relationship between women and sport appears to be more problematic than that between men and sport, since sport is still discursively positioned as a masculine practice. In Sweden, being a member of the sports movement is almost as common for girls as for boys. More than two out of every three boys and every other girl between the ages of 7 and 15 is a member of a sport club. The sports movement is considered to be a significant institution for socialisation - not the least gender construction.

Regarding gender as something that is produced and enacted through discourses, prompts an investigation into the discourses that form, and are formed by, the practice of sport. Inspired by feminist Foucauldian theory, the aim of the research is to analyse the discursive construction of “girls” in a large-scale government initiated sports project. Local sport clubs were in this context encouraged to work with projects that “promoted girls’ sports participation”, for which they could apply money. Project applications written by sport clubs in three traditional male-dominated sports constitute the empirical material of the study. The study’s central questions, as well as the analytical ones, are: what does “promoting girls’ sports participation” mean; what is to be done and why? How are girls portrayed and what kinds of girls are targeted in the projects?

The analysis shows that girls and their participation in sport are portrayed in a rather homogenous way: girls are something “special”, and that so far their participation in these male dominated sports has been limited. This seems to motivate a separation of girls and their sports from “ordinary” activities, which implicitly means activities for boys.

Using Foucault’s concept of normalisation, distinguishing girls by accentuating their specialty make sense. Forming categories and ascribing them certain characters, interests and competences, in the way it is done in sports projects, makes these projects - and the sport itself - possible and meaningful. But in practice, this normalisation could be a way of governing and disciplining individuals in certain directions, i.e. a form of modern power, in Foucault’s words. One consequence of normalisation is that projects aiming at “promoting girls’ sports participation” target certain girls and the resulting category of girls is attributed certain features. The group of girls is thus stereotyped and homogenised; something that limits the possibility of alternative and flexible identities and makes other types of girls invisible. From a feminist point of view, these are crucial issues.

**THE ASSESSMENTS OF SPORT MANAGEMENT STUDENTS’ VIEW TOWARDS THE RELATIONSHIP BETWEEN SEX ROLE STEREOTYPES AND REQUISITE MANAGEMENT CHARACTERISTICS**

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*Gazi University, Turkey*

The purpose of this study was to explore undergraduate female students’ assessments towards relationship between sex role stereotypes and requisite managerial characteristics. 194 undergraduate female sport management students were participated in this study.

Turkish version of Schein Descriptive Index (Schein, 1973) was used to evaluate undergraduate female sport management students’ view about sex role stereotypes and requisite managerial characteristics. The instrument has three forms containing the same descriptive terms and instructions, except that one form asked for a description of women in general (Women), one for a description of men in general (Men), and one for a description of successful middle managers (for this study, this form asked for a description of successful middle sport managers). The ratings of the descriptive terms were made on a 5-point scale, ranging from 1 (not characteristic) to 5 (characteristic) with a neutral rating of 3 (neither characteristic nor uncharacteristic).

Participants filled out only one form of the index. The index was given to 194 female sport management students at their regular class hours. Completed questionnaires were included in the study.

Intraclass correlation coefficients from two randomized-groups analysis of variance technique was used to determine the degree of similarity between Men and Mid-level Sport Managers, and between Women and Mid-level Sport Managers. The classes (groups) were the 92 descriptive items. The same procedure was applied for each of the four grade levels to learn if grade levels moderate these relationships. Pearson Product correlations were computed to determine the linear relationship between the mean ratings among four grade levels.

The results of ANOVA and the intraclass correlation coefficients indicated that there was a significant resemblance between the ratings of Men and Mid-level Sport Managers ($\rho = .82$, $p < .01$) and Women and Mid-level Sport Managers ($\rho = .84$, $p < .01$).

Also, there was a significant resemblance between the mean ratings of Men and Managers ($r’$grade1= .80, $r’$grade2= .83, $r’$grade3= .79, and $r’$grade4= .83, $p < .01$), and Women and Managers ($r’$grade1= .82, $r’$grade2= .85, $r’$grade3= .86, and $r’$grade4= .80, $p < .01$) in terms of
grade levels. Pearson Product correlations were computed to determine the linear relationship between the mean ratings among the four grade levels. 

The results revealed that successful middle sport managers are perceived to possess characteristics, attitudes, and temperaments more commonly ascribed to women in general than to men in general by the subjects. There are resemblances between the ratings of Men and Mid-level Sport Managers and between the ratings of Women and Mid-level Sport Managers among female sport management students, and also among grade levels. It might be concluded that sport management female students do not view any gender differences regard to requisite managerial characteristics in terms of sex role stereotypes. As a conclusion, female sport management students perceive management as a unisex profession.

DESIGN OF A SOCIO-EMOTIONAL QUESTIONNAIRE FOR YOUNG SOCCER PLAYER

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To carry out the first step of any research, which is no other than the approach to the question or the identification of a need, we have taken into account the illusion which day by day can be seen on a football ground. The need is no other than improve the approach of plans to help young footballers from big team’s football base.

Sometimes sport success or failure, due to certain abilities, is based on particular factors related, to begin with, the personal and familiar surroundings, and secondly, the condition in which he develops his preparation. This factors can have a huge influence on the sports performance and development, and also on the future elite sportsman evolution (Donohue, Miller, Crammer, & Cross, 2007; Holt & Tom, 2006; VanYperen, 1995). Garcia and collaborators go a step further, pointing that the surrounding conditions are as crucial as the genetic factors (Garcia, Campos, Lizaur & Bablo, 2003).

Among all the requisites which determine that a young sportsman plays on the main division, only and not always aspects as technical-tactical, physical and psychological could be controlled. On the other hand the socio-emotional aspects which we believe are as important as the above named are ignored. Consequently, the purpose of this work is to design a tool that detects and controls the socio-emotional factors that could influence the young footballer’s progression on sports.

Following the identification of the need, the current project tries to cover it specifying and controlling these parameters traditionally forgotten. Therefore, we have prepared a socio-emotional questionnaire of 42 items which inform us of the player’s social environment and his ability to handle the problems on such an environment. The questionnaire is comprised by the following dimensions:

1. Social class.
2. Family Relationship.
3. Relationship with the coaching staff.
4. Relationship with teammates.
5. Relationships with friends or peers.
6. Relationship to the school environment.
7. Partner Relationship.
8. Stress.
10. Emotional Intelligence.
11. Moral development.
12. Type of residence.
13. Public/Spectator

References:


EXPERIENCING OF PAIN AND INJURY AMONGST PORTUGUESE PROFESSIONAL FOOTBALL PLAYERS

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Modern sport is characterized by a growing competitiveness which according to Waddington and Murphy (1992) is associated with an increasing politicization and commercialization of sport. However this competitiveness has significant health cost for athletes, more precisely in the form of pain and injuries resulting in overuse and recurrent injuries that through time can become permanent. Athletes are enmeshed in large networks of interdependency thus being interdependent with a large number of people (such as coaches, medical staff, supporters, club boards and other players). This will probably compel them to act in ways that “they would not act except under compulsion” (Elias, 1980: 102). Since they are involved in multipolar relationships athletes feel constrained to continue practicing and competing independently of their physical condition. According to Waddington (2006) athletes with time come to accept pain and injuries as something normal and a part of the life of an athlete.

The main goal of this paper is to examine the experiences of pain and injuries of Portuguese football players. It was also our intention to understand why they continue practicing and competing while injured. The data was gathered through semi-structured interviews. Eight Portuguese professional football players were interviewed (three of them played in Liga de Honra and five played in Superliga). The interviews after being transcribed were submitted to content analyses.

All players mentioned that they had, at least once, played while in pain and injured. They mentioned taking pain-killing injections in order to continue playing for the good of the team. Due to their direct or indirectly interaction with other members that belong to the club structure, players refer that those members try to encourage them to play and practice with pain and injuries. In many cases the players are the ones who try to pressure the medical staff and the manager to continue playing in spite of pain and injuries and being physically...
diminished. They feel compelled to play due to the nature of their profession. Amongst the reasons to continue playing while in pain or injured is the fear to lose their place in the team, which may have repercussions upon their contracts. The discourse of our interviews is in accordance with what the literature mentions to be a normal practice at this level of competition. There is a latent ‘culture of risk’ which tends to normalize playing and practicing while in pain or injured, which can have important long term health risks for the athletes.

References:

YOUNG PEOPLE AND FREE TIME: REPRESENTATIONS AND PRACTICES

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Free time constitutes a central issue in the social dynamics sphere which shapes the contemporaneity of young people Larson & Seeperssad, 2003). The attitudes and behaviour shown during this time are determinants in defining their education and development (Marshall et al., 2004; Parr & Lashua, 2004). The purpose of this study was to identify young people’s representations of free time, to study the activities carried out during this time and examine the implications for their education. The study was carried out on 70 young people attending 9th year in state schools in Aveiro and Coimbra using semi-structured interviews. The technique used for data analysis was content analysis. (Strauss & Corbin, 1998). The elaboration of the categories had been defined a priori and a posteriori. (Bardin, 1977). The computer programme of qualitative data analysis QSR NVivo 7 was used in coding the transcripts of the interviews.

Free time is the personal time which is left in the use of the individual. It is the time when the values of the activity are those of the individual and not the ones of the group. (Parr & Lashua, 2004). Free time is defined as a personal pleasure which is not public (Parr & Lashua, 2004). Free time is the time which the individual has when he can do what he wants to do. Free time is a personal task which is not imposed by the group (Parr & Lashua, 2004). The individual can choose what he does in his free time (Parr & Lashua, 2004). Free time is the time when the individual can follow his own desires and not the desires of the group (Parr & Lashua, 2004). Free time is the time when the individual can do what he wants to do (Parr & Lashua, 2004).

Most of these free time activities are unstructured, carried out in the absence of adults, who coordinate and orientate them. The predominant activities are watching TV, computer usage (video games) / Internet, sport, and listening to music. The main reasons for these activities are fun and the development of new skills, which are carried out alone, with friends, with family and in the community. These trends should be considered by families, schools and other responsible institutions in order to adjust their multiple forms of intervention, taking into account young people’s interests, but following formative and educational principles.

References.

ATP AND WTA WORLD RANKINGS: A STUDY OF THE TOP PLAYERS TENNIS LONGEVITY
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This paper analyses the duration of top tennis players’ careers using data from the Association of Tennis Professionals (ATP) on male top players from 1973 to 2007 and from the Women’s Tennis Association (WTA) from 1998 to 2007. To do so, several hazard models are adopted to take into account the recurrences observed when the same player is reclassified top player. The results show that the most important factors are the player’s total career prize-winnings, singles matches won and the individual’s height, in addition to the number of recurrences registered at the top of the rankings. Furthermore, gender plays a role. We also find some evidence that US players have longer careers than European and Australian players. The policy implication is derived.

PHYSICAL EDUCATION AND FOLK DANCES COURSE IN VILLAGE INSTITUTES CURRICULUM IN TURKIYE
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The struggle to solve the problems of the country through educational institutions existed both before and after Republic period. The so-called educationist’s project Village Institutes were founded to substitute for traditional establishments. The principles of new concept of education were different from these of the traditional, which was an extension of the revolution launched by superstructural factors. When the first Turkish Government was founded during The War of Independence (1919-1922), education was one of the primary issues to receive attention. The renovation and modernization of Turkey’s educational system was planned to be carried out by considering our own social and cultural features. The problems about education were not neglected even in most critical periods of the war. After the victory the founders of the new country were naturally able to make more energetic efforts to improve Turkey’s much neglected educational system. One of these enormous effects is exactly the experience of Köy Enstitüleri (The Village Institutes). This project has been reflected the revolutionary character of the Republican Reforms. The teaching philosophy these institutes has been described on the basis of learning by doing.

21 Institutes were founded in different regions in Türkiye for developing rural areas. Village Institution Curriculum was prepared by Türkiye ministry of education in 1943. Courses were configured three main titles in the Village Institution Curriculum. These were Agriculture Courses and Practices, Technical Courses and Practices and General Information Courses. Physical Education and Folk Dances Course was one of the courses in General Information Courses. This course was took placed four years and 184 hours in Village Institution Curriculum.

Village Institutes founded in 1937 was closed down in 1954. 17.341 teachers, 8.675 educators and 1.599 health officers were trained until 1954 when Village Institutions were closed. So many poets, authors, researchers and educators were graduated from these institutions. The Model of Village Institution has been accepted as a great gift not only for this nation but also for the world education. UNESCO has proudly stated that Village Institution is an education system being an example for all the developing countries. In this research as well, the content, objects and applied dimension of Physical Education and Folk Dances Course which is one of the courses in the Village Institution Curriculum and the effects of this course that have on students in that period will be analyzed with the relations done one to one. For this purpose, prepared a interview form and had interviewed Village Institution graduates who have lived in Eskiehir.

ABUSED ATHLETES’ PERCEPTIONS OF THE COACH-ATHLETE RELATIONSHIP
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The coach-athlete relationship is often one of the most important and influential relationships experienced by a young athlete (Gervis & Dunn, 2004). While coaches may have many positive influences on young athletes, emerging literature also indicates problems of abuse. In fact, recent research indicates that athletes are not immune from experiences of physical, sexual, and emotional abuse (Kirby & Greaves, 1996; Stirling & Kerr, 2007). Furthermore, the power of the coach is thought to be a contributing risk factor in abusive relationships (Bringer, Brackenridge, & Johnston, 2001). The purpose of this study therefore was to investigate abused athletes’ perceptions of the coach-athlete relationship. More specifically, we were interested in abused athletes’ perceptions of the power held by the coach, and the influence of this power on an athlete’s experience of abuse. Semi-structured interviews were conducted with 9 athletes who had experienced at least one form of abuse; 4 retired elite female gymnasts and 5 retired elite female swimmers. Consistent with previous research, the participants reflected upon the significant power held by the coach over the athlete. The findings contributed to existing literature by revealing specific ways in which the coach’s power influenced the athletes’ experiences of abuse and their ability to report incidences of maltreatment. These findings are discussed and recommendations are made for abuse prevention and future research.

References.
COMPARISON OF SCORING IN THE 2004 ATHENS OLYMPIC SINGLE AND DOUBLE TABLE TENNIS

Barmaki, S., Gharakhanlou, R., Khazani, A., Kaseb, F., Ziaee, N.

The aim of the present research was the comparison of scoring by defensive and offensive tactics and techniques, and also studying the importance of defense and the role of service points in world-class table tennis. The collected data for this research is related to 172 table tennis players who participated in the 2004 Olympic Games. This data was collected through information that was given to Iran’s table tennis representatives. Based on this, the points gained using different tactics and techniques by male and female athletes were studied and compared. Results show that 34% of points were gained through offensive techniques and tactics (after 3 shots were played), 33% through defence and counterattacking, 25% through the third shots and serving, 8% through other shots in sing table tennis, so those show that 38% of points were gained through defense and counterattacking, techniques and tactics, 31% through offensive (after 3 shots were played), 24% through the third shots and serving, 7% through other shots in double table tennis. The same results where achieved for the top 4 players. Also there was significantly in defensive tactics in and counterattacking techniques in sing table tennis of top 4 players of men than women (p<0.05). No significant differences were found in other items between women and men groups (p>0.05).

Based on these statistics, coaches and players should strongly consider the defensive tactics and serving techniques along with the effective offensive tactics in order to reach world-class success.

References.

THE SOCIAL ASPECTS OF THE POPULAR RUNNING RACES OF THE CITY OF CURITIBA/BRAZIL

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Introduction.
Curitiba is a city located in the south of Brazil with 1.800.000 inhabitants. Since the 70s this city has public policies aiming to the improvement of quality of life of its population through special programs which include sports and leisure activities. One of the programs has been the promotion of running races in a regular basis annually for the city athletes and general public as well. The races occur always on Sunday mornings and the course is 10 km long and the participants must be over 16 years old. There are also races with shorter distances for participants aging from 12 to 16 years old. This kind of running races is a democratic way to stimulate participation of the individuals considering they come from different age-groups and technical backgrounds and all of them share the same event held in the streets of Curitiba providing the runners a chance to circulate through many sceneries of the City.

Objectives.
The objective of this study was to know some social aspects related to the participants registered in the races promoted by the Sport and Leisure Department of the city of Curitiba-Brazil.

Methods.
A ten questions questionnaire was applied to the runners. A sample of 200 runners answered voluntarily the instrument in events held in 2006 and in 2007.

Results.
The results showed that 77% and 33% of the runners were male and female, respectively. 49% of them run regularly for less than five years and 31% is involved in this type of activity to maintain their health. 41.5% train regularly in the streets of the city and 26.5% in the streets of Curitiba providing the runners a chance to circulate through many sceneries of the City.

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Conclusion.
According to the results it seems that the popular races represent a process of social inclusion since by running regularly they could obtain and keep healthy benefits from this sport as well as they have to keep in mind some sport values such as knowing new people and competing against them in a fair play basis. Through the popular races and based on the concepts involved in this kind of event it is possible to state that this sport could be understood as a manifestation of the popular culture.

References.

PETROPOLIS SPORTS AND LEISURE PUBLIC POLICIES-ANALYSIS OF THEIR IMPACT ON THE FORMATION OF CITIZENSHIP AND THE DEVELOPMENT OF THE POPULATION

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The subject of the survey are the public policies carried out by the City of Petrópolis, State of Rio de Janeiro, Brazil, aiming at utilizing sports and leisure as a means to promoting citizenship and population development. With the objective of beginning a process of enhancing access of the less favored to leisure, sports and other activities in schools, several projects were forwarded in that connection. Thus a new era began of expressive modifications of the picture heretofore observed. However, the system was lacking in evaluation methodologies - very much needed in order to provide valuable information as to the efficiency and the effectiveness of said policies.
2) the accuracy of choice in what regards the cultural, social, economic and financial return of the investment made in the field;
3) the equipment and facilities engendered by the new practices;
4) the improvement in the population’s quality of life, especially in what refers to health. The research began in 2005. The qualitative and descriptive methodology used was the application of the classical questionnaire to one hundred children - Tubino (2006). The analysis granted by the gathered information lead us to the perception that the present situation - after the rendering of the new policies, starting in 2001 - was some aspects (qualitatively, for instance) 60% superior to the previous one. The universe covered comprises 60,000 students of 67 municipal schools.

PROMOTION OF TALENTED ATHLETES IN CHINESE COMPETITIVE SPORTS

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Within Chinese competitive sports, the athletes are classified into three different categories: The first class athletes, the second and the third class athletes.

The term First Class Athletes refers to the members of the national team and the big teams of the provinces and towns. Second Class Athletes are they who have had a certain base of training and who are considered to be future top athletes.

Third Class Athletes are gifted, young, developing athletes who exercise in leisure sport clubs.

There are several ways of recruitment and promotion in the Chinese system of competitive sports.

First of all it is practiced at normal schools and universities. Sports is the one of the most important subjects at school, right after foreign languages.

Athletes who are very good at school and who are noticed by the teachers can change school and go to a particular school which promotes athletes.

Very talented athletes go to special sports schools (so-called leisure sport schools or colleges of physical education for youths) or join the province- or national teams.

The aim, which is to be achieved here is to train the young athletes for competitive sports in a different environment from normal schools. In the colleges of physical education the syllabus of the other subjects is not as important as the interests of the competitive sports but a reduced curriculum is certainly provided by the schools.

References.

Poster presentations (PP)

PP-TT01 Training and Testing 1

ANTHROPOMETRIC AND FUNCTIONAL PROFILE OF YOUTH TALENT VOLLEYBALL PLAYERS

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The central objective of this study was to identify the anthropometric and functional profile of male youth volleyball players. In addition, we intended to find the anthropometric and functional profile of volleyball players depending on the specific position played in the competition.

The sample was composed of 50 athletes, 19 belonging to the Youth National Team and 31 athletes who have not been selected, aged between 15 and 17 years. The study took place on the following factors in performance:

1. Anthropometrics—were made 24 measurements body, including, in addition to height and weight, length, diameter, perimeters and folds of adiposely subcutaneous;
2. Body composition and somatotype;
3. Functional tests were performed to assess the explosive strength of the upper and lower members, the maximum strength of the lower limbs, aerobic endurance, speed and the strength of speed.

The results showed statistically significant differences among the athletes selected and not selected in functional and anthropometric variables. The functional variables, including the reach (of attack and block), the maximum strength of the lower limbs and anaerobic power, showed a greater power of discrimination of the groups regarding the anthropometric variables. The analysis of profiles depending on the specific position showed that the setters and liberos presented profiles similar among themselves but quite distinct from attackers, especially those opposites and central players.

The data suggest the existence of anthropometric and functional distinct profiles in the selected athletes comparatively to the not selected ones and of a differential between the diverse played specific functions in the competition.

CHRONOTROPIC RESPONSE IN EXERCISE-TRAINED ADULTS WITH DOWN SYNDROME

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Introduction
Recently, Guerra, Llorens & Fernhall, (2003) found that sedentary Down-syndrome (DS) individuals had chronotropic-response-index (CRI) values indicative of true chronotropic-incompetence compared to healthy controls. It is not known if there are differences between the CRI of exercise-trained DS adults and that of healthy controls.

The main purposes of this study were to: (1) examine the influence of long-term exercise training on the CRI of DS individuals, and (2) compare the CRI of DS participants with that of healthy controls in response to a graded-exercise-test (GXT) at pre and post-training periods.

**Methods**

Ten male DS participants (33.0 ± 6.6 yo) and nine paired matched controls (32.7 ± 8.0 yo) were included. All DS participants performed a pre- and post-training treadmill GXT. The control group functional capacity was determined at a single occasion for comparison purposes with the DS at baseline and after training. The DS group underwent a 28-week ergometer exercise intervention consisting of two sessions (40 minutes/week, 60-85% peak oxygen uptake - VO2peak).

**Results**

At pre-training period the groups differed (p< 0.05) for: CRI (DS, 0.90 ± 0.09; controls, 1.04 ± 0.07), VO2peak (DS, 22.18 ± 3.80; controls, 25.28 ± 3.83), 51.85 ± 7.67 ml kg-1 min-1, HRpeak DS, 147.30 ± 19.71, controls, 183.66 ± 4.25 bpm, time on the GXT (DS, 12.20 ± 0.56, controls, 15.73 ± 0.71 minutes) and HR increase (IDS, 76.40 ± 0.73, controls, 115.11 ± 3.98 bpm).

Following training, DS participants improved (p< 0.05) their VO2peak and time on the GXT by 27% and 8%, respectively. There were no improvements for CRI or HRpeak following the exercise intervention. However, after training, there were no differences for CRI between DS participants and that initially obtained for controls (DS, 0.98 ± 0.15, controls, 1.04 ± 0.07, p< 0.272).

**Conclusion**

At baseline results show that, DS participants presented a lower chronotropic response to exercise in comparison to controls. Additionally, in opposition to the control group, DS individuals were in the upper limit of pathological CRI values.

Long-term exercise training was effective for eliciting a positive training effect after 28 weeks of continued exercise adherence. On the other hand, neither the CRI nor peak heart rate increased after training. However, opposing to baseline, the post-training CRI values of DS and controls were similar, suggesting a trend for normalization of the chronotropic response. Therefore, despite its inefficacy in eliciting significant intra-group CRI improvements, the exercise regimen attenuated the differences between DS and control participants initially found at baseline. Thus, our results suggest that, despite presenting lower peak HR than controls, exercise-trained DS adults are not chronotropically incompetent.

**References.**


**CONTRIBUTIONS OF SELECTED FUNDAMENTAL FACTORS TO ATHLETICS PERFORMANCE IN ADULT INDIVIDUALS WITH MENTAL RETARDATION**

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Regular physical activity is encouraged as being important for preventing diseases and promoting physical and emotional well-being for individuals with Mental Retardation (MR) (Fragala-Pinkham et al, 2005; Carmeli et al, 2005), but it is well known that people with MR exhibit poor fitness performance on standard fitness tests (Graham and Reid, 2000). The Aim of this study was to determine the contributions of selected fundamental factors to the athletics performance in adult individuals with MR.

Thirty-two trained athletes with MR (20 males and 12 females, age range 20-45 years, MR levels: 7 Mild, 3 Moderate-Mild, 8 Moderate, 4 Moderate-Severe, 8 Severe and 2 Profound) were recruited. The athletes’ performance was assessed using the official results in an Individual Athletics Championships. The athletes could take part in one or two competitions selected within one of the two ability levels: Level I (60m, 300m, 400m in walking, Standing Long Jump, and Vortex Throw) or Level II (100m, Shot Put, and Long Jump). The fundamental factors included anthropometric measurements (height, weight and %body fat), flexibility assessed by Sit and Reach test, standing balance assessed by Flamingo test, muscular endurance assessed by Push-ups and Sit-ups tests, leg muscular strength assessed by Standing Long Jump test, cardiovascular endurance (VO2max) assessed by Step test and coordination assessed by Timed Get-Up and Go test. Stepwise regression analysis was used to identify the contribution of these selected fundamental factors to athletics performance.

This study showed that in Level I the leg muscular strength and height had significant contributions to 60m (81%), the leg muscular strength and lower %body fat had significant contributions in vortex throw (70%). The coordination, lower %body fat and flexibility had high significant contributions in Standing Long Jump performance (90%). Within Level II, the leg muscular strength and a lower MR level had significant contributions in 100m (85%). Lower weight had high significant correlation in Long Jump scores (P<0.01). Lower age and cardiovascular endurance had high significant contributions in Shot put (98%). It was possible to predict the efficiency of athletics performance in Level I by leg muscular strength, flexibility and coordination. In Level II, cardiovascular endurance and anthropometric measurements were especially important to improve athletes’ performance. All these selected fundamental physical factors should be addressed in athletics training for adult individuals with MR.

**References.**


**BEHAVIOUR OF TOP FOOTBALL COACHES DURING GAMES**

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**Introduction**

Research of the behaviour of Football Coaches during a Football games, through observation, is a way to help the development of the coaches education. We think that the context (the game) plays an important role in this matter. The purpose of this study is to find out the differences between male and female coaches behaviour during football games.

**Methods**

Research of the behaviour of Football Coaches during a Football games, through observation, is a way to help the development of the coaches education. We think that the context (the game) plays an important role in this matter. The purpose of this study is to find out the differences between male and female coaches behaviour during football games.
Our sample was composed by 6 Football Coaches (3 male and 3 female), 18 football games from the 2006/2007 and 2007/2008 season. We observed 3 games from each coach. The games were video taped. The results from the observation were based on the total game. We used the SOTA observation system (18 categories).

Results
We compared the behaviour of the Football Coaches during the games by gender. There are significant differences between female coaches in 3 categories: Between male coaches we also found significant differences in 5 categories. Finally, when we compared by gender we found significant differences in only 3 categories.

Discussion/Conclusion
Concerning the results we identified that observation is the behaviour predominant between female coaches during the games. We also identified that female coaches behaviour during the football competitions is less interactive then the males behaviour, but in other hand they give more pressure to their athletes.

EFFECT OF INTERMITTENT NORMOBARIC HYPOXIC EXPOSURE ON PERFORMANCE IN HYPOXIC AND NORMOXIC ENVIRONMENTS

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Introduction: Intermittent hypoxic training has been shown to markedly enhance performance (Hellemans, 1999, Rodriguez et al, 1999, 2000, Harlin, Hellemans, 2007).

Aim: Investigate the effect of intermittent normobaric hypoxic exposure (IHE) on aerobic performance and endurance in hypoxic and normoxic conditions.

Methods: Eighteen male subjects were assigned to either a Control (N=9), or an experimental (IHE, N=9) group. Both groups participated in a 4 week training programme comprising endurance training on a cycle ergometer five days weekly. During each one hour training, the work rate was maintained such that the heart rate was at a level corresponding to that observed at 50% of peak power output (PPO) determined prior to the onset of the training under normoxic conditions. In addition, the experimental group conducted IHE one hour prior to the onset of each training session. During IHE, subjects inspired a hypoxic breathing mixture for 5 min, followed by 3 min of breathing a normoxic mixture. A total of seven such intermittent exposures were conducted. During each hypoxic exposure, the fraction of oxygen in the inspired gas mixture was regulated to maintain a blood oxygen saturation (SaO2) of 80%. Before (PRE), during (PER), upon completion (POST), and 10 days after the training period (AFTER) we evaluated maximal aerobic capacity (VO2max) and PPO under normoxic and hypoxic (FO2=0.12) conditions. We also conducted blood analyses and tests of pulmonary lung function. Endurance performance was reflected in the time the subjects were able to sustain a work rate equivalent to 80% normoxic PPO on a cycle ergometer, under both normoxic and hypoxic conditions.

Results: To maintain SaO2 at 80% during IHE, the FIO2 during IHE was progressively decreased during the course of the training, such that it was 0.12S in week 1, 0.115 in week 2, 0.105 in week 3, and 0.09S in week 4. No significant differences were observed in the normoxic VO2max, endurance performance, pulmonary lung function, and basic haematology in the PRE and POST trials in both groups. There was a significant improvement in the hypoxic VO2max for the IHE group, but not the Control group.

Conclusion: Under the conditions of the prevailing study, IHE may improve performance at altitude, but not at sea level conditions.

References.

THE PHYSIOLOGICAL RESPONSE TO CYCLING-RUNNING SUCCESSION IN YOUNG AND PROFESSIONAL TRIATHLETES

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INTRODUCTION
The performance during the running sector of the cycling-running succession in triathlon has been suggested to be helpful in the detection of talented triathletes, even more important than VO2max.1)

Thus, the aim of this study was to compare the cardiorespiratory response during a cycling-running trial of high level triathletes of different age, ir order to establish standards of performance for young triathletes.

MATERIAL AND METHODS
Six professional triathletes (G1, 23.8 ± 5.6 years; 71.2 ± 8.7 kg, 180.0 ± 8.8 cm) belonging to the Spanish National Triathlon Team and nine elite young triathletes (G2, 15.2 ± 0.8 years, 60.8 ± 6.2 kg, 173.7 ± 6.4 cm), selected by the Spanish Triathlon Federation as the best in their category (under 16), participated in the study.

Experimental protocol consisted of two trials performed in random order. In trial 1 (C-R) subjects completed a 30 min cycling at 3.5 W/kg on a cycle ergometer. Immediately after, subjects run 3000m as fast as possible on a 400m track (7.5 laps). Trial 2 (R) consisted of running 3000m as fast as possible. All cardiorespiratory variables were measured with a portable metabolic system (Jaeger Oxycon Mobile) and oxygen costs (OC) was calculated each 400m using the formula of di Prampero (2).

Aim: Investigate the effect of intermittent normobaric hypoxic exposure (IHE) on aerobic performance and endurance in hypoxic and normoxic conditions.

A Student t-test for independent samples was used to examine the differences between the two groups of subjects. Significance was set at p<0.05.

RESULTS
The OC for the G1 subjects was always lower than that for the G2 subjects, but not significantly so; neither were any differences seen between the OC values for the two tests. The G1 subjects took 1.2% longer to complete the running component of the C-R test than to complete the R test (591.2 ± 25.8 vs. 584.6 ± 30.4 s), compared to 3.7% longer for the G2 subjects (669.1 ± 23.8 vs. 645.5 ± 15.8 s). This loss of performance was only significant for the younger subjects.

DISCUSSION
The C-R tests was associated with an acute cardiorespiratory response in the younger athletes (G2) that was not seen in the professionals (G1). This explains the loss of performance seen in these younger competitors in terms of the time to complete the run and the mean speed maintained.

It is possible that the G1 subjects had a better adapted cardiorespiratory response given the longer accumulation of specific training over their sporting lives, certainly it has been shown that training in cycling-running blocks improves performance (3, 4).

Finally, this study provides a performance profile of elite triathletes for the cycling-running trial and shows that young competitors who want to compete at international level must achieve times of under 600 s in the post-cycling running component under the present C-R test conditions.

References.

CONCURRENT ANAEROBIC ASSESSMENT ON 14-15 YEARS- OLD MALE BASKETBALL PLAYERS

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Basketball, as many team sports, is characterised by short burst, predominantly anaerobic. Despite major children and adolescent participation in game sports, data reporting concurrent anaerobic performances during growing years is lacking. The present study examines the relationship between two field tests and a laboratory test (using a cycle-ergometer) to assess anaerobic performance on male 14-15 years-old basketball players.

The sample included 50 male basketball players (15.2 ± 0.5 years) classified in the stages 4 and 5 of pubic hair. All the subjects took part in a total of 3 tests performed either in the field or in the laboratory: the 30-s Wingate anaerobic test (WanT), 7-sprints test (7-sprT) (Bangsbo, 1994) and 140-m basketball shuttle run (140-mShtT). The latest consists in running a shuttle run from a baseline to marks at 5, 8, 14, 22, 28 and 30 m. Photoelectric cells were used to measure total time. Relations between the anaerobic tests were evaluated using Pearson correlations. Significance level was set at p<0.05.

The best sprint of the 7-sprint test showed the highest correlation with the 140-mShtT (r=+0.68, p=0.01). Results also showed modest correlations between field and laboratory tests, specially when WanT peak power (PP) and mean power (MP) were expressed in their absolute values. The association between 140-mShtT and the laboratory test increased when PP and MP were expressed per unit of body mass (r=+0.71, p=0.01, for PP; r=+0.71, p=0.01, for MP).

The 7-sprint test is modestly correlated with the 140-meter shuttle run and poorly related to Wingate test. Overlapping variance between field test and Wingate outputs are no more than about 50% for the 140-meter run. The magnitude of the association increases while expressing mean and peak anaerobic power per unit of body mass. The contribution of concurrent anaerobic test on the discriminant analysis of basketball players per competitive level and age-group, controlling for maturational status and past sport experience would be of interest.

References.
THE GAME INDICATORS ASSOCIATED WITH TEAM SUCCESS IN THE LAST TEN MINUTES OF BALANCED HANDBALL MATCHES

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Introduction
Sport game experts identify the last minutes of close matches as their critical moment (Bar-Eli, et al, 1992; Sampaio, et al, 2004). Thus, the reliable analysis of performance of this game period helps the coach to recognize the players’ actions and behaviour patterns that related to team’s success. The purpose of this study was to identify the set of relevant game indicators which distinguish winning from losing teams in ten last minutes of balanced matches.

Methods
The sample consisted of 16 balanced semi-finals and final matches from the 2003, 2005, and 2007-Men’s World Championships, as well as 2004 and 2006-Men’s European Championships of Handball (drawn and extended matches were not considered). The point differences in last ten-minute period were always below 5 points. 55 performance indicators were registered per ball possession in each match.

The test of Mann-Whitney was used to identify significant differences between winning and losing teams in last ten minutes in observed matches.

Results
It was noted that frequencies of the most of performance indicators were similar for winning and losing teams. The significant differences between winning and losing teams were found in nine variables that could be associated with the final result of the matches: break through goals (p=0.013); goals scored in position play (p=0.01); positional play shots efficiency (p=0.003); goals scored in fast break (p=0.045); fast break frequency (p=0.001); fast break efficiency (p=0.001); attack duration (p=0.02); goalkeeper defences (p=0.024); goalkeeper efficiency (p=0.022).

Discussion
As expected, the findings of this study revealed the more efficient play of winning teams in positional attack and goalkeeper actions during the last ten minute of match. It was registered that successful teams had longer ball possession comparatively with defeated teams. The losing teams, trying to recover from disadvantage, used more attempts and scored more goals in fast breaks.

Evidently, the summarized data are not sufficiently informative for explaining the team’s success or failure in the balanced games, but this data can be useful for describe the play profile of the team. In any case it’s necessary to consider the temporal and score evolution in the match, as well as opposition relationship between playing teams.

References.

DRIBBLING AS PREDICTOR OF FUTURE SOCCER PERFORMANCE

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To reach the top in soccer, technical skills are of extreme importance. The current study focuses on the development of dribbling with quick changes of direction, since this is recognized as a central component in the development of professional players (Malina et al. 2005; Reilly et al. 2000). To predict long-term success within a group of talented youth soccer players, longitudinal tracking is needed. The goal of the present study is to reveal whether the technical performance characteristics of dribbling and the factors underlying this technical skill have power for predicting future professional soccer players.

A total of 134 talented soccer players from soccer schools in the Netherlands age 14-18 were tested, 237 measurements were performed. The players tested are currently 20 years or older and are classified into their current playing level: professional (N=31), semi-professional (N=54) or non-professional (N=54) players. The Shuttle Sprint and Dribble Test was used to measure the development of dribbling performance in a longitudinal study over 5 years. The test consisted of a maximal sprint of 30 m while dribbling a soccer ball (Lemmink et al. 2004). The 30 m sprint has three 180° turns, measuring the acceleration of soccer players. Anthropometrics (height, weight, and body fat percentage), and training characteristics were assessed. Longitudinal changes in dribbling were investigated using the linear-mixed model procedure in SPSS.

The fixed part of the multilevel model contains a different intercept term for the current playing level (semi-professionals + 0.07 seconds and non-professionals + 0.17 seconds compared to professionals). The multilevel age-model showed better performance of the current professional players compared to the current lower level players at age 15, 16 and 17 on the Shuttle Dribble test (p < 0.05). The age-model was significantly improved by including lean body mass and total practice hours per week, both having a positive effect on dribbling performance.

Although soccer performance can be divided into many multidimensional performance characteristics (Elferink-Gemser et al., 2004), the current results showed that dribbling performance in youth can be an useful tool for identifying the best players for the future. Current professional players outscored current semi- and non-professional players in dribbling during adolescence, especially from age 15-17. More lean body mass and extra practice hours positively influence dribbling performance. The Shuttle Dribble test illustrated to be a good predictor for future playing level.

References.

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13th ANNUAL CONGRESS OF THE EUROPEAN COLLEGE OF SPORT SCIENCE
EFFECTS OF PILATES TRAINING ON BLOOD MARKERS OF OXIDATIVE STRESS

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INTRODUCTION: Muscular exercise increased production of free radicals and other forms of reactive oxygen species. The risk of oxidative stress with exercise depends on exercise intensity and the participant's state of training. Pilates is a system of over 500 controlled exercises that engage the mind and condition the total body. It is a balanced blend of strength and flexibility training that improves posture, reduces stress and creates long, lean muscles without bulking up.

AIM: This study examined the effects of 12 weeks pilates training on selected markers of oxidative stress in young women.

METHODS: Seven young women (mean±SD: age 24.7±3.7 years, body height 1.61±0.5 m, body weight 54.9±8.3 kg, body fat 11.1±5.2%) participated in the study. Blood samples, collected at rest before and after twelve weeks pilates training, were analyzed for the determination of selected markers of oxidative stress (lipid peroxidation byproduct malondialdehyde MDA, enzyme catalase CAT, carbonyl and sulphydryl group assay for determination of modified proteins and total antioxidant status TAS). The results were statistically evaluated by the Wilcoxon Signed Ranks Test.

RESULTS: An important finding in present investigation is that CAT increased significantly after 12 weeks (plasma CAT median 13.4 IU/L-1 pre vs. 34.56 IU/L-1 post, p<0.05). There were no significant changes in erythrocyte MDA (median 13.22 µmol/L-1 pre vs. 14.42 µmol/L-1 post, p>0.05), sulphydryl group (median 281.46 µmol/L-1 pre vs. 242.64 µmol/L-1 post, p>0.05), carbonyl group (median 1.2 µmol/g-1 of proteins pre vs. 1.31 µmol/g-1 of proteins post, p>0.05), and TAS (median 69.1% pre vs. 64.7% post, p>0.05).

CONCLUSIONS: This data suggest that 12 weeks pilates training increase the activities of CAT. Also, it can be concluded that pilates training program did not have other effects on oxidative stress levels in young women.

CONTROL AND MONITORING IN TRIATHLON: A STUDY OF THE ATHLETE'S SUBJECTIVE SELF PERCEPTION AND LOAD TRAINING

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Monitoring load training and tiredness subjective self perception, as well as effort taken, is crucial at the training process in many different sports. In triathlon studies which relate prescribed stimuli and subjective answer referred by the athlete are not common. The main objective of this study was to verify the relationship among indicators of training load and tiredness subjective self perception in triathlon. Triathlon - long distance, category of athletes aged from 25 to 29 years old (the athlete was 27 years old, 181 cm, 74.6 kg, Body Fat percentage 8.8) 2007 Brazilian's male champion training was evaluated during five weeks - 69 sessions of training, at the following variables: daily training duration in minutes, tiredness subjective self perception throughout a scale adapted from Borg (1982) and effort taken during every single session; and, following Foster (1998) proposal, intensity, media of weekly load, weekly total load, monotony, and strain were quantified. In order to analyze variation existence, and data relationship, descriptive measures of centrality and dispersion, and Pearson's correlation coefficient (r) (p<0.05) were used. Principal results point out to a variation of the daily training duration quantified in minutes (167.1±59.3 min), and tiredness self perception measures before (11.6±0.8), and after (13.3±0.7) daily training. Variables quantified by Foster's (1998) method also presented a variation during the period, as intensity (3.8±0.2), media of weekly load (619±93.6), and weekly total load (4335±655), monotony (2.15±0.4), and strain (9316±2070). It is highlighted that the correlation coefficient of intensity and self perception of tiredness before and after training, respectively r = 0.93 and r = 0.99, for p<0.05, demonstrates that tiredness after the most intense trainings had risen. To monitor tiredness subjective self perception seems to help the understanding of the relationship stimuli/pause of the analyzed training, as well as being a helper on identifying alteration at intensity and load variables, important indicators to not have other effects on oxidative stress levels in young women.

A FIELD TEST TO EXHAUSTION FOR VO2MAX DETERMINATION OF SOCCER PLAYERS

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The maximum oxygen uptake (VO2max) is one of the main variables to evaluate the cardio-respiratory fitness of an individual (1). In many sports a highly developed VO2max is prerequisite for good performance. This was also shown in soccer, where studies have demonstrated that player with a higher VO2max cover greater distances, complete more sprints, chose an enhanced average work intensity, and have an enhanced average aerobic energy contribution during match play (2,3). Because the determination of VO2max of an entire team is very time and equipment expensive, its regular use is rather uncommon. Therefore, the aim of this study was to evaluate the validity and the practicability of a 600 m run to exhaustion for VO2max testing of soccer players.

Six healthy young male soccer players (age: 18.2±0.4years, height: 180.8±6.8cm, weight: 72.2±7.6kg) of the national youth training centre participated in the study. Each subject performed a field test to exhaustion (after warm up subjects run two laps on a soccer pitch. The speed was continuously increased by means of self-assessment (0.5 lap at 50%, 0.5 lap at 70%, 0.5 lap at 90% and 0.5 lap at 100% of self estimated maximal performance capacity). If exhaustion was not achieved, subjects had to continue running maximally until complete fatigue and an incremental treadmill test (after 10 minutes at 6 km/h, the test started with a speed of 9 km/h (inclination 1%). The velocity was increased by 1 km/h every 1 minute until exhaustion). During each test oxygen uptake (VO2), ventilation (VE) and heart rate (HR), via chest belt, were measured with a portable spirametric-telemetric device (Oxycon mobile). In the 3rd minute after cessation of work, blood lactate concentrations (La) were determined.

There couldn't be detected any significant differences between the two tests except for the Lamax (p=0.001). During the tests the subjects achieved a VO2max of 58.3±3.7 and 57.5±3.7 ml/min/kg, a VEmax of 143.2±23.7 and 138±17.3 l/min, a HRmax of 187±4 and 190±6 b/min and a Lamax of 10.7±1.5 and 7.9±1.6 mmol/l for the field and the treadmill test.

The results indicate that a 600 m run to exhaustion could be adequate for VO2max determination of soccer players. The recorded small intra-individual differences could entirely be explained by the day-to-day variability of VO2max determination and the measurement variability due to the device. The higher values of La during the field test can be explained by the different protocols. During the field test the maximum intensity is reached faster and held for a longer period of time so that anaerobic processes were more stressed. Even if the test results are very promising more work has to be done to draw firm conclusions. However, if confirmed, this test could be a simple tool for exercise testing in soccer.

References.
AMERICAN WOMEN’S COLLEGE WATER POLO: A TECHNICAL AND TACTICAL ANALYSIS OF THE CENTRE FORWARD ROLE

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Introduction
Women’s water polo became an Olympic sport at the 2000 Sydney Olympic Games. Despite its short history, women’s water polo evolved quickly in many countries of Europe, Australia, and United States. At present, women’s water polo has accomplished a huge evolution where players’ technical and tactical abilities need to be specific according to the different roles. Recently, the analysis of elite men’s water polo matches showed that centre forwards perform intense and all-out actions (Smith, 1998), determining the majority of exclusion faults during man-up actions, and the highest number of goals (Lupo et al., 2007). Since there is a lack of information regarding women’s water polo, the aim of this study was to analyze the technical and tactical aspects of women’s water polo centre forwards during American college matches.

Methods
A notational analysis of 7 water-polo matches played during the NCAA 2007 championship was performed from DVD recordings. The actions were classified as even-play, counter attack, and woman-up play (including penalties) situations, considering their relative goal outcome. Furthermore, during even-play, the technical and tactical aspects of the centre forwards were analyzed according to the occurrence of the following indicators: goal, shot with no goal (out, save, posts, goalkeeper and field player bouncing, and corner), exclusion achieved (including penalties), steal ball, bad pass to and from the centre, and offensive faults. To assess the test-retest reliability, prior to the study the observer scored a single match twice, each observation separated by 7 days, showing no difference between observations.

Results
The frequency of occurrence of even-play, counter attack, and woman-up play actions was 80.3±5.3%, 6.2±4.4%, and 13.5±4.7%, respectively. The relative picture for goal scoring was 42.4±22.9%, 9.9±9.9%, and 47.8±24.8%, respectively. The centre forwards concluded 45.2±9.6% of the even-play actions. Only regarding the centre forward indicators, goal=10.6±6.9%, shot with no goal=18.6±8.1%, exclusion achieved (including penalties)=24.0±7.1%, steal ball=15.9±7.5%, bad pass to the centre forwarder=12.3±8.7%, bad pass from the centre forwarder=15.2±2.5%, and offensive fault=17.1±9.8%. Centre forwards also determined 63.2±22.1% of the exclusion (and penalty) faults.

Conclusions
The present data show that women’s American College water polo is substantially influenced by the centre forward role, especially for the achieving of several exclusion faults from which follow woman-up actions, the most advantageous playing situation to score a goal.

References
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FIELD TESTS OF THE FLEXIBILITY OF LOWER EXTREMITY: RELIABILITY STUDY

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Objectives:
Pre-seasonal flexibility testing has been commonly used to identify intrinsic risk factors of sport injury, as well as the capacity for the efficient movement performance. Unlike the laboratory tests of flexibility, the reliability of the field tests of flexibility has not been evaluated yet. The purpose of this study was (i) to evaluate the reliability and relationship among the most commonly applied field tests that was designed to assess flexibility of lower extremities, and (ii) to examine their concurrent validity.

Methods:
Physical education students (n=84) were familiarized and tested by two raters on three occasions (one familiarization and two testing sessions) performed one week apart in order to establish the intra-trial and test-retest reliability of the selected tests assessed by different measurement methods. In addition, one out of five participants was tested simultaneously both by means of a 3D kinematics analysis system and by means of standard field devices (kinantropometry, ruler and protractor) in order to assess the concurrent validity. The following tests were evaluated: Leg Raise in a Supine Position, Hip Abduction Test, Single-Legged Knee Bend, Sideward Leg Splits, Sit and Reach, Sideways Leg Splits and Lengthwise Leg Splits.

Results:
All tests demonstrated a high intra-trial reliability (Intraclass correlation coefficient, ICC=0.88-0.97). The corresponding within-subject variation (CV) ranged between 1.2 and 3.5%. A one-way ANOVA revealed non-significant differences among three trials. Test-retest reliability proved to be moderate to excellent (ICC=0.57-0.94, CV=2.0-6.7%) and the differences between the test and rated were below the significant level (p>0.05). Relationship among the tests was moderate to strong (r=0.44-0.94). When compared with objectively measured by the 3D system, the concurrent validity of field methods for estimation of flexibility was high (r=0.84-0.99).

Conclusion:
The findings suggest that the simple and effective field tests of flexibility of lower extremity based on using inexpensive equipment could be both reliable and valid. Therefore, the findings support their use as a pre-season screening tools for athletes. The obtained strong relationships among the tests also suggest that the routinely applied test batteries could be based on very few tests of the flexibility of lower extremity.

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PHYSIOLOGICAL CHARACTERISTICS OF ELITE BRITISH JUNIOR AND SENIOR RUGBY LEAGUE PLAYERS

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Whilest studies have previously reported physiological characteristics for Australian sub-elite junior and senior rugby league [RL] players (Gabbett, 2002), no study to date has investigated whether differences exist between elite junior and senior players. Therefore, the aim of this study was to investigate the physiological characteristics of elite British junior and senior RL players. A total of 254 elite junior [u13, n=27; u14, n=49; u15, n=78; u16, n=53] and senior [n=47] players from a professional RL club attended one field testing session at the start of pre-season. Players were categorised as forwards (n=96), backs (n=87) or pivots (n=71). Anthropometric measurements included standing stretch stature, body mass (BM) and the sum of four skinfolds (SKF). In addition, 0-10 m static acceleration and a multi-stage fitness test (MSFT) were performed in an indoor venue on a non-slip surface. Momentum over 0-10 m was also calculated as the product of velocity and BM. Data were analysed using two-way [position x age] ANOVA with Tukey’s post hoc test. Standing stretch stature, BM and SKF were measured at angular velocities of 90°.s⁻¹ (1.57 rad.s⁻¹). Sprint performance (5 meters), agility (T-test), kick performance [Professional Sports Radar] and vertical jump performance (squat jump and countermovement jump; Ergojump device) were also evaluated. Descriptive statistics were determined for the three age levels considered. Coefficient of correlation was calculated by Pearson product-moment correlation coefficient. The level of significance was set at 5%. SPSS 15.0 was used in all analyses.

Results: (1) We observed an increase of peak torque of knee extensor muscles of the dominant leg with age [U-14: 165.5±33.8; U-16: 197.8±28.6 and U-18: 208.5±37.2 N/m]. (2) Hamstring/quadriceps ratios of the dominant leg were U-14: 49.5±8.5, U-16: 51.5±8.7 and U-18: 50.8±8.4%. (3) Pearson correlation test showed a positive and low correlation between the peak torque of the extensor muscles and the kicking ball velocity (r=0.22, p=0.03), and 5 meters speed (r=0.27, p<0.001). A positive and moderate correlation was observed between the peak torque of the extensor muscles and agility (r=0.40, p<0.001), squat jump (r=0.44, p<0.001) and countermovement jump (r=0.40, p<0.001).

Conclusions: These results provide evidence that peak torque of the extensor muscles of the knee is associated with agility and vertical jump performance.
RELATIONSHIP BETWEEN TETHERED SWIMMING FORCES AND FRONT CRAWL AND BUTTERFLY PERFORMANCES

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A review of the specialized literature about tethered swimming shows that it is scarce the number of studies conducted over other swimming techniques than front crawl. Additionally, most studies were developed using partially tethered swimming. Except Magel (1970), no butterfly stroke characterization was found. Yeater et al. (1981) studied the relationship between mean tethered force and mean velocity for front crawl, backstroke and breaststroke using fully tethered swimming. Those authors got a positive correlation between mean force and velocity for front crawl and no evidences were shown for the same relation for breaststroke and backstroke. The purpose of the present study was to correlate the mean force obtained in a 30 s maximum tethered swimming test with the mean velocity obtained during a 50 m maximum intensity front crawl and butterfly swimming test. Subjects were eleven male volunteers of the Portuguese National Absolute Team.

Six swimmers (179.3 ± 12.1 cm and 73.6 ± 6.2 kg) performed a 50m front crawl swimming test at maximal intensity, and other five swimmers (179.1 ± 7.37 cm and 74.0 ± 9.47 kg) performed butterfly stroke. All swimmers were specialists on the technique swam. Tests were performed on a long course swimming pool. For the 30 s tethered swimming test, swimmers were attached by a non-elastic cable to a strain-gauge (Globus, Italy).

Mean velocity values obtained for front crawl was 1.86 ± 0.06 m.s-1 and 1.78 ± 0.09 m.s-1 for butterfly stroke. Average force assessed was 1218 ± 13.71 N for front crawl and 103.5 ± 21.8 N for butterfly. Complementarily, a positive and significant correlation was found between mean tethered swimming force and mean velocity, either for front crawl ($r = 0.922$, $p < 0.01$), as well as for butterfly technique ($r = 0.933$, $p < 0.01$). Obtained data seems to indicate the possibility of the mean force obtained through a 30 s fully tethered swimming test predict the mean velocity correspondent to a 50m front crawl ($r = 0.004$ tethered force + 1.318), corroborating the findings of Yeater et al. (1981) and butterfly swimming events ($r = 0.004$ tethered force + 1.358).

References.

INTRA AND INTER-EXAMINER RELIABILITY OF THE ADAPTED PHYSICAL ACTIVITY BED FOR EVALUATION AND TRAINING OF TERMINAL SHOULDER FLEXION STRENGTH

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INTRODUCTION: The forward shoulder posture is related to the Impingement Syndrome because it narrows the subacromial space. People with this posture pattern benefit from the terminal shoulder flexion exercise. Objective: To evaluate the intra and inter-examiner reliability of the isometric test for terminal shoulder flexion maximum strength.

MATERIALS AND METHODS: Subjects: 9 males and 10 females, age range 20.8 ± 1.8, healthy. Materials: Adapted physical therapy bed with a guide arm with vertical handles and a dynamometer support. Procedures: Subjects performed warm-up exercises consisting of 15 minutes.

RESULTS: Intra-examiner reliability of the test was .98 ($p<0.05$) and inter-examiner reliability was .96 ($p<0.05$).

CONCLUSION: The isometric test for terminal shoulder flexion in prone position using these equipments and methods shows excellent results for both intra and inter-examiner reliability in a sample of healthy young individuals. This test may be used both as a form of physical evaluation and training control of isometric terminal shoulder flexion.

PHYSIOLOGICAL PROFILES OF YOUNG ELITE ATHLETES OF DIFFERENT DISCIPLINES

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INTRODUCTION: Much is known about the physiological demands, which are needed to be competitive in endurance sports at elite level. Although there is accordance about the importance of a basic endurance ability in many sports, there is much less data available which describe the physiological profiles of athletes of team sports or sports with mainly technical character (e.g. Judo, Fencing, Basketball). Because of increased numbers of competitions and training sessions, in these sports a high endurance level is required as well. Not only competing but rather a high ability to recover is essential to be competitive at international level. Furthermore the risk of injuries is reduced while continuous attention can be maintained during activity and immune system is stabilized. Due to this lack of data, the capturing of physiological profiles of athletes of different sports is essential to develop training strategies and to filter weaknesses in performance. Therefore reliable parameters for aerobic endurance capacity (lact threshold, VO2peak) were measured.
the current literature only 10.8% of our tested athletes barely strike this endurance capacity level. Due to the fact that coaches in technical or team related sports have limited time periods to develop endurance capacity, time saving strategies like high intensity training should be accounted for training regimes.

**DISCUSSION:** Considering there exist different test protocols to detect VO2peak, a mean value of 60ml/kg/min is the average found in published literature of international competing athletes. According to this literature only 10.8% of our tested athletes barely strike this endurance capacity level in comparison to international successful athletes. This level of 4.0 m/s was achieved by 27% of the athletes in this investigation. Due to the fact that coaches in technical or team related sports have limited time periods to develop endurance capacity, time saving strategies like high intensity training should be accounted for training regimes.

**COMPARISON OF AEROBIC ENDURANCE CAPACITY IN MEMBERS OF SPECIAL FORCES AND SOCCER PROFESSIONALS**

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**INTRODUCTION:** Although members of special forces of Military or Police have eminent duties and responsibilities there is few knowledge of the physiological demands of that profession. Although all members of these forces should be regarded as professional athletes, much of the training regime is not specific with regard to their goals and is influenced more on practical experiences than on scientific findings. In comparison, soccer players at elite level have several coaches being responsible for different physiological components (e.g. strength, endurance). Furthermore, possibilities to ensure a fast recovery and medical services are available to prevent injuries. On the other hand members of special forces are struggling with injuries in many cases. These are mostly fatigue related and consequences of physiological overload. To avoid fatigue related injuries, a high endurance capacity level will be preventive. Due to the fact, that soccer training as well as training for member of special forces include technical and tactical aspects, the time available for endurance training is limited in both of these groups. The aim of this study was to define the aerobic endurance capacity of the members of a special forces and of professional soccer players.

**METHOD:** 38 male volunteers of Police special force (mean value for height and weight: 183.6±5.6cm, 82.5±7.3kg) and 22 male professional soccer players (184.3±6.0, 81.2±6.1) were tested. In order to detect the thresholds at 2 and 4 mmol/l (V2, V4) on a treadmill, all subjects performed a step test (start: 2.8m/s, increase: 0.4m/s, duration of step: 5min, incline: 1%). Oxygen uptake (VO2) and Respiratory Exchange Ratio (RER) was recorded by an open spirographic device (ZAN 600).

**RESULTS:** Mean values for velocities at lactic concentrations of 2 and 4 mmol/l, as well as VO2peak were 3.4±0.3m/s, 3.8±0.2m/s and 56.7±4.8ml/kg/min. Maximal values during the step test were 3.7m/s, 4.2m/s and 65.4ml/kg/min. Mean values for soccer players were 3.3±0.5m/s, 3.9±0.3m/s and 54.7±7.1ml/kg/min. Maximal values were 3.7m/s, 4.2m/s and 65.3ml/kg/min.

**DISCUSSION:** The results show similar data for V2, V4 and VO2peak for the police men as well as for the soccer players although the training concept is different. In soccer training normally a volume oriented training is chosen whereas in special forces a high intensity training (strength & endurance training) is exercised in many situations. Although the training in special forces includes other time consuming aspects than physical training such as mission tactics and simulation, handling weapons and individual tasks (e.g. first aid), a high intensive training shows similar results than professionally organised training with soccer players. The collected data help to understand the physiological demands in very different situations such as police tasks and soccer and to find background variables for performance.

**LACTATE AND VO2-KINETICS DURING TRAINING AND MATCH IN TABLE TENNIS: CONSEQUENCES FOR EXERCISE**


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Table tennis (TT) has developed to a global sport. Especially young TT-players face an increasing amount of training, matches & travelling. From this focus, a high endurance level plays a beneficial role for fast recovery and increased concentration during stress situation. For developing endurance performance it is vital to quantify the metabolic demands during TT training and matches in order to develop strategies for the training process. The mere analysis of lactate concentration (Lac) before and after training will not quantify the energetic demands during a complete training session or match. Close monitoring of Lac, heart rate (HR) and oxygen uptake (VO2) are favourable. The aim of the study was to determine metabolic energy demands during intensive and moderate training as well as during match in order to develop strategies for training process. **METHOD:** Lac, HR, VO2 and ratings of perceived exertion (RPE) in 8 juvenile subjects (15±1yrs, 71.4±10.9kg, 182±9cm) were measured during three special training sessions (TS, 82±13±4:09 min) and during an international match simulation (15:13±4:09 min) with three sets. The three TS were planned by a German Junior National Coach with either a technical/moderate emphasis or high intensive TT-specific stress. VO2 was registered continuously with portable spirographs (K4B2 & Metamax) calibrated prior to every single test. HR was recorded online every 5s. Lac-concentration was analysed amperometric-enzymatically. Additionally the subjects were asked to rate their perceived exertion. Lac and RPE were collected closely every 1-3 minutes. **RESULTS:** The average Lac concentration during the high workload reached 2.06±1.10 mmol/l. Mean heart rate was measured with 127.4±18.6 B/min and mean relative VO2 with 21.6±8.7ml/min/kg. Mean RPE values were noted 16±2±2.3 on the BORG’s scale. Peak values in TS reached 168.0 B/min and 44.1ml/min/kg as well as BORG 20. The peak values were achieved after a special drill without breaks playing 200 balls at maximum speed. During less intense TS average values for Lac (0.98±0.16 mmol/l), HR (125.2±40.2 B/min) and mean relative VO2 with 21.1±8.7ml/min/kg. Mean RPE values were noted 16.2±2.3 on the BORG’s scale. Peak values were achieved after special drill without breaks playing 200 balls at maximum speed. During less intense TS average values for Lac (0.98±0.16 mmol/l), HR (125.2±40.2 B/min) and mean relative VO2 with 21.1±8.7ml/min/kg. Mean RPE values were noted 16.2±2.3 on the BORG’s scale. The collected data help to understand the physiological demands in very different situations such as police tasks and soccer and to find background variables for performance.
MAXIMAL VOLUNTARY ISOMETRIC FORCE IS LOWER DURING BILATERAL COMPARED TO UNILATERAL QUADRICEPS CONTRACTIONS

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Introduction
A reduction in force produced by homonymous muscle during bilateral (BI) maximal voluntary contractions (MVC) compared with the sum of unilateral (UNI) MVC forces has been previously described. This phenomenon, which is known as the bilateral deficit, has not been found in all instances (see Howard and Enoka 1991, Kawakami et al. 1995 vs. Jakobi and Cafarelli 1998). However, the contribution of each leg has never been quantified using independent strain gauges during BI MVC. The purpose of this study was to compare the isometric MVC force of the knee extensor muscles between unilateral and bilateral contractions using a system equipped with two separate strain gauges.

Methods
Twenty physically active men (26.5 ± 4.5 years) volunteered to participate in this study. They were placed in the seated position on a leg extension machine with the hips at 90° and the knee flexed at 70°. Subjects performed several MVC of the knee extensor muscles in different conditions (3 trials/condition): unilateral MVC with the right (MVC RUNI) and left leg (MVC LUNI) and bilateral MVC. MVC RBI and MVC LBI corresponded respectively to the MVC force of the right and left legs during bilateral contractions. The interpolated twitch technique was used during MVC to quantify maximal voluntary activation level (VAL).

Results
MVC RBI (401.9 ± 76.4 N) was significantly lower (P<0.01) than MVC RUNI (418.2 ± 77.9 N), in the same way, MVC LBI (399.4 ± 87.3 N) was significantly lower (P<0.01) than MVC LUNI (421.5 ± 78.1 N). VAL was not significantly different between UNI and BI conditions (P=0.12 for MVC RUNI; 91.6 ± 4.9 % for MVC RBI; 90.2 ± 7.3 % for MVC LUNI and 90.1 ± 6.4 % for MVC LBI).

Discussion
These results showed that absolute MVC force of the knee extensor muscles depends on the mode of contraction, i.e. maximal force is lower for BI MVC compared to UNI MVC. These findings confirm the results of previous studies (e.g. Howard and Enoka 1991, Kawakami et al. 1995), i.e., lower maximal force produced by homonymous muscle during BI MVC compared with the sum of UNI MVC. Since maximal voluntary activation level was similar between UNI and BI conditions, it is suggested that bilateral deficit was not due to neural mechanisms. Further studies are needed to clarify the physiological/biomechanical mechanisms underlying bilateral deficit.

References

EFFECTS OF WHOLE BODY VIBRATION ON MAXIMAL STRENGTH AND POWER DEPENDING ON INPUT FREQUENCY

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The human body reacts to external vibration with muscle tuning as a damping mechanism to avoid a resonance catastrophe. An induced vibration of a muscle near to the individual natural frequency (INF) leads to an increasing muscle activity (Wakeling, Nigg & Rozitis, 2002). Therefore, it is assumed that vibration training at the INF will result in an increase of strength. The purpose of the study was to evaluate whether mechanical vibration induced with the INF leads to a higher increase in maximal strength and power compared to vibration with a general frequency of 30 Hz. 30 sport students took part in the study, 17 men (26.3 ± 3.8years, 78.3 ± 6.9kg) and 13 women (21.7 ± 1.7years, 60.2 ± 5.6kg). At different frequencies (vibration plate, Galileo 2000) the INF was assessed from m. rectus femoris by using an accelerometer. The INF was defined as the frequency where the amplitude of the acceleration is lowest. Two intervention groups performed vibration training, three times a week for a time interval of 7 weeks. The subjects had to stand in a static position with a knee angle of 140 degrees (8 series of 60-120 seconds). A third group served as a control group (no training). The vibration frequency of group one was adjusted to the INF. Group two practised with a general frequency at 30 Hz which was different to the INF. Before and after the training period, explosive power and isometric strength of the legs were measured. It was expected that group one shows a higher enhancement in strength parameters in comparison with group two. One way ANOVAs of the differences between the pre and post test values have been calculated for each parameter. The analyses show significant differences between the groups for maximum strength of the left leg (F=7.577, p<0.003, etaf=0.367) and right leg (F=3.705, p=0.041, etaf=0.252) and for explosive power of the right leg (F=6.207, p=0.007, etaf=0.361). Post hoc tests indicate that only the control group differs significantly from the intervention groups. The results are not in line with the assumption that vibration training at the INF leads to the highest increase in maximum strength and explosive power. Reasons for this unexpected result may be due to methodological and technical limitations and will be discussed.

References

COMPARISON OF POWER OUTPUT MEASUREMENTS DURING ERGOMETER AND ON-WATER ROWING

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Introduction
Physiological responses to rowing training are usually assessed by laboratory-based incremental tests conducted on rowing ergometers, although several on-water protocols have been reported (1, 2). These investigations used custom-designed equipment to measure on-water power output (2), but did not measure oxygen consumption (VO2). This study evaluated commercially available power and VO2 measurement devices for on-water testing applications and compared results between ergometer and on-water tests using matched protocols.
Methods

Seven male rowers (mean age 20.4 years, s=2.0; VO2max 5.61 L min⁻¹, s=0.47) completed incremental tests on a rowing ergometer (Concept2 Model D, Morrisville, USA) and in a single scull (Sykes Racing, Geelong, Australia) instrumented with a WEBA Sport Rower Expert Light biomechanics system (WEBA, Wien, Austria). Ergometer (ERG) and on-water (OW) tests both comprised five submaximal workloads and one maximal performance trial each of 4 min duration; tests were completed in a randomised order. Average power output during each workload was measured by the Concept2 work monitor unit and WEBA during ERG and OW tests, respectively. VO2 (Cortex MetaMax 3B, Leipzig, Germany) was measured using the average from steady-state conditions achieved during the final 2 min of each workload. VO2-power relationships were established for ERG and OW conditions, thereby permitting comparisons between data from both power measurement devices at each workload based on VO2 values matched between tests.

Results

Strong VO2-power relationships were obtained during ERG (r=0.96) and OW (r=0.94) tests. ERG and OW VO2 values predicted from the same five submaximal power output references (140-280 W) were not significantly different and displayed a strong correlation between tests (r=0.91). However, mean VO2 values were consistently higher during the OW test (3.04-4.88 L min⁻¹) compared to the corresponding ERG data (2.84-4.48 L min⁻¹). These differences were eliminated (+/-0.02 L min⁻¹) when power output comparisons were offset, normalised mean VO2 data indicated that the reference ERG power outputs between 140 and 280 W have equivalent OW power outputs between 128 W and 277 W. During maximal exercise, OW power output was significantly lower (8.0%, P=0.04) and the corresponding VO2 1.2% lower.

Conclusions

Incremental rowing tests that include power output and VO2 data can be completed on-water using commercially available measurement devices. Although the resulting VO2-power relationship was not significantly different between tests; compared to Concept2 ergometers, the WEBAs may under-represent power output during submaximal and maximal rowing.

References.


COMPARISON OF FOREHAND RECEIVING ABILITY OF NATIONAL-LEVEL TO SENIOR HIGH SCHOOL-LEVEL MALE TABLE TENNIS PLAYERS

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The receiving ability is one of main factors of anticipating the other initiative to win in a table tennis match. The strength of receiving is directly concerned with bringing skills and tactics into a play.

Purpose: To give an idea of advancing receiving ability, a new procedure to assess forehand receiving performance of male table tennis player at different level in simulated conditions was employed in this study. Method: 32 male players representing two different skill levels volunteered in this study. Ten of them are at national-level, while 20 belong to senior high school champion team in 2007 National High School Games. The protocol consists of 5 tests, including basic control, reflection, agility, judgment and match-like condition. Every test is composed of 6 spin types of serving repeated 6 times, which are topspin, backspin, left-side spin, right-side spin, left-side downspin and right-side downspin. Each player performed 180 receives in total. Every serve was driven by the same table tennis player at national-level, produced a neutral and offensive situation as real games. Receiving quality was determined by simultaneous record of success rate and accuracy of target area on the table. Results: National-level players significantly scored higher than senior high school players on agility, judgment, and match-like condition in terms of receiving success rate (P<0.03); however, there are no significant differences on basic control and reflection. Moreover, national-level players outperformed senior high school players on control, reflection, judgment (P<0.05), and agility (P<0.01) in receiving accuracy. The participants were also evaluated by different spin types and it is found that national level players performed better on every spin types, especially on left-side spin and left-side downspin in the aspect of both success rate and accuracy (P<0.01), which signifies that senior high school players cannot control more complicated spins as well as national level players. Conclusion: This authentic, reliable and valid study specifically indicates the differences of forehand receiving quality in national level and senior high school level players, which can be used as an efficient instrument for evaluating forehand receiving quality. By these test results, coaches can adapt and apply different training programs to improve receiving ability of individual player.

ACUTE AND CUMULATIVE EFFECTS OF DIFFERENT TIMES OF RECOVERY FROM WHOLE BODY VIBRATION EXPOSURE ON MUSCULAR POWER

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INTRODUCTION

Vibration training has been introduced lately into training routines by using different platforms. These machines are capable of, by means of oscillatory movements, provoking a mechanical stimulus that gets transmitted throughout the whole body, stimulus known as Whole Body Vibration (WBV) (1). Through this stimulus, the gravitational load the neuromuscular system undergoes is increased. After applying different training parameters, contradictory acute and chronic effects were transversal on muscle power of lower limbs (2). To the best of our knowledge, the influence of different recovery times between exposures has not yet been assessed.

This study was based on the hypothesis that the duration of the recovery interval is affected whether the applied vibration stimulus during training is acute or chronic.

AIM

This experiment was designed to assess, the acute (Study I) and cumulative (Study II) responses of muscular power to different recovery times after WBV exposure.

METHODS

All subjects (mean age 19.7 ± 1.9) were healthy and physically active. In both studies, subjects were exposed to a WBV bout of 6 exposures of 60 seconds each, frequency 30 Hz, amplitude 4 mm; this protocol has already been tested in previous studies (3). In Study I subjects (n=30) underwent 3 trials on different days, each trial including one bout of vibration training with 1, 2 or 3 minutes’ recovery between exposures to WBV. Muscle power was measured before and after each bout. In Study II, subjects (n=45) were randomly as-
signed to 4 weeks’ WBV training (3 bouts/week) with either 1 or 2 minutes’ recovery, or to a control group. Muscle power was measured before and after each bout. In both studies, muscle power was measured using a lineal encoder with the subjects performing a half-squat exercise using a Multipower machine equipped with calibrated disks.

RESULTS
In the acute study, recovery times of 1 and 2 minutes resulted in an enhancement of muscle power (p < 0.05) while 3-minute recovery did not, the 2-minute recovery proved to be the most effective. In the long-term study, however, while both recovery periods also enhanced muscle power (p < 0.05), the 1-minute recovery proved to be more effective, since the response was modified by systematic stimulation.

CONCLUSIONS
2-minute recovery periods provided the most effective acute enhancement of muscle activation, while the 1-minute recovery provided a more effective cumulative enhancement of muscle power.

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second one (decreases also higher than 30%), while in the third round we noticed great inter-individuals variations between athletes, due to each technical-tactical characteristic.

Conclusions
The experimentation state that the fatigue weigh on the kicks rapidity in TKD proportionally to the length of the match, with a progressive decrease of the rapidity during the three fighting rounds, especially in the 2nd.

This decrease weigh the match tactic adopted by each athlete.

In the preparation of the TKD results fundamental:
1) To organize the training of the elite athletes, taking care in a specific way the development of the rapidity endurance
2) Pay great attention to the tactical management of the matches.

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RUNNING EXERCISE AFFECTS MAXIMAL ISOKINETIC TORQUE, BUT DOES NOT AFFECTS TOTAL WORK AND TIME TO PEAK

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Introduction
Running exercises are commonly used in many recreational practices and sports, in which the muscular fatigue can decrease the skills and performance. Previous studies have been conducted concerning the strength losses after running exercises at different intensities and durations, however, the relationship between the effects of an aerobic running exercise in neuromuscular variables during isokinetic tests (peak torque [PT], total work [TW] and time to achieve peak torque [TPT]) could be more explored. The main objective of the present study was to verify the effects of a continuous running exercise on the isokinetic PT, TW and TPT.

Methods
Sixteen healthy males (12±2.6 years, 180.3±6.4 cm, 80.3±12.3 kg; VO2max 46±8 ml kg⁻¹ min⁻¹) performed the following tests on different days: 1) an incremental test in a treadmill (INBRAMED Super ATL, Porto Allegre, Brazil), in order to determine maximal oxygen uptake (VO2max) (Cosmed Quark PFT ergo, Rome, Italy, and the velocity at onset of blood lactate accumulation vOBLA (YSI 2300, Ohio, USA); 2) 5 maximal isokinetic knee extensions (System 3 PRO, BIODEX Medical Systems, NY, USA), to determine the peak torque, at 180° s⁻¹ under concentric (C-180) and eccentric conditions (E-180), in random order; 3) the same isokinetic protocol described previously, performed 15 minutes after a continuous running at 95% vOBLA (9.06±1.9 km h⁻¹, 74.2±9.3% VO2max), in which the duration was estimated to a caloric expenditure around of 500 Kcal (35.07±5.93 min) for all subjects. All tests were separated by at least seven days. PT, TW and TPT were obtained by the Dynamometer software, and the comparisons between pre and post-exercise conditions were made by using a two tailed Students Paired t test.

Results
Significant differences were found for PT at E-180 between pre (325.5±60 N.m) and post exercise (306.4±69 N.m) (p<0.05) with no differences to PT at C-180 (pre = 169±4 ± 33; post = 172±9 ± 32 N.m). Significant differences were found for TW during concentric contractions between pre (154.98±27 J) and post exercise (160.78±26.7 J), without differences for TPT (pre = 223±60 ms; post = 210±39 ms). In the same way, no significant differences were found for TW and TPT during eccentric contractions between pre (TW = 276±52.6 J; TPT = 662±228 ms) and post exercise (TW = 271±64 J; TPT = 693±206 ms).

Conclusion
Running exercise performed at 95% vOBLA decreases the PT during eccentric contractions, likely due small muscle damage. However, the similar amount of torque produced (between pre and post exercise) verified by the TW, is contrasting with your increase in concentric contractions. This fact can be related to a superimposed muscle heating on the small muscle damage. Neuromuscular patterns of the knee muscle length and torque production (described by the TPT) were not influenced in this these exercises conditions.

NEW DIAGNOSTIC MEANS IN BALANCE ABILITIES

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Introduction
Balance boards are widely used in the objective measurement and testing of balance abilities. Its known, that tests of easier character with less feel have higher reliability then tests that are more complicated with more feel. And to these tests with more feel belong tests maintaining dynamic balance in different positions on a stabbilographic board , which shows the level of development of dynamic balance. Balance abilities belongs to a structure of coordination abilities, and is characterized as an ability to maintain the body in a stable position or to renew this position if it is disturbed by outside interference.

Objective
The aim is to analyze reliability of the testing dynamic balance abilities on different balance boards

Methods
Balance abilities were tested on 45 students of Faculty of physical education and sports, Comenius University in ages 21 - 23. Among them there were 26 males, 19 females. By using the paired correlation we calculated the correlation coefficient with intervals of reliability and testing errors. For testing the dynamic balance abilities we chose the test of balancing on different unstable boards. Reliability of test we verified method test - retest with time interval one week. Test and retest were accomplished in a standard laboratory conditions. The goal of the tested person was to balance him/herself in the longest balance standing position on the board. The attempt was finished at the time if any part of the board touches the ground. Everybody was tested three times. We tested in the same place, at the same time of the day, on the same surface, with the same motivation and the same researchers.

Results
Relatively highly significant relationships was confirmed in the tests of dynamic balance. Test on Balance master r (corr.) = 0.78, Extrem balance boards r (corr.) = 0.75, Energetics board r (corr.) = 0.73. Test of balancing on an unstable boards r (corr.) = 0.72.

Conclusion
Tests of balancing on an unstable boards are good means for diagnostics of dynamic balance abilities in sport professions.

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INFLUENCE OF PHYSICAL FITNESS ON FREESTYLE PERFORMANCE IN YOUNG SWIMMERS

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INTRODUCTION
Physical fitness requirements for swimming are diverse. According to Tanaka et al. (1993) dry-land resistance training is an important part of modern swim training. Testing of physical abilities is important to assess the athlete's general fitness and for training prescription. The aim of this study was to determine the influence of physical fitness on different events in freestyle swimming.

METHODS
34 competitive swimmers (16 men, 18 women) took part in this study. The subjects mean values ± SD for age, height and body mass were 16.0 ± 2.4 years, 170.9 ± 10.1 cm and 61.3 ± 10.7 kg. The following parameters were tested to assess the swimmers’ general fitness: isometric abdominal and back strength, isometric bench press and bench pull strength, isometric leg strength, counter movement jump (cmj), tapping and maximum velocity on a custom built swim bench (Platzer et al. 2004). All tests met scientific criteria. For statistical analysis Pearson correlation was used to test relationships between the different parameters. A multiple regression (stepwise forward) analysis was carried out to estimate swimming performance by the different parameters.

RESULTS
Isometric abdominal strength, cmj and tappings correlated significantly with 50, 100 and 400 meter, isometric back and bench press strength only with 400 meter and the swim bench test with 50 and 100 meter freestyle time in men. In women only abdominal strength (not over 50 meter) and maximum swim bench velocity correlated significantly with swim time over 50 and 100 meter. Multiple regression revealed R²=0.8, R²=0.77, R²=0.6 for men’s 50, 100 and 400 meter freestyle time respectively. In women’s 50 and 100 meter freestyle events, R² values of 0.5 and 0.63 respectively were found.

DISCUSSION
The results indicate that the test battery is a good predictor for men’s freestyle 50 meter sprint performance. For longer distances and for females the predictive value of the test battery continuously decreases. In 400 meter events other factors such as technique, endurance or anthropometric issues are more important. Interestingly, women’s strength parameters are not performance determining in this study. Perhaps kinaesthetic sense or body composition are central elements in women’s swimming performance. Maximum velocity in the swim bench tests is the most important predictor for men and women in all events except 400 meters. This indicates that sport specific strength and power testing is crucial for performance diagnostics in swimming.

References

FORECASTING OLYMPIC RESULTS IN AN ATHLETIC EVENT
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The Olympic Games will be hold once again next summer. The Olympic motto of ‘faster, higher, stronger’ is an aspiration of all athletes. In that sense, a question of interest is ‘how far are athletes willing to go?’

This work focusses on the triple jump. This field event was included in the modern Olympic Games since its first celebration in 1896. The Olympic record is 18.09 metres, performed by Kenny Harrison, in 1996. The distance of 18.29 metres remains as World record, although it was recorded in 1995.

This paper aims to forecast the result to be obtained by man’s gold medalist in the 2008’s Olympic. The time series with the best distance reached on each Olympic since 1986 was used in order to evaluate the forecast. The behaviour of this time series is typically autoregressive. Some of the events that occurred in the past, such as the two world wars, may have some influence in the forecast, as after the wars the scores dropped down. The high altitude of Mexico City, where the Games took place in 1968, was credited to have contributed to many records setting. We may thus think that the conditions observed after the wars, as well as the conditions found at high altitude are critical interventions to the subject we are dealing with.

Several intervention autoregressive models were estimated and some criteria were discussed in order to choose the ‘best’ model. An autoregressive model of order one with two interventions, due to the world wars, was chosen on the basis of minimum Akaike Information Criterion (AIC). The mean squared error (MSE) evaluated using errors of the one-step ahead in-sample forecast from year 1920 through 2004, and the MSE calculated using errors of the one-step ahead out-of-sample forecast between years 1980 and 2004 are also favourable to the referred model.

According to the chosen model, the point forecast to the score of triple jump 2008’s Olympic champion will be 17.76 metres, with the limits of the 95% prediction interval to be 17.06 and 18.45 metres. This prediction meets the best 2007’s performance, which was 17.90 metres, and the World Leading 2008, which is 17.42 metres.

DIFFICULTY SCORE FOR RHYTHMIC GYMNASTICS GROUP EXERCISES IN PORTIMÃO 2007 WORLD CUP SERIES
Avila-Carvalho, L., Corte-Real, A., Araújo, C., Botelho, M., Lacerda, T., Lebre, E.
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The performance in rhythmic gymnastics is evaluated in competition by a final score that includes 3 sub-scores: Difficulty, Artistic and execution scores. The difficulty score represents the body difficulty level that the gymnast or the group can achieve. The aim of this study is to try to see if there is a profile in the type of difficulty elements chosen by different groups all over the world to make their choreography for competition routines.

For this study, 38 different routines from 19 different countries from 4 different continents that competed at Portimão 2007 World Cup Series were observed. The groups performed two different routines, one with 5 ropes and other with 3 hoops and 4 clubs. The analysis of the difficulty elements of the routines was made using the competitions forms that group have to give in advance to the competition organisation. We preferred to study the competition forms instead of the films because in this way the analysis will not be affected by the fails and mistakes made by the group during the competition. The classification used to organize different elements was the official
classification used in the FIG (Gymnastics International Federation) Code of Points (FIG, 2007). We so classified the difficulty body movements in five main categories: Jumps/Leaps, Flexibility/Waves, Balances, Pivots and Exchanges. Analysing the main results we could conclude that in the Jumps, for all groups and for the 2 different routines they preferred performed difficulties with different kinds of "jeté en tournant". For group of Balance elements the most performed element was the balance with the trunk at the horizontal with different position of the other leg., also for the two different types of routines. For the pivots the most used were the pivots with the leg high (in front or side) For the flexibilities/waves we could mark that were the splits with the on the horizontal positions the preferred elements for the sample observed. To compose the difficulty elements the groups observed have chosen for both routines preferably Jumps and Flexibility/Waves.

Analysing the Exchange elements the results showed that the majority of the Exchange elements have no body difficulty elements included. But when it happens the groups have chosen the jumps in both type of routine.

References.


CARDIAC LOAD IN TEAMGYM PERFORMANCE

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Introduction

Teamgym is a fairly new and popular form of Gymnastics including only trampoline, tumbling and floor exercises. While artistic gymnastics has been closely studied during simulated competitive routines with respect to cardiovascular load, power, endurance, heart rate, blood lactate concentration, and VO2max [Noble, 1975; Jemni et al., 2002, Goswami, Gupta, 1998], teamgym has never been investigated. The aim of the present study was to investigate the cardiac load in teamgym performance during National and European Championships.

Methods

Ten Italian elite gymnasts, 5 males and 5 females, (mean age 21 ± 2) performed the same exercise program during National (NC) and European Teamgym Championships (EC). Gymnasts’ cardiac load (HR) was measured recording heart rate (Polar team System) in each competition, during the three routines. For the analysis of the physical load, heart rate was classified based on the percentage of time spent in three zones (Low-intensity: <85% HRmax; High-intensity: 86-95% HRmax; Maximal effort >95% HRmax). Statistical comparison among heart rate values in each of the three routines in different championships were made using non parametric Friedman's Test ANOVA.

Results

Differences (p<0.05) in heart rate emerged between NC and EC only in the tumbling routine with higher values during EC (86-95% HRmax = 29%) than NC (86-95% HRmax = 9%). Furthermore differences were found for apparatus in each competition (p<0.05). During Tumbling subjects remained at the lower intensity frequencies (<85% HRmax) for the majority of exercise time (NC= 91%, EC= 71%). During trampoline routines the more frequent zones were low-intensity (<85% HRmax: NC= 70%, EC= 53%) and High-intensity ones (86-95% HRmax: NC= 30%, EC= 47%). The highest cardiac load was observed during the floor exercise (<85% HRmax: NC= 53%; EC= 46%; 86-95% HRmax: NC= 46%; EC= 45%). Furthermore 1% and 9% of frequency of occurrence of HR > 95% HRmax were observed during NC and EC respectively.

Discussion/Conclusion

As expected, Teamgym competitions elicited a very high cardiac load, with differences between apparatus. Actually, during the trampoline and tumbling gymnastics perform rounds of acrobatic elements between rest periods, while the floor exercises require fluid routines with no rest periods, which elicit higher HR. Despite the exercise program did not differ between National and European Championship, the higher HR observed during the latter competition might be attributed to a higher arousal determined by the higher level and importance of the event.

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WHICH IS THE MOST VALID INDEX OF EXPLOSIVE STRENGTH DURING AN ISOMETRIC LEG PRESS TEST?

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Explosive strength is the ability to exert maximal forces in minimal time and is important for success in several sports. A popular method for measuring explosive strength is isometric testing, and various force/time indexes have been proposed in the literature [1, 2]. The aim of the present study was to determine the validity of these indexes of explosive strength during an isometric leg press test, by exploring their correlation with vertical jump performance (VJP).

Explosive strength of 14 healthy and active male subjects (age 25±2 years, height 178±7 cm, weight 84±12 kg) was tested with an isometric dynamometer mounted on a horizontal leg press with a 120 degree knee angle [3]. VJP was measured as height reached during a countermovement jump. Statistical significance was set at 0.05.

Only rate of force development (r = 0.66, p<0.01) and starting gradient (r = 0.57, p<0.05) were significantly correlated with VJP. None of the other indexes of explosive strength were significantly correlated with VJP. Some of the rates with the leg high in front were significantly correlated with VJP time to 500N r = 0.18, time to 30%MVC r = -0.14, time to 50%MVC r = -0.36, time to 90%MVC r = -0.28, force at 30ms r = 0.07, force at 100ms r = 0.35, explosive strength index r = 0.14, reactivity coefficient 0.13, acceleration gradient r = 0.11).

These results demonstrate that the choice of which explosive strength index to use during isometric tests can not be arbitrary. When the aim of the isometric test of maximal strength is to infer dynamic performance, we suggest the use of rate of force development and starting gradient. All the other indexes of explosive strength should not be used for athletic assessment.

References

ARTISTIC VALUE SCORE FOR RHYTHMIC GYMNASTICS GROUP EXERCISES IN PORTIMÃO 2007 WORLD CUP SERIES

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The performance in rhythmic gymnastics is evaluated in competition by a final score that includes 3 sub-scores: Difficulty, Artistic and execution scores. The main liability of the final score depends on the artistic score (Lebre, 2007). In the Code of points last modifications we could find some improvements that transformed this part of the final score more precisely. The aim of this study is to see if there is a profile in the type of artistic elements chosen by different groups all over the world to make their choreography for competition routines. For this study, 38 different routines from 19 different countries from 4 different continents that competed at Portimão 2007 World Cup Series were observed. The groups performed two different routines, one with 5 ropes and other with 3 hoops and 4 clubs. The analysis of the artistic elements of the routines was made using the competitions forms that group have to give in advance to the competition organisation. We preferred to study the competition forms instead of the films because in this way the analysis will not be affected by the tails and mistakes made by the group during the competition. The classification used to organize different elements was the official classification used in the FIG (Gymnastics International Federation) Code of Points (FIG, 2007). So we divided the artistic elements in 3 main categories: Mastery (MAST), CAP's (Particular Artistic Characteristics) and Collaborations among gymnasts (COL).

Analysing the main results we could concluded that for MAST the groups preferred the bonification using throws for both type of apparatus but when we compare the routines with different type of apparatus we could observed that the bonus for catches were considerably higher in hoop/clubs exercise. For COL we concluded that in rope routines they use more the COL with simple throw and the RRT COL, but in the hoop/clubs exercise they preferred the COL with simple throw. For CAP's we could conclude that for rope the groups preferred to use the jumps through de rope and for the hoop/clubs route they preferred the handling of the apparatus.

In general we could design a profile for each kind of apparatus, but this profile is not the same for the two routines of the same group.

References.


DESIGNING, VALIDITY, RELIABILITY AND NORM PROVIDING OF TAEKWONDO SKILL TESTS

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Taekwondo is one of the martial arts and in recently years joined to Olympic Games. But it has no any skill test. The purpose of this research is designing, validity, reliability and norm providing of Taekwondo skill tests. For designing of Taekwondo skill tests, first, discussing by the coaches and elite athletes and then, designing five tests for measuring the Taekwondo skills. 10 young men ages 20 ± 2 years of Karaj Piroozy Taekwondo Club were selected voluntarily and participated in testing for determining of validity and reliability. Statistical analyses were Spearman Correlation Coefficient and Cronbach Alpha.

The results showed three tests of five tests have a suitable validity and reliability. There were significance relationship for Foot Speed Bit (r= 0.65, a= 0.75), Hand Power Bit (r= 0.61, a= 0.81) and Speed Combination Skills (Eleven Bits) (r= 0.58, a= 0.79) (p<0.05).

Finally, based on the records were made norm for three skill tests and suggestion the Taekwondo coaches can measurement the skills of Taekwondo by these tests.

MATCH ANALYSIS IN FEMALE FUTSAL

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Introduction

Although match analysis has been largely used to evaluate the demands of competition of team sports (Bangsboo et al., 1991; Pers et al. 2002), the few studies on futsal (Barbero-Alvarez et al., 2008; Soares and Tourinho Filho, 2006; Tessitore et al., 2007) involved only male players and were mainly focused on time motion analysis. Therefore, the aim of the present study was to analyze the tactical profile of female futsal matches.

Methods

Fifteen official matches of the Serie A 2006-2007 Italian Women’s Futsal Championship were analyzed. Each match was recorded by means of two cameras positioned at the side of the pitch. The videotapes were later replayed to analyse three tactical situations to score a goal: 1) Counter-attack (CA), i.e., 1vs0, 1vs1, 2vs1, 2vs2; 2) Set-Pieces (SP), i.e., Free-kick, Corner-kick, Penalty-kick, Kick-in, 10m Second-penalty, Goal-kick; 3) Passing Attack (PA) against a defensive alignment of the opponent team, i.e., an offence based on passes, screens and cuts designed to prepare for favourable shooting position. A chi-square test was applied to verify differences (p<0.05) between halves. The goals were expressed as percentages of the total.

Results

During the 15 matches 80 goals were scored. Higher percentages of goals were scored during SP (36%) and PA (35%) with respect to CA situation (29%). Despite CA and PA determined higher percentages of goals in the first half (64% and 61%, respectively) and the reverse picture emerged for SP (first half: 41%, second half: 59%), no difference was observed between halves. During CA, goals were more frequently scored from 2vs1 (43%) and 1vs1 actions (35%), than 1vs0 (13%) and 2vs2 (9%). During SP, goals resulted more frequently from Kick-in (31%), Corner-kick (31%), and Free-Kick (21%) than from 10m Second Penalty and Goal-kick (7%).

Conclusions

In team games the detailed analysis of the most relevant tactical situations to score goals is helpful to elaborate appropriate training strategies. The present results suggest that training Counter-Attack, Set-Pieces, and Passing Attack is equally relevant in female futsal. In particular, 2vs1, 1vs1, Kick-in and Corner-kick resulted the most important situations to train. The lower percentages of goals scored as a
result of Counter attack and Passing Attack during the second half might be probably due to fatigue occurring towards the end of the matches.

References.

INTENSIFICATION OF A TRAINING PROCESS OF GYMNASTS AT THE SPORT SPECIALIZATION STAGE

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Constant growth of achievements in gymnastics makes it necessary to study the process of training of gymnasts in details and find new ways to improve it. The stage of sport specialization is a significant phase of the athletes’ mastery. Its further development, in many respects, will depend on effectiveness of the stage.

The training process at the sport specialization stage is supposed to be more productive if the selection of means and methods of the gymnasts’ training is based on the analysed results of kinematic parameters and peculiarities of the muscle bioelectric activity, registered during performance of gymnastic exercises.

25 gymnasts, aged 10-12 took part in the investigation. The sportsmen were mastering the main exercises of the specialization training stage in combined events (handspring and back flip in acrobatics, giant circles on a horizontal bar, handspring vault, etc.).

The quality of the main exercises performance was assessed by comparison of the characteristics, registered in the process of biomechanical researches, of the gymnasts participating in the investigation and those of high qualification.

To reveal the extent and sequence of various muscle groups, performing the main exercises, to join in the work, a method of surface electromyography was used.

The process of the tests a support programme of physical fitness training was worked out. The gymnasts’ level of the physical fitness after the investigation increased in average by over 30%.

The muscle groups performing the studied movements made the core of the means of the support programme.

Comparison of the data received during the biomechanical and electro-myographical researches allowed to define the mechanisms of the performance of the main exercises of the sport specialization stage and succession of complicated moving skills formation on the base of the programme of handstand, spin and take/push-off training.

The number of successful attempts of handstand exercises (4 tests) increased after the test in average by 2.8 times; the increase of push-off exercises (2 tests) made 2.45 times, a take-off exercise (1 test) made 1 time increase.

Good basic skills (handstand, dynamic posture and push-off) made the most contribution into the quality of the performance of the main exercises mastered during the investigation. The score for the performance of the main exercises increased in average by over 0.9 points.

The results of the investigation showed that the programme of the combined events main exercises mastering, including sub-programmes of the basic and support physical training of the gymnasts, is pedagogically expedient in training gymnasts at the sport specialization stage.

WRESTLING COACHES AND EDUCATIONAL NEEDS

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Background

Despite an increasing recognition of the existence of a process of coaching, and a resulting increase in research activity, there remains a lack of a clear conceptual base for sports coaching (Cushiona, Armourb, & Jones, 2006). In wrestling it is not sufficiently answered what are the specific and essential things that coaches need to know in order to achieve competitive results! This situation has left coaching without a clear set of concepts and principles that reflect coaching practice on wrestling. In this paper, using a qualitative approach we will consider the expert coaches knowledge foundation to further describe what they consider the most important professional knowledge.

Method

The study involved in depth interviews to 6 expert coaches. At the time of the interview all of the coaches were training a team. The ages of the participants ranged from 31 and 53 years. Three of the 6 coaches were Portuguese, two were Spanish and one was Cuban working in Portugal. The interview questions concerning educational needs were part of a larger interview addressing pedagogical content knowledge in wrestling.

The 6 interviews were conducted in a direct, in-depth interview format in a time and location in order to ensured confidentiality and noninterference from others. After participants agreements the interviews were tape-recorded and then transcribed. The procedure used to look at the answers was the content-analysis, consisting on repeatedly transcriptions reading and listening to the interviews tapes. After that, we look for emerging themes, assigning compiled or paraphrased quotations using inductive and deductive procedures for further categorization.

Results and Conclusions

Coaching Education Background Profile

Educational levels of the participants varied. All the coaches had completed a federation course, which makes them possible to coaches. They considered experience as an athlete of there own the most important sources to develop their coaching style and knowledge, followed to academic graduation in sports sciences, except one of them which is graduated in industrial engineering.

Reading coaching books and journals, navigate in the web, “going out” and contact with others is considered as well the most important sources of professional knowledge for coaching.

Future Coaching Education Needs

Considering ultimately others needs, the coaches shows concerns about getting awareness of sports medicine, biomechanics, psychology, physiology and marketing. They state that the new wave of coaches must be integrated in a vast team of experts in each area.
indicated to prepare young coaches for elite level coach is needed. Thus mentoring programs the young coaches should learn to develop
their own style and knowledge from working with top coaches at the same time they work in a national level. With that, they will learn the
environment of competition so well considered to achieve higher results.

INFLUENCE OF THE EXERCISE CONSTRAINTS IN THE SOCCER TRAINING
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The aims of the study were to investigate the intensity of soccer training exercises and to analyse the variation of distance and speed
according to the restrictions of the exercises (Adjustment circle, Bangsbo, 1994). The sample was formed by soccer juniors A players (N= 10) that participated in the Second Division of the National Championship. The images of the exercises were gathered in video (miniDV format) and subsequently digitalised. They were analysed by TMAS software that estimated the distance and speed of the players.
Non-parametric tests were used (Mann-Whitney, Kruskal-Wallis, Wilcoxon, Friedman) to compare and correlate the study variables. The comparison of the distance and speed in 6 against 6 (6 x 6) and 4 against 4 (4x4) exercises showed significant (p<0,05) differences. It was found that the distance and speed results were always higher in 6x6 than 4x4 exercises. However, when the limit of kicks and goals
were employed, the results revealed that only the limit of kicks influenced significantly distance and speed. The results also support the
conclusion that the intensity of the effort increased in a proportional way with the number of players and playing area.

THE EFFECT OF INSPIRATORY MUSCLE TRAINING UPON CARDIORESPIRATORY PRIMARY KINETICS RESPONSE IN
ENDURANCE ATHLETES
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It’s known that Inspiratory muscle training (IMT) may increase respiratory muscle power-endurance, working capacities, respiratory re-
sponse to CO2, perceptual response and lactate kinetics (1,2). Whether or not these benefits and athletes’ working capacities can be
achieved by only increasing of respiratory muscle possibilities remains open for debate. It was hypothesized that effects of IMT may be
linked with increase of respiratory primary kinetics. The purpose was to determine the effects of IMT on respiratory, gas exchange fast
kinetics and exercise performance.
Twenty two of male high performance runners (Vo2 max = 70,4-73,6 ml kg-1 min-1) were randomized into two groups and perform the
same program of preseason training for three weeks (18 sessions). 10 athletes were assigned to IMT group and 12 athletes were received
sham inspiratory training with the same device (control group). IMT group performed ten repetitions (interval 2 min) of 30 inhalation-
exhalation (Powerlung) two times a day for three weeks with resistance adjusted to allow for 30 breathes to be close about 3 of maximal
effort. Before and after IMT athletes primary kinetics (T50, monoexponential, breath by breath method, transition from 100 w of VO2,
VCO2, VE and HR in rowing ergometer exercise at 0,75 VO2 max and performed 2000m all-out rowing simulation.
The results showed that IMT produce significant increase in VE peak response in comparison with control group (2,12±0,17 and 1,89±0,15
l.min-1.kg-1; p<0,05) and in primary kinetics. In IMT group T50 VE decreased from 39,12(7) to 31,9(2,8) s (p<0,05), in control group - from
38,3(2,9) to 36,4 (2,7) s (ns), T50VCO2 : in IMT group from 36,9 (2,4) to 33,7 (2,7) s (p<0,05); in control group - from 38,2 (2,6) to 36,0 (2,7) s
(ns) and V50 HR - in IMT group from 21,2 (1,2) to 17,6 (1,2) s (p<0,01), in control group - from 20,8 (1,4) to 19,2 (1,3) s (ns). The changes of
and VE peak (r=0,65) for all-out rowing simulation (r=0,61). In IMT group increased some measurements of working capacities also.
It may be related to increase VO2 utilization, power of metabolic acidosis respiratory compensation and respiratory drive mecha-
ism.
References.
2007:547-62

CARDIORESPIRATORY REACTIVITY MODIFICATION RELATED TO SPORTS SPECIFIC ENDURANCE TRAINING
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The sports specific capacities of cardiorespiratory system (CRS) usually related to specific metabolism for different power of loads. We
suppose that repetition of uniform character of endurance sports training provides an increase in specific optimization of CRS respon-
siveness also. The aim of the studies was to determine the differences in CRS responses to CO2 and in CRS, gas exchange fast kinetics in
middle and long distance runners.
Two groups (20-24yrs, 5-8 yrs training) of middle (800 m, n=15; body mass 75,1±1,2 kg) and long (5000 m, n=16; 70,6±0.9 kg) distance
runner were examined. The treadmill incremental to exhaustion (10-14 min), at 53,5(49,1-56,3)% VO2 max (5min) and at power VO2 max
(5min) exercises were used. Peak responses and fast kinetics (half-period - T50, monoexponential, breath by breath method, transition
from 6 km hour-1) were determined. Capillary blood lactate was measured after incremental load. Rebreathing VE sensitivity to CO2 was
determined.
The results showed that in incremental treadmill load to exhaustion the peak of lung ventilation (VE) was higher in long distance as com-
pared to middle distance runners (2,22±0,10 and 1,87±0,11 l.min-1.kg-1; p<0,05). Blood lactate after load was higher in middle distance as
compared to long distance runners (11,9±0,76 and 8,10±0,91 nmol.l-1, respectively). Besides, middle distance runners have been also
characterized by lower value of VE/ VCO2 than long distance runner (32,7±1,36 and 36,6±2,23) and by higher peak value of
VCO2/VO2 during recovery period (1,23±0,11 and 1,04±0,08, respectively; p< 0,05). The peaks of gas exchange ratio (VCO2/VO2) after
incremental load was related to VE sensitivity to CO2 \( r = 0,59; p < 0,05 \).
Fast kinetics VO2, VE at submaximal load were higher in in middle distance runners as compared to long distance runners. For instance,
T50 VO2 has constituted 25,3±1,7 and 28,9±2,1s, where as T50 VE - 38,5±2,8 and 45,9±3,3 s, respectively; p<0,05). But at power of VO2
max - the fast kinetics was the lower in the group of middle (T50 VO2 22.8±2.4s) than in long distance runners (25.4±2.7 s). Sensitivity of CRS responses to CO2 (VE/PACO2) was higher in middle distance (1.59±0.11) than in long distance runners (1.09±0.14 l/min-1 mm Hg-1 l). In middle distance runners individual differences in T50 VE and VCO2 have been related to VE sensitivity to CO2 (r=-0.67 and -0.65, respectively, p<0.05). The lung ventilation at PACO2 = 50 mm Hg was reliable higher in middle (29.5±2.0l/min-1) than in long (20.7±2.8 l/min-1; p<0.05) distance runners.

The results showed differences in sensitivity to CO2 in middle and long distance runners and in fast kinetics of CRS response as well as VO2 and VCO2 kinetics. The higher values of sensitivity to CO2 and fast kinetics at power of VO2 max in middle distance runners were related to higher intensity of metabolic acidosis respiratory compensation in comparison with long distance runners.

**TRAINING LOAD IN AN IRONMAN PREPARATION MACROCYCLE**

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**INTRODUCTION**

Ironman is one of the official triathlon competition, that includes 3,8 km swimming followed by 180 km road cycling, and that ends with a marathon running (42.195 km). Due to the prevailing aerobic demands, from a physiological point of view, Ironman is considered an ultraendurance effort.

During the Ironman training process, it is essential to determine and evaluate the training load in order to quantify the magnitude of the effort done, and to control the degree of fatigue of the triathlete. Quantification of the load, by means of heart rate, can be done easily using the total number of beats, or total heart rate, of each session and/or microcycle.

**PURPOSE**

The aim of this study was twofold; (a) to determine the training load in a macrocycle of 24 weeks for the preparation of an Ironman and (b) to relate the training load with the volume (time and distance), and with the intensity (mean speed and mean heart rate) of the training.

**MATERIAL AND METHODS**

An amateur triathlete (32 years, 1.76 m of height, 71 kg of weight), with six years of training experience and a best performance of 10 h 58 min.

Heart rate was registered in each training session using a heart rate monitor “Polar XTrainer-plus”. Distance covered and time expended in each training session were also measured. In running and cycling sessions, distance was measured using a GPS “Garmin Forerunner 201” and the heart rate monitor.

**RESULTS**

The triathlete did 196 training sessions. He devoted 336.11 hours to cover 5996.89 km. He swam 209.22 km, and did 4856.7 km cycling and 930.96 km running.

Half of the training sessions represented a small training load (< 9000 total number of beats), and only 16% of the training sessions supposed an extremely high level of training load (> 22500 beats). The mean training load was of 117.952 (DE 61.407) total number of beats, ranking from 18453 to 233438 beats.

The total number of beats of each microcycle correlates significantly with distance (r=0.97), time (r=0.99) and the mean speed (r=0.66).

On the other hand, total number of beats did not correlate with mean heart rate. Training volume (distance and time) correlated with mean speed (r=0.76 and 0.66), but mean heart rate did not correlate with any variable.

**CONCLUSIONS**

Training load, measured as total number of beats, is more sensitive to the training volume of microcycles than to the physiological intensity (mean heart rate). It allows to assess the effort done and to control the dynamics of the training process of the triathlete.

**EFFECTS OF SMALL-SIDED GAMES ON PHYSICAL CONDITIONING AND PERFORMANCE IN PUBERTAL SOCCER PLAYERS**

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**INTRODUCTION**

Small-sided games are extensively used by coaches for improving technical and tactical skills among young soccer players (1).

**PURPOSE**

To examine the fatigue effects induced by small-sided games on soccer physical conditioning and field test performance in pubertal soccer players.

**METHODS**

Fourteen pubertal soccer players (age: 14 ± 0.98 yrs, body mass: 62 ± 17.65 Kg, height: 168 ± 7.97 cm) participated in the study.

Small-sided games included games 3 vs 3 and 6 vs 6 in standard pitch size, with adopted rules and coach encouragement (2).

Each small-sided game consisted of 10 bouts of 4 min duration with 3 min active recovery between bouts. The recovery between the 5th and the 6th bout was 15 min. Soccer performance was evaluated via the implementation of five field tests: a) 30m sprint, b) throw-in for distance, c) agility test (Illinois Agility Test), d) dribbling the ball and e) horizontal jump. Heart rate was monitored during the entire testing session and it was used for the estimation of game intensity. Field tests were performed before (pre), in the middle and after (post) the implementation of the fatigue protocol.

**RESULTS**

Three-a-side games displayed higher heart rate values compared with 6 vs 6 games (86.9 ± 4.77% of HRmax versus 75.9 ± 6.22% of HRmax, respectively). Performance indices significantly decreased (P<0.05) in the middle and after the implementation of 3 vs 3 games (30m sprint: pre= 5.04 ± 0.32sec, middle= 5.21 ± 0.33sec and post= 5.34 ± 0.35sec. Agility test: pre=17.07 ± 1.02sec, middle= 17.60 ± 1.19sec and post= 18.01 ± 1.34sec. Dribbling: pre= 11.4 ± 0.48sec, middle= 11.99 ± 0.75sec and post= 12.85 ± 1.53sec. Horizontal jump: pre= 2.02 ± 0.15m, middle= 2.00 ± 0.17m and post= 1.87 ± 0.13m. Throw-in: pre= 14.81 ± 1.02sec, middle= 13.60 ± 3.04m and post= 12.45 ± 2.81m). During 6 vs 6 game situation, only 30m sprint and agility test were significantly lower (P<0.05).

**DISCUSSION**

The results of the present study indicated that small-sided games with 3 players led to increased intensity and therefore increased fatigue towards the end of the game, which has negative effects on player's performance. However, when the number of players increased, heart rate intensity decreased, while fatigue did not have the same effect on technical skills (dribbling) and explosive actions (horizontal jump and throwing) but only on agility and sprinting performance. Previous studies have reported that alterations in performance are accompanied by significant decline in muscle strength capacity and activation levels (3,4), which probably explains the decline in performance observed in the present study. However, small-sided games are strongly recommended for young ages due to higher involvement of players in the game.

**References**

NEUROMUSCULAR AND FORCE PROFILE OF THE SWALLOW AT THE GYMNASTIC STILL RINGS AND RECOMMENDATIONS FOR TRAINING EXERCISES

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The swallow at the rings can be rated as extreme challenging and strong determined element, which is only shown from excellent gymnasts. Due to the high quality rating of the swallow within the Code de Pointage of the Fédération Internationale de Gymnastique (FIG), this difficult technical element must be shown in a gymnastics exercise. The problem thereby is, that the training of the swallow takes a huge amount of time. So the following question arises: Is it worth spending time on developing the swallow or should this time better be used to train other elements? In order to help trainers and athletes answering this question, the purpose of this study was to develop a huge amount of time. So the following question arises: Is it worth spending time on developing the swallow or should this time better be used to train other elements? In order to help trainers and athletes answering this question, the purpose of this study was to develop

Six expert gymnasts who were able to perform the swallow took part in the study. They performed the original version of the swallow and six special trainer-assisted exercises for the swallow. Within the cables of the rings force transducers detect the tensile force. Surface EMG was depicted of ten muscles according to the recommendations from Sands (2006).

Considering the neuromuscular activation levels from the different muscles contributing to realize the swallow, high individual differences can be observed. These differences could be based on varying anatomical and anthropometrical prerequisites. Regardless these individual differences the mm. pectoralis clavicularis, biceps brachii, deltoideus anterior, trapezius and pectoralis sternocostalis were proved to be the most important muscles.

The aptitude of the tested training exercises to develop the special skills for performing the swallow was therefore not possible solely based on the electromyographical data. Regarding the force data it could be assumed that the force output was enhanced if the support from the coach was given more caudal. Based on these data a ranking of the different training exercises was fixed.

In order to simulate different anatomical and positional differences of the athletes performing the swallow a mechanical model was designed. With this model it can be shown, that the angle between the arms and the body play an important role in terms of a successful performed swallow.

It could be concluded that these results were able to support the training process for the development of the swallow in order to provide different ranked training exercises. The muscle profile helps the coaches to find training exercises which are able to enhance muscular force without using the special training exercise. So the long term periodization becomes more efficient.

References.

MEASURED MAXIMAL OXYGEN UPTAKE DURING AN INCREMENTAL VELOCITY CONTROLLED FIELD AND TREADMILL RUNNING TEST

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BACKGROUND: Maximal oxygen uptake is an indicator for aerobic endurance capacity. The multistage 20 m shuttle run test with 1 min stages is a popular field test to predict maximal oxygen uptake (Tomkinson et al. 2000). In this test, subjects run back and forth between 2 parallel lines, marked 20 m apart, in time to sounds. Predicted maximal oxygen uptake by the 20 m shuttle run test in a Figure of 8 (20MST-Fo8) was shown to exceed the value predicted from the line to line 20 m shuttle run test (Willems & Garatt, 2007). However, measured maximal oxygen uptake for the 20MST-Fo8 is not known. PURPOSE: We examined maximal oxygen uptake for the 20MST-Fo8 and a treadmill running test (MST-TRT, 0% gradient) with similar increases in velocity (0.14 m/s each minute) in both tests. METHODS: A random crossover design was used with the 20MST-Fo8 run indoors. Subjects ran the 20MST-Fo8 and MST-TRT until volitional exhaustion. Peak velocity, total running time, maximal heart rate, ratings of perceived exertion (RPE), blood lactate and maximal oxygen uptake using a Cosmed K4b2 portable gas analysis system were measured in 9 healthy, physically active, males (20.2 ± 0.4 yr, body mass 75.1 ± 9.9 kg, height 1.78 ± 0.06 m, mean ± SD). Data were analysed with a paired samples Student t-test with P<0.05. RESULTS: The 20MST-Fo8 and MST-TRT resulted in similar ratings of perceived exertion (19.6 ± 0.7 vs 19.2 ± 0.7). The 20MST-Fo8 had lower peak velocity (13.4 ± 0.68 vs 16.39 ± 1.08 km/h, P<0.001), shorter total running times (640.8 ± 81.8 vs 987.3 ± 145.6 seconds, P<0.001), lower maximal heart rates (192 ± 8 vs 195 ± 7 beats/min, P=0.022) and lower blood lactate values (7.5 ± 1.2 vs 8.2 ± 1.2 mmol/L, n=7 each, P=0.021) compared to the MST-TRT. However, measured values for maximal oxygen uptake were 15% higher for 20MST-Fo8 (62.4 ± 5.9 ml/(kg/min) compared to MST-TRT (54.5 ± 5.0 ml/(kg/min)) (P=0.001). CONCLUSIONS: Maximal oxygen uptake by the 20 m shuttle run test in a Figure of 8 is larger than measured for an incremental treadmill running test with similar changes in speed as in the 20 m shuttle run test. The nature of the running movement during a 20 m shuttle test in a Figure of 8 limits may involve a larger active muscle mass compared to treadmill running. However, it cannot be excluded that the longer total running time for the treadmill test compared to the 20 m shuttle run test in a Figure of 8 may have contributed to the lower maximal oxygen uptake values.

References.
DIFFERENCES IN PHYSICAL CAPACITIES BETWEEN SPANISH JUNIOR MALE BASKETBALL PLAYERS ACCORDING TO THEIR FINAL LEVEL OF ADULT PERFORMANCE (ELITE VS. NON-ELITE)

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Determining player selection criteria is one of the important current topics in competitive team sports such as basketball. In recent years, physical capacities have been assuming a more important role as parameters for player selection. Coaches often assume that more elite players will perform better on physical conditioning tests and therefore they are more likely to select these players for their team. Scant scientific literature exists, however, regarding the validity of the specific parameters used to discriminate between prospective basketball players in the talent screening process.

PURPOSE: to compare the performance level in each conditioning capacity category between elite and non-elite young basketball players over a 4-year period.

METHODS: 15 top-level male players participated in this retrospective study during four years (14-17 yr old) - guards [n=2], forwards [n=7], centers [n=6]. The subjects were divided into two different categories: II Elite (EI), athletes who play in the NBA, the First League of Spain (JACB) or on the Spanish National A Team (SNAT) [n=8]; III Non Elite (NE), players in the Second League of Spain (LEB) [n=7]. All the players participated in the same training program (5 h per day). Four times during each season each player performed various tests including countermovement jump (CMJ), Abalakov (ABK), horizontal jump (HJ), course Navette test (CNI), abdominal test [AT], strength explosive arm test [SEAT]. In addition anthropometrical data were recorded. The measures of each test were registered each season over the four year period and the best value of the first and last year was analyzed.

RESULTS: At the end of the training program the values were [Means±SD]. [Height: 198.4±5.0 vs. 197.2±4.3 cm, P<0.34]; [Weight: 89.7±10.5 vs. 91.7±3.9 kg, P<0.53]; [BMI: 22.52±2.0 vs. 23.4±0.7 Kg/m2, P<0.62]; [CMJ: 49.75±4.9 vs. 48.8±4.0 cm, P<0.17]; [ABK: 58.0±6.3 vs. 56.3±4.4 cm, P<0.06]; [HJ: 2.56±0.1 vs. 2.59±0.1 cm, P<0.53]; [CNI: 12.6±1.3 vs. 12.9±1.4 paliers, P<0.43]; [AT: 32.3±3 vs. 33.2±2 rpl, P<0.21]; [SEAT: 7.77±0.7 vs. 7.8±1.3 m, P<0.63], E and NE respectively.

CONCLUSION: Surprisingly, no statistically significant anthropometrical neither conditional capacities differences were identified between players that actually playing in NBA, ACB or SNAT and LEB players.

THE RELATIONSHIP BETWEEN PERCENT FAT AND 1500M TRACK RACE PERFORMANCE IN FEMALE ADOLESCENT RUNNERS

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Middle/long distance runners and their coaches often believe that runners must keep weight or fat mass as low as possible to run faster. In female adolescent runners, however, pursuing such a belief in excess would bring about harmful consequences to their health such as disordered eating, anorexia nervosa, or osteoporosis (female athlete triad).

To evaluate the relationship between fat percent (Fat%) and performance of running, we measured body composition by hydrostatic weighing among 18 female middle/long distance runners in a Japanese high school ranked in a high level in national competitions.

Body composition was measured twice in a year at the beginnings of pre- and peak-seasons and the measurement was repeated during 3 years of high school (from 15/16 to 17/18 years of age). The best record of 1500m track race of each season was selected from the results of several official races held in the respective season (T1500) and the best value of the first and last year was also determined (T1500best).

The first evaluation was performed in a preseason when the subjects entered the high school and height, body mass, and Fat% were 160.4+/−5.7 cm, 53.3+/−4.8 kg, and 14.1+/−7.8%, respectively. Although individual analysis of each year revealed that the subjects likely decreased Fat% and improved T1500.

RESULTS: At the end of the training program the values were (Mean±SD): [Height: 198.4±5.0 vs. 197.2±4.3 cm, P<0.34]; [Weight: 89.7±10.5 vs. 91.7±3.9 kg, P<0.53]; [BMI: 22.52±2.0 vs. 23.4±0.7 Kg/m2, P<0.62]; [CMJ: 49.75±4.9 vs. 48.8±4.0 cm, P<0.17]; [ABK: 58.0±6.3 vs. 56.3±4.4 cm, P<0.06]; [HJ: 2.56±0.1 vs. 2.59±0.1 cm, P<0.53]; [CNI: 12.6±1.3 vs. 12.9±1.4 paliers, P<0.43]; [AT: 32.3±3 vs. 33.2±2 rpl, P<0.21]; [SEAT: 7.77±0.7 vs. 7.8±1.3 m, P<0.63], E and NE respectively.

CONCLUSION: Surprisingly, no statistically significant anthropometrical neither conditional capacities differences were identified between players that actually playing in NBA, ACB or SNAT and LEB players.

PILOT PROJECT: TALENT DIAGNOSTICS AND DEVELOPMENT IN SELECTED SPORT ASSOCIATIONS

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Introduction: In June 2006 the interdisciplinary “Hamburg Talent Diagnostics and Development Program” - utilising sport scientific methodology - commenced. The talent diagnostics included a comprehensive physical ability test as well as a questionnaire regarding the athletes’ sport and training history. Eight selected sports associations (volleyball, field hockey, handball, basketball, badminton, track-and-field, soccer and rowing) were tested in the pilot project. The aim of the project was to analyse (1) the current state of the physical ability of the D-squad-athletes, (2) the identification of the athletes’ potential for development, (3) the requirement for career development and (4) as long-term assistance for their coaches.

Methods: 206 D-squad-athletes (age-group 1991-96) took part in the pilot project. The investigation included a normative questionnaire about the sport and training history and physical ability tests. The tests included: body composition (body height, body mass), flexibility, coordination and conditioning tests (areal orientation, shuttle run, 30m sprint, foot tapping frequency, speed related (jump strength, speed related throw strength) and sports specific tests. The data was compared with the normative data of C- and B- squad standard values. A correlation analysis was applied to verify the autonomy of the different tests.

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Results: The correlation showed that the tests were autonomous except the basketball throw correlated with body height (r=0.474), body mass (r=0.601) and BW (r=0.467). Foot tapping frequency correlated with the speed related jump tests (r=0.423), 30m sprint (r=0.479) and the shuttle run (r=0.490). The physical ability tests showed that only the hockey and handball sports associations were within the normative data. Sport specific normative data available for this age group is minimal.

Discussion: The pilot project “Hamburg Talent Diagnostics and Development Program” designed a manageable and practical approach to selective talent assessment. A comparison of the results of each individual within their sport and to the relevant normative data can then be available to coaches for discussion and analysis in reports and meetings. As a result, individual development tasks for each athlete were determined and operational guidelines formulated for each relevant coach. Through improved individual career development, competitive sport in Hamburg will be enhanced.

References.

VARIATION IN STRENGTH TRAINING WITH NON LINEAR OR UNDULATING PERIODIZATION - A CRITICAL REVIEW

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Designing a resistance training program is multifaceted. Non linear or undulating periodization has been a proposal of one possible procedure of strength training to improve maximal strength and muscular endurance.

Method: In this critical review, various studies are compared which includes non linear/undulating periodization as one of their parameters. Most studies compare groups which include variables which have a greater effect on maximum strength than the input of variation in an undulating training. Three out of four studies with equated volume and intensity didn’t show significant differences. Those three studies included bad males and women as subjects. One study revealed a significant increase in maximum strength compared to the other group but used trained males as subjects. Studies which included some sort of daily activity (e.g. carrying task) as their test parameters showed significantly better performances (nEMG efficiency) for the non linear group as compared to a linear group.

Conclusion: A higher maximum strength after a 6 to 12 weeks training period on non linear/undulating periodization was not observed compared to a linear periodization training concept, except on trained males and leg press only. A measurement on daily activity, testing the efficiency of the EMG muscle activity, is substantially better without increasing strength significantly. Functionality in sports such as a tennis serve improves significantly with a non linear program compared to a linear program without increasing maximum strength parameters at the same rate. Therefore the review leads to the conclusion that a non linear periodization training program might not increase maximum strength as much as expected but can be easily used to maintain strength and create a more interesting and challenging training program. It will work beneficiary in neurologically adaptations of muscle groups for skilled tasks in sports or everyday jobs.

HEART-FREQUENCY EXAMINATIONS OF PREMIER-LEAGUE MAN HANDBALL PLAYERS

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Introduction: The European Championship for the Hungarian handball team this year in Norway did not yield the result we hoped for. Domestic sport experts have for long time the unanswered question: how could they make team sportsmen’s trainings more efficient and build in their individual cutted program onto their load cycle. The POLAR Team System is developed for objective measurement of team and individual performances. The trainer and the sports physician receive a steady feedback of the player’s match or training performances, development, overtraining-belowtraining, via the method of the pulse control. With the help of this system the sport expert can control the performance of 10-20 players on the court with laboratory accuracy. It becomes possible to form and execute an individually different training plan. The downloading of training’s data files to the POLAR analysing software is completely automatic and quick. The storage of all players’ training’s and application data, the test results, the pulse graphs and the training diary can be registered and managed in one place. The changes and developments can be calculated precisely. The tests are any time repeatable. After programming the chest signalling we can control the results and manage the performance data of each players with thorough analysing by the software.

Objective: To improve the match and training efficiency of teammates especially of international leading men handball players development of individually training plans and sport-art specific test system.

Method: A continuous heart frequency monitoring with the help of the POLAR Team System, making videos and taking notes on matches and trainings, the precise and objective analysis and assessment of these materials. Accomplishment and repetition of antropometric measurement, body combination examination, relative VO2, “pendulum-test” for stamina, and specific (f. e.: “loop-test”) tests. Anaerobic threshold value definition with lactate measuring. The results of the measurements are processed by POLAR Precision Performance, MS Excel and Statistica 7.0 Softwares.

Results: We have collected, registered and aggregated the training data of several months of 20 premier league and 15 third league handball players. These data informed the sport expert of his/her player’s actual state, actual and longer-term performance, working ability, individual load zone, test results. The improvement of the player’s performances was already demonstrable in the preparatory section in the course of experiments. The player’s got motivated improving their individual performances to create a more successful team play.

Inference: The measurement’s results show that most problems can be leaded back onto incongruent coordination, few work with aerobic character, deficiency of stretching. “Tired” musculature and heart circulation system can be the reasons of potential failures first of all of the inadequate match performance For the qualitative change o

EFFECT OF PASSIVE STRETCHING ON STRENGTH: A SYSTEMATIC REVIEW

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Purpose: The purpose of this investigation was to assess the effects of passive stretching on the different components of strength, through a meta-analysis.

Methods: We searched six databases using relevant terms and strategies. Criteria for study inclusion were: a stretching intervention must be employed providing details about the procedures (duration of each stretch, delay between the last stretch and the
performance test and the outcome had to include performance tests of strength or power, inclusion of all necessary data to calculate effect sizes. Data sets reported in more than one published study were only included once in the present analyses. Initial search provided 266 studies of which 107 titles were potentially relevant and screened for retrieval. Of these, 59 studies met the inclusion criteria and were included in the meta-analysis. We conducted separate analyses for voluntary maximum voluntary contraction (IWVC) and power (jump tests) using the independent variables stretch duration, delay between the last stretch and the performance test, sex, and physical activity level. Standardized mean differences (SMD) in MVC or power were calculated, and weighted according to the within-group heterogeneity to develop an overall effect estimate. We compared subgroups using the Chi-squared (Q) test. Results: Passive stretching significantly decreases MVC (SMD [95%CI] = -0.21 [0.35 to -0.07], p = 0.003), but not maximal power (SMD [95%CI] = -0.06 [0.17 to 0.05], p = 0.28). The duration of the delay between the last stretch and MVC (less than 5 minutes; from 5 to 15 minutes; from 15 to 30 minutes; more than 30 minutes) did not affect the results (Q = 2.88, p = 0.41), nor did sex (Q = 0.91, p = 0.34). However, stretching had a lesser effect as physical activity increased (comparison of subgroups Q = 6.18, p = 0.04). Stretching decreased maximal voluntary strength more in sedentary (95% CI = -0.40 [-0.70 to -0.11], p = 0.008) and active individuals (95% CI = -0.10 [-0.23 to 0.02], p = 0.10). Conclusion: There is a growing consensus that passive stretching decreases performance during strength and power tests. The main result and contribution of this study is to underscore the heterogeneity of this acute response. Passive stretching significantly decreased MVC, but the decrease in power was not statistically significant. This effect is independent of sex and duration of the delay between the stretching procedure and the strength measure, but it is much more important in sedentary and active individuals compared with athletes. This meta-analysis provides a framework that can be useful for athletes to optimize their warm-up strategy, but also for scientists to understand the mechanisms underlying the heterogeneity observed between sedentary, active and highly trained individuals.

THE CONTROL MODEL OF PHYSICAL FITNESS AT THE NATIONAL ARMED FORCES OF LATVIA

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Properly worked out physical fitness norms motivate every soldier to go in for sports activities regularly in order to maintain his physical condition on adequate level. It is an essential precondition for successful performance of military service duties. Physical fitness evaluation system should reflect the real situation - real physical condition of the tested people. Physical fitness evaluation system should be adequate, objective and developing versatility. Equal evaluation points should be given for equal difficulty level results in different tests. Physical fitness norms should promote development of soldiers' physical fitness. Elaborating the point tables (data tables) according to the S-type (percentile) scale, we may have an adequate assessment of equal difficulty level results in various tests. The sum of the points gained by performing a set of tests is used for the evaluation of physical fitness by giving a mark or a certain physical fitness category according to the norms - previously stated sum of point values. Physical fitness norms are the most significant block of physical fitness control system - a mechanism which promotes the development of many-sided, harmonious and physically fit people. In order to prepare soldiers of the Latvian NAIF for professional military service it is essential to evaluate the current physical fitness of soldiers, its control system and, if required, to change the system. Taking the conclusions drawn from the analysis of the physical fitness test results as the basis the physical fitness and condition control system model is being worked out. Having the test result data of the statistical analysis and approximating the gained results in the percentile scale to standard distribution cumulative function the S-type point table was constructed for each test. By offering the new point table model, we foresee significant changes, as well as radically changed physical fitness norms for Latvian soldiers.

OBSERVATIONAL METHODOLOGY: T-PATTERNS DETECTION IN SOCCER

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Several traditional soccer analyses essentially show quantitative data (frequency of shots on goal, distribution of player’s passes...). But not the context where the actions (interactions) are developed. In this sense, the purpose of this study is to detect and analyse t-patterns when the attempt to score occurs. The sample is formed by 47 games of the Korea/Japan 2002 FIFA World Cup, where 55 free kicks and 285 cross plays were coded to sequential analysis with TH-HEME 5.0 (T-Pattern). One complete t-pattern was detected in free kick plays and seventeen in cross plays pointing to the importance of the initial conditions (first event of sequential structure) and the game non-linearity. However, when teams score the results only reveal incomplete t-patterns showing its importance is in free kicks to aim for the top corners without course changes if the efficacy of the shots to the low corners and cross play’s from the wings.

RELATIONSHIP BETWEEN DISCUS PERFORMANCE AND USING THE TORSO ROTATION ACTIVITY DURING DISCUS THROWING

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In discus throw, it is very important to clarify the relationship between discus performance and using the torso rotation activity during discus throwing. The subjects were nine male Japanese discus throwers including Japanese top throwers (age:20.8±21.9yrs, height:179.6±5.8cm, body weight:93.6±10.7kg, fat free mass: 74.0±5.4kg, personal best:48.10±5.0m). Using the torso rotation activity was performed subjects face up position on the ground, and put the balance ball (a diameter of 60cm) in between both legs, was relaxing upper body including cervix. Using the torso rotation activity on right and left side with balance ball was performed by ten times after the third throw (before), and then after the other three throw (after). It was same as an official competition for six throws. Discus performance was adopted average of three throw in before and after using the torso rotation, and best throw of three throw in before and after using the torso rotation. Discus throw movement time was filmed by digital video camera at 1/250s and 60 frame/s(FMV-Canon). The results were as follows: Average of Discus performance was improved with using the torso rotation activity 41.7±4.68m to 42.35±5.13m. And also, best of discus performance was improved with using the torso rotation activity 43.39±4.64m to 44.45±5.15m.
Discus performance in after using the torso rotation activity was significantly higher than before using torso rotation activity (p<0.05).

Discus throw movement time was not so differed between before using the torso rotation activity (1.56±0.18sec) and after torso rotation activity (1.56±0.17sec). It was no significant differences between discus performance and discus throw movement time.

In this study, discus throw movement time dose not influence to discus performance, whereas the using torso rotation activity during discus throwing was influential to the discus performance. In addition, it is suggested that throwers needed to torso rotation training. From these finding, it is considered that in discus throw, using the torso rotation activity during discus throwing and developing torso rotation training can be factors of improved at discus performance.

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FAMILIARIZATION, RELIABILITY, AND COMPARABILITY OF A 40 M MAXIMAL SHUTTLE RUN TEST
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The aims of the present study were to examine issues of familiarization and reliability associated with a 40 m maximal shuttle run test (40 m MST), and to compare performance and associated parameters in the test with those of a typical unidirectional multiple sprint running test. 16 well-trained subjects (12 men and 4 women) completed four trials of the 40 m MST (8 × 40 m; 20 s rest periods) followed by one trial of a unidirectional multiple sprint running test (12 × 30 m; repeated every 33 s); with seven days between trials. All trials were conducted indoors and performance times were recorded via twin-beam photocells. Means ± standard deviation for age, height, and body mass were 20 ± 2 years, 176.5 ± 9.7 cm, and 72.6 ± 11.2 kg, respectively. Significant (p < 0.05) between-trial differences in mean 40 m MST times were indicative of learning effects between trials 1 and 2. Test-retest reliability across the remaining trials as determined by coefficient of variation (CV) and intraclass correlation coefficient (ICC) revealed: a) very good reliability for measures of fastest mean and mean shuttle time (CV = 1.1 - 1.3%; ICC = 0.91 - 0.92); b) good reliability for measures of blood lactate (CV = 10.1 - 23.9%; ICC = 0.74 - 0.82) and ratings of perceived exertion (CV = 5.3 - 7.6%; ICC = 0.79 - 0.84); and c) poor reliability for measures of fatigue (CV = 38.7%; ICC = 0.59). Comparisons between performance indices of the 40 m MST and the unidirectional multiple sprint running test revealed large (r > 0.5) significant (p < 0.05) correlations between all measures apart from pre-test blood lactate (r = 0.47). Whilst the 40 m MST does not appear to provide any more information than can otherwise be gleaned from a typical unidirectional multiple sprint running test, the results of this study show that following the completion of a familiarization trial, the 40 m MST provides an alternative and, except for fatigue measures, reliable means of evaluating repeated sprint ability.

PROPOSITION TO TEST SOCCER PLAYERS FOR MAXIMUM AEROBIC POWER
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This present study has as objective to develop a maximum aerobic power test, specific to application on soccer athletes, and to propose an equation to estimate VO2 max, through a field test developed. The proposed test constitutes of applying progressive, continuous and maximum speed running, covering 80m (1 lap), structured in a square (20m x 20m), test initial speed was 11.5 km/h, with speed increments of 0.5 km/h each minute, where the athletes should perform up to exhaustion. For measuring velocity in field test the CD test of Yo-yo endurance II proposed by Bangsgaard (1996) was used. As gold standard to compare the field test a treadmill test was carried out with initial velocity of 8 km/h with 1 km/h increments each minute up to the exhaustion. To obtain measures referred to VO2max a portable device of ergospirometry K4b2 was used in treadmill tests as well as in field tests and to analyse the blood lactate the ‘Yellow Springs 1500L’ equipment was used. The variables studied on both tests were VO2max, FCmax, respiratory quotient, minute ventilation, distance covered, maximum speed reached, total test duration time and final lactate after three-minute active recovery. Twenty four soccer athletes under-18 and under-21 were evaluated, aging 16.66±1.49 years, body mass of 71.5±8.28, height of 177.07±0.82 and BMI of 22.74±1.28. The following procedures were carried out to analyse the data: descriptive statistics, t Student test, Pearson’s correlation and Simple Linear Regression Analysis using the statistical program SPSS13.0, considering a significance level of p<0.05. The results found show no significant difference between treadmill test and the proposed test, for the variable VO2max (treadmill 30.19±5.09 and field 48.55±6.56; p<0.077). High correlation was found between field VO2max with distance covered in field (r=0.768; p<0.000) and with maximum speed reached in the field test (r=0.737;p<0.000). Thus, it was possible to establish two predictive equations through variables of distance covered and maximum speed reached: VO2max = 21.829 + 0.015 x Distance covered and VO2max = -65.275 + 7.536 x maximum speed reached in the field test (r=0.737;p<0.000). Thus, it was possible to establish two predictive equations through variables of distance covered and maximum speed reached: VO2max = 21.829 + 0.015 x Distance covered and VO2max = -65.275 + 7.536 x maximum speed reached in the field test (r=0.737;p<0.000). Thus, it was possible to establish two predictive equations through variables of distance covered and maximum speed reached: VO2max = 21.829 + 0.015 x Distance covered and VO2max = -65.275 + 7.536 x maximum speed reached in the field test (r=0.737;p<0.000). Thus, it was possible to establish two predictive equations through variables of distance covered and maximum speed reached: VO2max = 21.829 + 0.015 x Distance covered and VO2max = -65.275 + 7.536 x maximum speed reached in the field test (r=0.737;p<0.000). Thus, it was possible to establish two predictive equations through variables of distance covered and maximum speed reached: VO2max = 21.829 + 0.015 x Distance covered and VO2max = -65.275 + 7.536 x maximum speed reached in the field test (r=0.737;p<0.000). Thus, it was possible to establish two predictive equations through variables of distance covered and maximum speed reached: VO2max = 21.829 + 0.015 x Distance covered and VO2max = -65.275 + 7.536 x maximum speed reached in the field test (r=0.737;p<0.000). Thus, it was possible to establish two predictive equations through variables of distance covered and maximum speed reached: VO2max = 21.829 + 0.015 x Distance covered and VO2max = -65.275 + 7.536 x maximum speed reached in the field test (r=0.737;p<0.000).

OPTIMAL WARM-UP STIMULI OF MUSCLE ACTIVATION TO ENHANCE SHORT AND LONG-TERM ACUTE JUMPING PERFORMANCE
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The aim of this study was to determine the effect of different types of active warm-up stimuli of muscle activation on explosive jumping performance after short 15 minutes postwarm-up and long 16 hours postwarm-up recovery periods following warm-up. Twelve trained volleyball players [21-24yr] performed different types of specific warm-up stimuli (WP) after baseline measurements (e.g. countermovement jump (CMJ) without and with extra load and Drop jump (DJ) on randomized separate occasions: 113 sets of 5 jumps with extra load (WP1), 212 sets of 4 reps at 80% of 1RM parallel-squat (WP2) and 2 sets of 2 reps at 85% of 1RMPS (WP2), 312 sets of 4 reps at 80% of 1RMPS and 2 sets of 2 reps at 90% of 1RMPS and 2 sets of 1 rep at 95% of 1RMPS (WP3), 413 sets of 5 DJS (WP4), 5 specified warm-up for a volleyball match (WP5), 613 sets of 5 reps at 30% of 1RMPS (WP6) and 7) an experimental condition of no active warm-up. Height in DJ significantly improved (p<0.05) after WP1 (4.18%), WP2 (2.98%), WP3 (5.47%) and WP4 (4.49%). Maximal power output during CMJ with extra load significantly improved (p<0.05) after WP2 (11.39%), WP3 (10.90%), WP3 (9%) and WP1 (2.47%). High-intensity dynamic loading (e.g. 80-95% 1RM), as well as specific volleyball warm-up protocol bring about the greatest effects on subsequent neuromuscular explosive
responses. Acute positive effects on jumping performance after warm-up were maintained after long recovery periods (e.g., 6 hours following warm-up), particularly when prior high-intensity dynamic actions were performed.

**HEART RATE THRESHOLD OCCURRENCE AND STROKE VOLUME PERFORMANCE DURING 1-MIN RAMP TEST IN CYCLISTS**

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In 1982, Conconi et al. presented a non-invasive method for the determination of anaerobic threshold (AnT) based on the occurrence of a break point in the heart rate - physical work curve, so called “heart rate deflection point” (HRDP). However, its application is limited because the HRDP appearance would be protocol dependent (Jones et al. 1997). Furthermore, the physiological explanation of the HRDP is still lacking. Recently, Lepretre et al. (2005) found a significant correlation between the power at which the HRDP appeared (pHRDP) and the power at which the stroke volume (SV) reached its maximal value (pSVmax) in 72.7% of 22 well-trained subjects engaged in an exhaustive 3-min stage incremental cycle exercise. In addition, a protocol effect on SV responses has also been reported in trained subjects engaged in different maximal graded exercise tests (McCole et al. 2001). Therefore, this examines the effect of exercise protocol on the relation between heart rate, stroke volume appearance and SV response in ten well-trained male cyclists (20.9±6.1 yrs, VO2max: 67.6±5.7 mL·min−1·kg−1 and power at VO2max: 365±38 watts). An incremental exercise test (2-min warm-up at 60 watts then 25 watts min−1 until exhaustion) was performed in an upright position using an electromagnetically braked cycle ergometer (Ergoline BP-900, Schiller, Germany) to determine: 1) the maximal oxygen uptake value (VO2max, 2) the power associated with the anaerobic threshold (pAnT), and 3) the heart rate (HR) and stroke volume performance curves. HR and SV values were continuously measured by impedance towards the end of exercise (Charloux et al. 2000). In all subjects, the arterial-venous O2 difference increased up to pAnT (corresponding to 83.0±3.8% of pVO2max).

A HRDP, estimated by a third order curvilinear regression method (Kara et al. 1996), appeared in 80% of the subjects at about 82.5±9.3% of their pVO2max (n = 13). In 4 of these subjects, SV reached a plateau at the intensity of which HRDP appeared whereas it increased until pVO2max for 4 others. However, this SV increase from pHRDP to pSVmax was not significant. Moreover, pHRDP was not significantly different from pAnT. Any significant effect of the protocol was found on relationship between the HRDP occurrence and SVmax during incremental exercise to VO2max. Our data also indicates that the factors influencing the SV response to exercise could subject dependent with VO2max limited by central (evidence of SV plateau) or peripheral factors (continued increase in SV until VO2max).

**THE CLUSTERING OF PHYSIOLOGICAL RESPONSES AMONG ELITE ATHLETES FROM DIFFERENT SPORTS**

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The athletes engaged in the events of longer duration and lower intensity would use different energetic pathways than the events of shorter duration and high intensity, resulting in specific physiological adaptations after years of training. Many authors suggest that some adaptations may be limited by genetic make-up or heredity. The aim of the study was to determine whether all elite athletes coming from the same energetic group (aerobic, anaerobic or mixed type sports) manifest the same physiological response during physical load and to determine whether the traditional classification of the sports according to the energetic demands could be applied to them. The sample comprised 102 elite athletes divided into 3 groups (Group 1: aerobic sports, Group 2: aerobic/anaerobic sports, Group 3: anaerobic events). Morphological variables, explosive strength, and ventilatory parameters during incremental treadmill test (Vo2max, HR at ventilatory threshold, VO2max, VO2 at threshold, VE at threshold, expired CO2 at maximum, RERmax) were measured and the percentages of maximal VO2, HR, CO2 and VE at the ventilatory threshold were calculated.

1st step: The discriminative analysis confirmed that the traditional classification of sports according to the energetic pathways was reasonable when applied to total sample. The three groups of athletes really differed significantly (Wilks’ lambda=0.350, p<0.001). The variables that contributed the most to the discrimination of the groups were VO2max, VO2 at ventilatory threshold, and % of VO2 at ventilatory threshold, all of which were higher in aerobic athletes. RERmax and explosive strength were lower in aerobic athletes as expected.

2nd step: We tried to determine whether the statistical analysis would divide the subjects into the same groups as we did according to the energetic demands of the sport. The k-means cluster analysis was used and it confronted the previous findings in a way that it extracted the entities that were really different from other members of their group. The number of subjects in the newly obtained groups was different from the number in our groups, which clearly pointed to mixing of the subjects among the groups. Even though their ventilatory parameters, explosive strength and aerobic capacity was not as it was expected for that type of sport they were still the top athletes in their sport. The most interesting findings were the results of several aerobic athletes whose functional response was similar to the athletes in anaerobic group and despite that they won several international competitions shortly after. It was interesting that the years of aerobic training did not result in expected adaptations which might be explained by heredity. In conclusion, individual differences originating from genetic and psychosocial factors should always be considered before evaluating testing results, especially during the selection process.

**THE DYNAMICS OF SPEED OF THE 400M SPEED RACE JUNIOR ATHLETES (18 YEARS)**

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The transversal study points to the fact that during the 400m speed race, indoor, junior athletes 1st category, the greatest speed loss can be noticed in the interval between 200-300m. The selection of the subjects was made on the basis of their enrollment in the 400m event. Date analysis have been recorded during the Athletics National Championship, juniors (boys) 1st category, on February 26-27, 2005, Bucharest. The study’s hypothesis presupposes that the greatest loss of speed in the 400 m indoor, juniors race 1st category (18 years) in Romania is on the last 100m, fact that was not confirmed. During the first 100m of the 400m race, the 15 boys have recorded medium speed 7.83m/s±0.19 (CV%=2.82). In the second 100mp of the race medium speed was 8.18±0.30 (CV%=3.66). In conclusion, any significant effect of the protocol was found on relationship between the HRDP occurrence and SVmax during incremental exercise to VO2max. Our data also indicates that the factors influencing the SV response to exercise could subject dependent with VO2max limited by central (evidence of SV plateau) or peripheral factors (continued increase in SV until VO2max).
A KINEMATIC ANALYSIS OF NETBALL GOAL SHOOTING: COMPARISON BETWEEN JUNIOR AND SENIOR PLAYERS

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Introduction
Only two experimental studies have investigated the relationship between shooting accuracy in netball and anthropometric and kinematic parameters of the dominant side of the body. Shooting accuracy was positively related to better wrist flexibility, greater angle of knee and elbow flexion in the preparatory phase, lesser movements of the trunk and arm during the shot, and greater height and velocity at release (Elliott and Smith, 1983a,b). The aim of this study was to investigate the effect of playing age and experience on the kinematic characteristics of the dominant and non-dominant sides of the body during the goal shooting action in netball players.

Methods
Six county-level junior and six senior goal shooters took part in the study. All subjects performed eight shots at the goal during which thirty-three 19 mm retro-reflective markers were fixed to anatomical landmarks for segment identification and 3D motion tracking. Kinematic data were captured at 200 Hz using a 10 camera (M CU240 ProReflex) retro reflective motion capture system (QTM, Qualysis, Sweden). The shot was divided in three periods: preparatory phase, shooting action and release, the following variables were analysed during each period; ball position, joint angles, angular velocities and timings. Differences between junior and senior shooters were analysed by a non-parametric Mann-Whitney test. The level of confidence was set at P<0.05.

Results
Compared to the senior players the juniors exhibited a significantly greater extension of the non-dominant arm during the preparatory phase (angles at the elbow of 139.1±19.4° vs. 106.8±25.1° for juniors compared to seniors, P<0.05), reduced synchronisation between knee and elbow extension during the shooting action (time between the start of knee extension and elbow extension of 0.15±0.03 s vs. 0.04±0.05 s respectively for juniors and seniors, P<0.05) and a greater extension of the non-dominant elbow and shoulder at release (angles at the elbow and shoulder were 153.3±16.9° and 150.5±11.1° vs. 121.5±32.5° and 121.0±28.9° for juniors compared to seniors, P<0.05).

Discussion-Conclusion
These results could be useful for coaches to understand the technique used by shooters at different learning stages. In particular, recommendation to junior less skilled players should focus on the synchronous actions of the elbows and knees and dissociation between the right and left upper limbs during the shooting action.

References.

PHYSIOLOGICAL DEMANDS PLACED ON FEMALE BASKETBALL PLAYERS DURING COMPETITION

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Introduction.
In May 2000, basketball rules changed (shorter attack time from 30 to 24 s and less time allowed to cross the median line from 10 to 8 s). Ben Abdelkrim et al. (2007) measured heart rate (HR), blood lactate ([La]-b) and time motion analysis of elite under-19 male players during competition and reported that the new rules led to an increase in the game intensity and a higher cardiac work. The aim of the present study was to investigate if the new rules of the game have also changed the metabolic load experienced by female players competing at a lower level.

Methods
9 female university basketball players (25.8±2.5 years old, 172.8±4.7 cm, 63.2±4.5 kg, 19.9±3.4% of body fat) were studied during 9 games in the premiership league. During each game, HR was measured at 15-s intervals using Polar S810 heart rate monitors (Polar, Kempele, Finland), blood samples were taken to analyse [La]-b between quarters, during timeouts, or during player substitution (Analox Instruments Ltd., London, UK). In addition, video recordings of matches (VVC-x400 Hong Kong, China) were used to determine the frequencies of the main movements performed by the players, as defined by McInnes et al.2. Differences in physiological parameters between the quarters and halves of the game were analysed by a one-way ANOVA and a student T-test for paired samples, respectively. Statistical significance was set at p<0.05.

Results
51 HR files and 111 blood sample were obtained. The mean HR was 165.0±9.0 beats.min⁻¹ (89.8% of HRmax) and the mean [La]-b was 5.2±1.7 mmol.L⁻¹ (45.9% of [La]-bmax). In addition, HR was significantly higher in the first half compared to the second half (166.3±9.4 vs. 163.3±9.0 beats.min⁻¹, P<0.01), whereas no significant effect of time was observed on [La]-b (P>0.05). Video analysis showed that players performed on average 52±14 jogs, 56±11 runs, 32±13 sprints, 69±18 low-intensity shuffles, 58±15 medium-intensity shuffles, 43±16 high-intensity shuffles and 42±11 jumps.

Discussion-Conclusion.
These results show a significantly higher HR compared to the values reported in male players before the rule changes (87% of HRmax, McInnes et al., 1995), and similar to the HR measured in male and female players after the new rules (91% of HRmax and 90.8% of HRmax, respectively in the studies of McInnes et al., 1995 and Rodriguez-Alonso et al., 2003). They suggest an increase in physiological demands of university-level female basketball players after the new rules.

References.
CROSS-VALIDATION OF THE KHAMIS-ROCHE METHOD FOR THE PREDICTION OF MATURE HEIGHT

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Several non-invasive methods have been proposed for the estimation of maturity status in youth. The purpose of this paper is to compare percentage of predicted mature (adult) height at a given age with percentage of mature height based on attained mature (adult) height. The sample included 80 youth hockey players 14.8-16.5 years who were measured in 2002 (Sept-Oct). Height and weight were measured using a portable stadiometer (Harpenden) and a portable balance (Seca model 770) to the nearest 0.1 cm and 0.1 kg, respectively. Maturity height was predicted after Khamis and Roche (1994) using age, height and weight and midparent height. Heights of both biological parents were measured. Current height of the player was expressed as a percentage of predicted mature height. Heights of the players were measured again in 2006 (Sept-Oct) providing a measure of attained mature height. Heights of the players as teenagers were then expressed as a percentage of attained mature height.

The difference between predicted and attained adult height was 0.9±0.196 cm (median: 1.20 cm, range: 3.7 to -4.0 cm). Of interest, the difference was, on average, less in 15 year old (10.3±1.98 cm) than in 16 year old (13.4±1.85 cm) players. Teenage height was 171 2±6.3 cm (G1: 15 yrs) 168±5.9 cm; G2: 16 yrs: 172±8.6 cm) compared to attained mature height, 175±5.2 cm (G1: 174±5.1 cm; G2: 176±5.2 cm). Teenage height represented 98.0±1.6% of predicted mature height (G1: 96±1.5%; G2: 97±1.2%) and 97±1.4% of attained mature height (G1: 96±1.5%; G2: 97±1.1%). The correlation between measured and predicted adult height was r=0.93 (G1: +0.92, G2: +0.94), while the correlation between current height as a percentage of predicted mature height and as a percentage of attained mature height was +0.75 (G1: +0.73, G2: 0.61).

The results indicate that the Khamis-Roche protocol for the prediction of mature (adult) height without a measure of skeletal age has reasonable validity in this sample of Portuguese adolescents and can be used to derive current height as a percentage of adult predicted mature height as a non-invasive estimate of biological maturity status.

References.

SKILL IMPROVEMENT FOR AN ELITE BACKSTROKE SWIMMER AS DETERMINED WITH A SPEED METER

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A speed meter that measures a subject’s moving velocity by pulling a fine wire over a generator (Maglisch, 2003) for a distance of 25m was developed for use with competitive swimmers. In a previous study, the authors used the speed meter to check for skill differences between competitive breaststroke swimmers of international achievement and collegiate breaststroke swimmers. Additionally, the speed meter was used to measure improvement in underwater dolphin kicking for a backstroke swimmer who made very rapid progress. These results showed that this method was useful for identifying skill differences among a group of swimmers as well as reasons for improvement for each swimmer. In the present study, the authors used the speed meter to determine the degree of skill improvement during the underwater stroke phase for an elite backstroke swimmer. This was compared with the amount of improvement in his performance over a period of two years. The speed meter recorded his intracyclic velocity changes during a 25m maximum effort backstroke swim which included approximately 12m of underwater dolphin kicking. An underwater video analysis system was also used to check his stroke techniques during these efforts. Based on the video data, the authors divided the stroke cycle into two phases, i.e., 1) first downsweep and upsweep phase, and 2) second downsweep phase. The mean velocities for the second downsweep phase were similar despite improvements in the athlete’s performance times (Joncheere-Terpsstra Test, p=0.0562). However, the mean velocities for the first downsweep and upsweep phase became higher as performance improved (Joncheere-Terpsstra Test, p=0.0053). It was concluded that the first downsweep and upsweep phase was the most improved portion of this swimmer’s underwater stroke and, therefore, primarily responsible for his improved performance.

PREDICTION OF SUCCESS IN VOLLEYBALL THROUGH ANTHROPOMETRIC, PHYSIOLOGICAL AND PSYCHOLOGICAL CHARACTERISTICS

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The purpose of this study is to determine linear regression between anthropometric, physiological, psychological and skill-related characteristics of volleyball players in South Khorasan Province, Iran. Forty five volleyball players participated in this study. Anthropometric, physiological, psychological, and skill-related characteristics of subjects were measured using methods including Storer and Davis maximal test, Wingate test, strength test, Zigzag test, floor push-ups, Winter’s questionnaire and the AAHPERD skill-related test for volleyball. To analyze the data we used Pearson correlation coefficient and linear regression test through Stepwise method and, statistical significance was considered where P<0.05. A significant correlation was noticed between the subjects’ height, weight, trunk height, humerus diameter (HD), motivation, group type, experience in volleyball (EV), muscular strength and endurance, agility, anaerobic peak power (APP), concentration, and their service skill (P<0.05). In addition, there was a significant correlation between the subjects’ height, body mass index, flexibility, APP, motivation, group type, EV, weight, calf circumference, muscular strength and endurance, agility, concentration, and their overhead pass skill. Moreover, a significant correlation was obtained between the subjects’ flexibility, experience of parents in sport, group type, EV, grip strength, trunk muscles endurance, agility, concentration, and their pass skill (P<0.05). Besides above, it is established a significant linear correlation between the subjects’ weight, HD, agility, back strength, concentration, and their service skill, and a significant linear correlation between the subjects’ agility, concentration, targeting and their pass skill (P<0.05). The results show that EV, age, grip strength, overhead pass and service skills are good criteria to distinguish subjects and their success levels. It is, therefore, possible to predict success in volleyball through players’ anthropometric, physiological and psychological characteristics.

References.
The subjects of the study were 18 male high-level athletes from predominantly aerobic sports athletics (middle distance runners), orienteering and biathlon. A maximal treadmill stepwise test until exhaustion was performed with continuous breath-by-breath gas analysis. VTRER was defined at the level of RER=1.0, VTEqO2, VTV-slope and RCP were determined with a linear regression analysis. For all methods the corresponding values of physical power (PP) and oxygen consumption (VO2) at VT were analyzed. The obtained values for VTEqO2, VTV-slope, VTRER and RCP were statistically processed with one-way ANOVA-test and pairwise comparison analysis (Student’s t-criterion). Despite the presence of criteria verifying maximal exertion, in 3 of the tested subjects RERmax was below 1.0, thus, not allowing determination of VTRER. These subjects were excluded from the statistical analysis. In the One-Way ANOVA test a significant difference was demonstrated between the values of VO2 (ml/min) and PP (MET) corresponding to the determined VTRER, VTEqO2, VTV-slope and RCP (F=7.95 and F=14.53; p<0.05) in the pairs VTV-slope-VTRER, VTV-slope-RCP, VTEqO2-VTRER and VTEqO2 RCP. The multiple pairwise comparison analysis for VO2 and PP revealed the following values for r, t and p: VO2 to VTRER r=0.646, t=4.86; p<0.05; VTRER to RCP r=0.955, t=1.41, p=1.03.

The conducted analyses demonstrate a lack of statistically acceptable interchangeability between VTRER as compared to VTV-slope and VTEqO2. The differing results obtained for VTRER probably depend on which of the 3 methods for its determination is applied the classical method (using the breakpoint of the nonlinear increase of RER), VTRER at RER=0.95 (3) or VTRER at RER=1.0 (4).

In some high-level athletes with RERmax <1.0 VTRER (RER=1.0) cannot be used which requires further investigations on the criteria for VTRER determination.

References.

DEVELOPMENT OF SPORTS TALENT SEARCH SYSTEM FOR KOREAN YOUTH
Byounggoo, K., Bonjgu, S., Haimo, G., Hongsun, S., Sungwon, Y., Dongsik, C., Juhak, K., Seungyun, S., Kyoungtaek, C., Yeonsung, C.
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The purpose of this study was to develop sports talent search system that can easily assess potential of Korean youth in 23 sport events and to identify sport talents who have high potential in track-and-field, swimming and gymnastics. Physique, fitness, motor ability, physiological and psychological tests were administrated. Data of 407 elite athletes, 249 university students and 2,406 youths who aged 7 to 15 were collected.

Using standardized process of differences between elite athletes and university students in each test result, the profiles of elite athletes in 23 sport events were made. Based on these results, the evaluation program for assessing potential of Korean youth in each sport was developed.

Finally, sports talent search system for Korean youth that has 3 stages was developed through web based computer programming. The function of stage 1 is searching for youth who have reached certain criterion on physique and fitness test that were already administrated in schools. The function of stage 2 is informing best suitable sports and determining candidates for sports talent in each sport event through assessing test results on physique, fitness and motor ability that would be administrated in regional sports talent centers. And the function of stage 3 is identifying sports talent through assessing the results on physiological tests, psychological tests and basic movement performance test which is related to track-and-field, swimming and gymnastics that would be administrated in central sports talent center.

The sports talent search system would contribute to identify talented youth in sports among Korean youth population and success for international sports competition.

THE HEART RATE RESPONSES AND REPRODUCIBILITY OF SMALL-SIDED RUGBY LEAGUE GAMES
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Small-sided games (SSGs) are an effective aerobic interval training method used in soccer (Impellizzeri et al., 2006) and rugby league (Gabbett, 2006). The framework of 4×4 minute high intensity bouts of 90-95% maximal heart rate (HRmax) has been incorporated within SSG research as this interval format has been shown to increase maximal oxygen uptake (VO2max) (Helgerud et al., 2007), while also providing an ecologically valid training method (Impellizzeri et al., 2006). Furthermore, heart rate (HR) responses to SSGs have been shown to be sensitive to the playing area size and player number in soccer (Owen et al., 2004). Therefore, the purpose of this study was...
to examine the effects of altering playing area size and player number on the intensities (HRs) elicited by elite junior players during rugby league SSGs.

Following ethical approval, 14 junior players from a professional club (mean age: 15.5 +/- 0.5 y; stature: 179.6 +/- 5.1 cm; body mass: 76.7 +/- 10.2 kg; V02max: 52.2 +/- 5.5 ml/kg/min; HRmax: 196 +/- 9 b/min) volunteered to participate in the study. HR responses were recorded in separate 4v4 and 6v6 offside touch games (adapting the same rules), randomly played across two trials of three different sized areas; 15x25 m (small), 20x30 m (medium) and 25x35 m (large).

A three-way ANOVA with repeated measures indicated that there was a significant main effect of player number (F = 40.4, P< 0.05), with mean HR being higher in the 4v4 (90.6% HRmax) than the 6v6 SSGs (86.2% HRmax). The variability due to trials was not significant (F = 1.9, P>0.05), nor was the effect of playing area size (mean HRs of 89%, 88.8% and 87.4% of HRmax in the large, medium and small playing areas respectively). The player number x area size x trial interaction was significant (F = 40.4, P< 0.05), though this was solely due to significant (P<0.005) variability occurring between trials in the small 6v6 SSG.

Intraclass correlation coefficients (ICC) indicated that the 4v4 medium grid was the most reliable SSG condition (ICC = 0.91) with all other ICCs ranging from 0.54-0.73. The 95% limits of agreement (LoA) showed good agreement between trials, particularly in the 4v4 medium condition, whereby the HR variation was only 2.6% of the overall mean of the two trials.

This study’s findings demonstrate that these SSGs generate high HR responses, the highest being elicited in the 4v4 games (above 90% HRmax) independent of the size of the area used. Moreover, the medium 4v4 SSG condition was found to be the most reproducible size in terms of HR responses. It is recommended that rugby coaches take account of these factors when adopting SSGs for aerobic training.

References:
energy in the pole by bending it, using the energy recall from the pole to increase the potential energy of the centre of gravity and to add muscular work to maximize jumping height. However the quantitative distinction between the athlete’s energy and the energy of the pole was not done.

Improvements of the technical equipment allowed to analyse (within reasonable work load limits) pole vault kinematics in three dimensions. However it could be shown, that the three dimensional analysis of pole vaulting did not lead to improvements in energy calculations. Further improvements of technology allowed to measure the ground reaction forces in the planting box of the pole, synchronised with vetworks to gather the kinematical data. With this achievement it became possible to calculate the pole energy. The quantification of the athlete’s energy and the pole energy at the same time allowed identifying the actual energy exchange between athlete and pole. It could be shown that the amount of energy transferred to the pole is bigger than the decrease of the athlete’s energy, which means this energy difference results from muscular work of the athlete during rockback. In the second phase the pole returns energy to the athlete and the athlete does muscular work to increase his potential energy. The role of the pole during the vault is to store a part of the kinetic energy from the athlete’s run up (as strain energy) and return it as potential energy of the athlete. The second important function of the pole is to allow the athlete to produce muscular work while energy is stored in the pole to increase the total energy potential.

**RECENT METHODOLOGICAL ADVANCEMENT IN RESEARCH OF NORDIC SKIING**

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Cross-country (x-c) skiing and skijumping have been studied quite frequently with kinematic methods. Kinetic approaches are more difficult to apply in natural condition but add valuable information for understanding the mechanisms involved. Special emphasis has recently been put to develop kinetic research methods in Vuokatti Sports Institute in Finland. These methods include force-plate systems installed in Vuokatti Ski Tunnel and on two different size jumping hills and a special ski-tester device.

In x-c skiing ski and pole forces are recorded separately with four rows of platforms. In order to capture several consecutive steps the system needs to be rather long. Therefore, a 20 m long system consisting of four rows of 1 m long individual plates recording the forces in two directions (Fx, Fy) was constructed and installed in the tunnel. This allows measurements of different slope conditions of diagonal x-c skiing all year round with controlled snow, temperature and humidity conditions. The two middle rows (for skis) are covered with snow similarly to the actual ski track. The metal surfaces of the outer two rows for the poles are covered with the glued tarter type material, the surface of which is on the same level as the two middle rows.

The effects of waxing and ski properties can, however, be difficult to estimate accurately as the force production even in experienced skier may vary considerably. In order to allow accurate measurements in laboratory conditions a ski tester that simulates the force production of natural skiing was developed. 13.7 m long tester using a 7.5 kW motor attached to a linear motor unit is equipped with pneumatic cylinder and 6 pieces of 1 m long force plates. A ski is attached to the cylinder and pressure against the force plates and the velocity of the ski can be adjusted.

For skijumping research, the force platform system should cover the entire take off including most of the run curve of the jumping hill. Consequently for a 90 m jumping hill the force platform must cover the last 15 m of the take off area and for 30 m hill the last 12 meters. In skijumping the two rows of similar construction as in x-c skiing are mounted permanently for two different size jumping hills (30 and 90 m) in Vuokatti.

The constructed systems are currently used for several research projects and combined with simultaneous multichannel EMG recordings and 3D kinematics. The platform of x-c skiing is utilized to understand in more detail the distribution of force production between legs and arms when the conditions of slope, speed, waxing, skis, poles, and snow are varied in a controlled manner. Ski tester has been tested to used to examine the effects of different waxing conditions on gliding properties and force production. In skijumping the force production measurements have been combined with accelerometer data and video analysis.

**THE INFLUENCE OF SUSTAINED SUB-MAXIMAL SKIING ON THE FREQUENCY AND INTENSITY CONTENT OF THE EMG SIGNAL**

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Quantifying fatigue processes in alpine skiing could be helpful in improving comfort, enjoyment and safety issues. It has been shown, that muscle activity changes during fatiguing exercises to exhaustion. Due to the fact that these changes can be observed in amplitudes / intensities and frequency contents of a signal, a method covering both aspects is essential. As with other dynamic exercises, the intensity analysis in time-frequency space of EMG signals by wavelets is a powerful analytical tool in alpine skiing (Kroell 2007). The purpose of this study was to investigate the influence of a sub-maximal skiing session on EMG frequency and intensity content of rectus femoris (RF) by the use of wavelets. Seven female subjects performed 24 runs on a slope with 300m elevation. Knee angle and EMG of RF right leg was measured during runs 2, 3 and 4 [PRE, 23+24=POST, 23=POST1, 24=POST2]. Knee angle and raw EMG were used to determine the start and end of each double turn (1st turn right leg = inside leg (IL); 2nd turn right leg= outside leg (OL)). The EMG signal of each run was resolved with a wavelet transformation into intensities for each point in time (10 centre frequencies between 19.3 and 395.4 Hz, von Tscharner 2000). ‘Double turns from the last segment of each run and each subject were used to calculate a representative turn. For descriptive analyses, intensity spectra were calculated for ten evenly spaced windows of each double turn. 3D intensity plots were then created. For statistical analyses, intensity spectra were calculated for IL and OL. A 1-way ANOVA with RM was used to analyze mean intensity and frequency for IL and OL.

A downward shift in mean frequency was observed for IL (82.1Hz/79.4Hz, 4Hz, p eta2=0.26, p=0.049) and OL (71.3Hz/68.3Hz, p eta2=0.50, p=0.049) between PRE and POST. Higher intensity values for IL (+15%, p eta2=0.10, p=0.439) and OL (+22%, p eta2=0.16, p=0.034) were observed for POST compared to PRE. However the treatment effect is clearly lower compared to the frequencies. The change between PRE and POST is larger than the change between POST1 and POST2 for the frequencies in IL (eta2=0.41, p<0.01) and OL (p eta2=0.53, p<0.01). The changes in intensity were not different for PRE vs. POST and POST1 vs. POST2 for IL (p eta2=0.03, p>0.99) and OL (p eta2=0.01, p>0.04).

Previously, alpine skiing researchers extracted only intensity and timing data from EMG. Our data demonstrate that the quantification of sub-maximal fatigue by intensity alone does not identify signal changes. This may be due to the high variability caused by the complex movements in alpine skiing (from turn to turn and from run to run) compared to e.g. isometric tasks. However frequency changes can be explained by the sub-maximal skiing treatment (run3 to run22). It is recommended that the focus be on frequency more than intensity in the description on muscular fatigue during alpine skiing.
In successful athletic performance. Although sports prowess (an important component of dancing) is undoubtedly defined by a constellation of trait and state sensorimotor communication, courtship, and spiritual facets of the dancing phenotype rather than other aspects of this complex phenotype, such as human religious and spiritual experiences. We therefore hypothesize that the association between AVPR1a and SLC6A4 reflects the social vertebrates and, more recently, in humans. Additionally, serotonergic neurotransmission in some human studies appears to mediate individual differences, and new common obesity susceptibility variants in unexpected genes have been identified. Last year, GWA resulted in the first major success in the field of obesity genetics with the discovery of FTO (fat mass and obesity-associated gene) as an obesity susceptibility gene. The studies identified independently a cluster of common genetic variants in the first intron of FTO showing consistent and highly significant association with BMI and severe early-onset obesity. This association has been unequivocally replicated in many populations of European descent. Individuals carrying 2 risk alleles weigh 3-4 kg more and have a 1.67 fold increased risk of obesity than those without risk alleles. Physiological experiments are being carried out to improve our understanding of the role of FTO in the development of obesity. Currently, the major challenge is to find more obesity-susceptibility variants using GWA. This will require large-scale data integration to obtain the power needed to identify common variants with likely modest effects. Therefore, as part of the GIANT (Genetic Investigation of Anthropometric Traits) consortium, we combined GWA data of 7 populations, including more than 16,000 individuals. The strongest association, seen in other studies, was mapped 18kb downstream of MC4R, a well-known gene causing monogenic forms of severe childhood obesity. This finding was confirmed in more than 60,000 adults and 6,000 children. Each risk allele is associated with a 0.22 kg.m-2 increase in BMI and a 12% increase in odds of obesity. Extended analyses within GIANT are ongoing, including more than 32,000 individuals, and new common obesity susceptibility variants in unanticipated genes have been identified. This presentation will review the latest findings in the obesity genetics field and will also highlight the promise and difficulties of the GWA approach.

GENES, PERSONALITY AND SPORT PARTICIPANTS

Ebstein, R., Bachner-Melman, R., Granot, R., Constantini, N., Salomon, I., Lerer, E. Laibe, E. Hebrew University, Israel

Dancing, integrally related to music and sport, likely has its origins close to the birth of Homo sapiens. The authors hypothesized that there are differences in aptitude, propensity, and need for dancing that may be based on differences in common genetic polymorphisms. Identifying such differences may lead to an understanding of the neurobiological basis of dancing. Our research group has been investigating the role of two nonapeptides, vasopressin and oxytocin, in human social behaviors including music and dancing. Our first study focused on comparing 85 current performing dancers, 91 competitive athletes and a group of 872 nondancers/nonathletes. We used a robust family-based analysis and genotyped all groups of subjects for the arginine vasopressin 1a receptor (AVPVA1 promoter repeats (RS1 and RS3) and the serotonin transporter (SLC6A4) promoter-region polymorphism (HTTLPR). Dancers scored higher on the Tellegen Absorption Scale, a questionnaire that correlates positively with spirituality and altered states of consciousness, as well as the Reward Dependence factor in Cloninger’s Tridimensional Personality Questionnaire, a measure of need for social contact and openness to communication. Highly significant differences in AVPVA1 haplotype frequencies (RS1 and RS3), especially when conditional on both SLC6A4 polymorphisms (HTTLPR and VNTR), were observed between dancers and athletes using the UNPHASED program package. Similar results were obtained when dancers were compared to nondancers/nonathletes. These results were confirmed using a robust family-based test. Association was also observed between Tellegen Absorption Scale scores and AVPVA1, and AVPVR1a conditional on SLC6A4. Similarly, significant association was observed between Tridimensional Personality Questionnaire Reward Dependence scores and AVPVR1a. Two-locus analysis (RS1 and RS3 conditional on HTTLPR and VNTR) was highly significant. Promoter repeat regions in the AVPVA1 gene have been robustly demonstrated to play a role in molding a range of social behaviors in many vertebrates and, more recently, in humans. Additionally, serotonergic neurotransmission in some human studies appears to mediate human religious and spiritual experiences. We therefore hypothesize that the association between AVPVA1 and SLC6A4 reflects the social communication, courtship, and spiritual facets of the dancing phenotype rather than other aspects of this complex phenotype, such as sensorimotor integration.

Although sports prowess (an important component of dancing) is undoubtedly defined by a constellation of trait and state sensorimotor processes, it should be considered that psychological factors that are also partially due to genetic predisposition, also play a crucial role in successful athletic performance.

GENETIC PREDISPOSITION FOR ELITE STRENGTH PERFORMANCE: WHAT DO(N’T) WE KNOW?

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The maintenance of a high muscular fitness, both in muscle mass and strength, is positively related to bone health, functionality in daily life as well as an important factor in the control of insulin sensitivity. On the opposite, it is inversely related to falls and fractures, morbidity and mortality. In elite athlete performance, sports-specific strength characteristics (high isometric strength, high-velocity or power output, and muscular endurance) are one of many major contributors to final performance. Genetic epidemiologic studies have estimated the contribution of genetic factors to the interindividual variability in muscular strength components of non-athlete populations to be moderate to high (h²=31-95%). Multivariate studies in twins investigated a ‘strength generality’ versus ‘specificity’ hypothesis, to determine...
whether different strength phenotypes are determined by similar underlying genetic factors, or if they are largely strength-type specific. Within the ‘measured-genotype’ approaches, several research designs can be used to test the association of specific gene variants to observed variability in strength. This presentation will give an overview of candidate gene studies, linkage and fine-mapping studies and more functional genetics approaches that are applied in an attempt to detect ‘predisposing’ genes for high muscle performance. Results will be shown of genome-wide and myostatin pathway-based linkage studies for muscular strength phenotypes within the Leuven Genes for Muscular Strength Study. Focus will be given on identification of Quantitative Trait Loci using a genome-wide SNP-based multipoint linkage analysis, based on a 6008 SNP-panel Illumina Linkage IVb Panel for torque-length, torque-velocity and resistance to fatigue characteristics of knee musculature. Within linkage regions on chromosome 12, stepwise fine-mapping procedures have been worked out, that identified several candidate genes, for which variability in expressed mRNA levels for specific SNPs are now studied. As an example of candidate gene studies, an overview of studies of the ACTN3 gene with a high frequent stop codon polymorphism (R577X) will be presented. Both international studies, results from an animal knock out model and functional variant-effect studies within our laboratory will be presented. Finally an overview of other candidate genes and association studies related to muscular strength performance is given.

Invited symposia (IS)

IS-PM05 Exercise and the brain: clinical implications

EXERCISE AND NEUROTRANSMISSION: ARE THERE CLINICAL APPLICATIONS

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Exercise can be a powerful tool in the rehabilitation of injured athletes, cardiac patients, and might have a profound effect on neurological diseases. There have been a number of studies that examined the exercise effect on a wide variety of pathological situations, and it seems that exercise works, although there is a general need for controlled trials.

Recently there has been more interest in the effects of exercise on brain processes. These new experiments arise mostly from animal studies where the basic knowledge on possible underlying physiological mechanisms are explored. From these animal studies it is known that exercise might be a ‘natural’ antidepressant, and that some neurotransmitters are influenced by regular exercise. Training will induce other neurochemical reactions, that might explain possible underlying neurophysiological arguments for the use of training in degenerative neurological diseases such as Parkinson’s disease and Alzheimer disease.

When exploring the possibilities for the use of exercise, there is now new striking evidence that an ‘enriched environment’ will lead to neurogenesis, meaning that new brain cells are formed when an animal is given the opportunity to explore new situations.

Extensive research on humans suggests that exercise could have benefits for overall health and cognitive function, particular in later life. Most recent studies have been directed towards understanding the neurobiological bases of these benefits. It is now clear that voluntary exercise can increase levels of brain-derived neurotrophic factor (BDNF) and other growth factors, stimulate neurogenesis, increase resistance to brain insult and improve learning and mental performance.

We will present recent evidence to illustrate these new frontiers of exercise in the treatment of several neurological disorders.

THE EFFECTS OF EXERCISE ON REDOX SYSTEM AND BRAIN FUNCTION

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Reactive oxygen species (ROS) are continuously generated during aerobic metabolism. Certain levels of ROS, which could be dependent on the type of cell, cell age, history of ROS exposure, etc., could facilitate specific cell functions. Indeed, ROS stimulate a number of stress responses and activate gene expression for a wide range of proteins. It is well known that increased levels of ROS are involved in the aging process and the pathogenesis of a number of neurodegenerative diseases. Because of the enhanced sensitivity of CNS to ROS, it is especially important to maintain the normal redox state in different types of neuro cells. In the last decade it became clear that regular exercise beneficially affects brain function as well, and can play an important preventive and therapeutic role in stroke, Alzheimer, and Parkinson diseases. The effects of exercise appear to be very complex and could include neurogenesis via neurotrophic factors, increased capillarization, decreased oxidative damage, and increased proteolytic degradation by proteasome and neprilysin. Data from our and other laboratories indicate that exercise-induced modulation of ROS levels plays a role in the protein content and expression of brain-derived neurotrophic factor (BDNF), tyrosine receptor kinase B (TrkB), and CREB, resulting in better function and increased neurogenesis. The enhanced activities of proteasome and neprilysin result in decreased accumulation of carbonyls and amyloid beta-proteins, as well as improved memory. It appears that exercise-induced modulation of the redox state is an important means by which exercise benefits brain function, increases the resistance against oxidative stress, and facilitates recovery from oxidative stress.

EXERCISE: PSYCHOSOCIAL IMPLICATIONS AND CLINICAL APPLICATIONS

Lemmyre, P. N.

Norwegian School of Sport Sciences, Norway

Over the past decade a myriad of studies has shown that physical activity is beneficial to brain health and performance in human populations, and that exercise participation is linked to higher cognitive functioning. Research in the sport domain has been predominantly aimed at investigating the role of the brain in optimizing performance. In the physical activity domain, research seeks to better understand important health and well-being issues such as perceived exertion and emotional benefits related to exercise participation, the influence of physical and mental fitness on the response and resilience to stress, as well as its role on cognitive performance related to learning and problem-solving.

Recent research efforts using multidimensional perspectives have attempted to better understand the role of exercise on well-being indices as well as its effect on a wide range of disorders. Recently an important line of research has focused on the effects of exercise on brain processes and how in return these brain processes influence physical activity outcomes. Based on these findings, it is suggested that physical activity represents an essential context for the development and maintenance of high levels of brain functioning, plasticity.
and health throughout a lifetime. Thus, it becomes a vital endeavour to better understand how these variables influence initiation and adherence to physical activity behaviour. While the expression of positive affect and high cognitive functioning are important indices reflecting positive exercise outcome, it is also clear that it transcends the physiological gains associated with physical activity. The cognitive appraisal of perceived changes associated with physical activity participation represents a potent determinant of the motivation necessary to exercise adherence. In order to better understand the role of physical activity and exercise to promote and maintain healthy brain functioning, we will present recent evidence illustrating the psychosocial determinants and outcomes associated with exercise and physical activity and exercise participation.

**Oral presentations (OP)**

**OP-BIO1 Biochemistry 1**

**TRAINING WITH LOW MUSCLE GLYCOGEN INCREASES FAT OXIDATION DURING EXERCISE**

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Introduction: Training adaptations are thought to be generated by elevated gene transcription and protein synthesis after repeated exercise bouts. These responses may be exaggerated when endurance exercise is performed with low muscle glycogen. Hansen et al. (1) reported increased exercise capacity after 10 weeks training with low glycogen. In this study the amount of work performed was the same in high and low glycogen conditions, even though higher glycogen would normally allow for exercise at higher intensities. As a result, the practical implications of the Hansen study are unclear. Therefore, the purpose of the present study was to determine the effect of muscle glycogen content on training adaptations when cyclists train at a self-selected intensity.

Methods: Fourteen male cyclists (pair-matched for VO2max and power output) were assigned to high (HIGH) or low (LOW) glycogen training groups. Subjects trained for 3-weeks, completing 3 aerobic (90 min at 70% VO2max) and 3 high intensity training (HIT) sessions (8 x 5 min interspersed with 1 min recovery) each week. Glycogen content was altered by the length of recovery between training sessions. HIGH trained once daily whereas LOW trained twice every second day. A short (1 h) recovery period in LOW meant glycogen content would be reduced at the beginning of every second bout. Self-selected power output during HIT was used as a measure of training intensity. Biopsies were taken from the V. Lateralis pre and post training to determine adaptations in skeletal muscle. Subjects performed a 1 h steady-state (SS) cycle at 70% VO2max and 1 h time trial (TT) to determine changes in substrate metabolism and performance.

Results: Power output during HIT was 323±10 W in HIGH and 297±7 W in LOW (P<0.05). TT performance was improved by a similar extent in both groups (10%). TT time decreased from 62.10±1.49 min pre-training to 56.37±1.17 min post-training in HIGH (P<0.05), whereas in LOW TT time decreased from 61.90±1.12 min pre-training to 56.12±1.22 min post-training (P<0.05). Fat oxidation during SS increased by 27% from 0.52±0.04 g/min (pre-training) to 0.67±0.04 g/min (post-training) in LOW (P<0.05). Fat oxidation tended to increase after training in HIGH (0.44±0.04 g/min to 0.48±0.01 g/min) but this did not reach statistical significance. Beta-HAD protein content increased by 38% after training in LOW (P<0.05) but decreased by 21% after training in HIGH (P<0.05). GLUT4 protein content was increased by 55% after training in HIGH (P<0.05) but was unaffected by training in LOW.

Conclusion: Training with low muscle glycogen increased resting beta-HAD protein content and increased fat oxidation during exercise. However, improvements in time trial cycling performance were similar in both groups.

References:

**RECOVERY RESPONSES IN IRONMAN TRIATHLETES**

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Background: Finding an appropriate balance between training, competition and recovery is an essential challenge for competitive endurance athletes in order to maintain a high level of performance and to minimise potential adverse consequences including an increased risk of infection and/or overreaching/overtraining. An acute bout of ultra-endurance exercise, such as an Ironman triathlon, induces muscle damage and a systemic inflammatory response that is associated with a transient immune dysfunction. However, information on the alterations of these responses beyond 1 day post-race is limited.

Purpose: The present study aimed to examine indices of muscle damage, immuno-endocrine and systemic inflammation parameters to quantify their magnitude and to verify the resolution of recovery following an Ironman triathlon in a large cohort of athletes.

Methods: Blood samples were taken from 42 well-trained male triathletes (mean±SD: age 35±3.7 yr, height: 180±6.5 cm, weight: 75±1.4 kg, cycling VO2 peak: 56±6±6.2 ml kg⁻¹ min⁻¹) 2 d before an Ironman triathlon, then immediately post-race, and 1, 5, and 19 d later. Blood was analysed for haematological parameters, plasma values of cortisol, testosterone, creatine kinase (CK) activity, myoglobin, polymorphonuclear (PMN) elastase, myeloperoxidase (MPO), interleukin (II)-6, IL-10 and high-sensitive C-reactive protein (hs-CRP). The athletes documented their training in the six months prior to the Ironman and thereafter until the end of the study, and performed recovery training that was of moderate intensity and duration post-race.

Results: Immediately post-race there were significant (P<0.001) increases in total leucocytes, granulocytes, cortisol, CK, myoglobin, PMN elastase, MPO, IL-6, IL-10 and hs-CRP, while lymphocytes, testosterone and testosterone-cortisol (T/C) ratio significantly (P<0.001) decreased. One d post-race these alterations persisted (P<0.001, P<0.01 for IL-10), with the exception of cortisol which decreased to below pre-race values (P=0.013) and T/C ratio which recovered. Despite a decline thereafter, CK activity, myoglobin, IL-6, IL-10 and hs-CRP remained significantly (P<0.001, P<0.05 for IL-10) elevated 5 d post-race. Moreover, several relationships between leucocyte dynamics, cortisol and muscle damage, cytokines and hs-CRP were observed.

Conclusions: An important finding of the current study was that although the pronounced initial systemic inflammatory response induced by an Ironman triathlon subsided rapidly, a low-grade systemic inflammatory response was sustained until at least 5 d post-race. The prolonged moderate, but significant elevation of markers of muscle damage and inflammation might indicate incomplete muscle recov-
LIVER, MUSCLE AND PLASMA ATP LEVELS IN RESPONSE TO A TREADMILL EXERCISE IN RAT AT REST: ATP BIOLUMINESCENCE ASSAY

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Introduction: the intracellular of ATP has been recognized as an energy source of mechanical works and several anabolic reactions. Cells have complex mechanisms for synthesizing ATP and maintaining or rapidly restoring the intracellular level, and one might therefore expect that release of ATP to the extracellular milieu would rarely occur. Nonetheless, extracellular ATP at low micro molar concentrations can influence many biological processes including platelet aggregation, vascular tone, neurotransmission |peripheral and central, cardiac function and muscle contraction. The effects of physical exercise at different form on skeletal muscle ATP concentration well documented. However, the effects of treadmill exercise training at moderate to high intensity on plasma and liver ATP levels is lacking or very less and conflicting data provided after acute exercise. The purpose of this study was to investigate the effects of 10 weeks of a treadmill exercise (60 min, 28 m/min, 0% grade) program on plasma, liver and skeletal muscle ATP contents in wild type male rats.

Methods: forty male Wistar rats (17-18 weeks old, and weighing 200-220g) used for this study and divided into four, fed-control, fed-exercise, fast-control, and fast-exercise. Animals were sacrificed 24 hours after the last session of exercise, the blood and tissue samples were collected. ATP was measured by using an enzymatic luciferine-luciferase method. Normal distribution of dependent variables was documented by Kolomogorov-Smirnoff test. The data were analyzed by ANOVA univariate and one way ANOVA. The level of statistical significance was set at P<0.05. Results: the data indicate that the level of liver ATP was significantly higher (P< 0.028) in trained group when compared with control group. A higher but non-significant plasma and muscle ATP concentrations were observed in trained rats. However, fasting lowered liver, plasma, and muscle ATP contents only in central rat trained-fasted rat. Discussion: the main finding of this study was a higher levels of liver ATP in trained rats following the treadmill training. Data also shows training attenuated a fasting-induced reduction of ATP in the liver, plasma, and muscle. A non-significant increase in plasma ATP levels might be related to the release of ATP from blood cells (erythrocyte and leukocytes) and a non-significant increase of muscle ATP content following treadmill exercise due to incomplete recovery of muscle glycogen content which acts as a source of ATP synthesis. This the first study which investigate the effects of 10 weeks of treadmill exercise training on plasma, liver and muscle ATP contents at rest. Conclusion: a higher resting liver ATP might be due to an exercise-induced increase in liver glycogen content and ATP uptake from plasma.

EFFECT OF ALLOPURINOL AND EXERCISE ON PROTEIN EXPRESSION IN RAT GASTROCNEMIUS AND SOLEUS MUSCLE

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Allopurinol is an inhibitor of xanthine oxidase. Xanthine oxidase is a major contributor of free radicals during exercise. Previous studies from other laboratories have shown that free radicals are vital for physiological adaptations in exercise. To this end we studied the effect of allopurinol administration on protein expression in various rat muscles. Sixty adult male Wistar rats, 8 weeks old, weighing 220±10 g, means±SEMI, were randomly and equally divided into six groups as follows: a) DMSO-treated rats killed at 1.5 h after administration, b) DMOSO-treated rats exercised at 1.5 h after administration and killed immediately after exercise, c) DMOSO-treated rats exercised at 1.5 h after administration and killed 5 h after exercise, d) allopurinol-treated rats killed at 1.5 h after administration, e) allopurinol-treated rats killed at 2.5 h after administration, and b) allopurinol-treated rats killed at 7.5 after administration. Allopurinol was dissolved in dimethyl sulfoxide (DMSO) and administered intraperitoneally in a single dose of 50 mg/kg body weight at 1.5 h before the acute exercise protocol, as allopurinol peak plasma levels occur about 1.5 h after its administration. Exercise duration to exhaustion of DMOSO-treated rats lasted approximately 1 h. Allowing 7 days of acclimatization in the animal facility, animals were then familiarized to swimming for a period of five days before the actual swimming protocol. Rats of the exercising groups individually swam until exhaustion in deep water tanks at a water temperature of 33/36 °C. Gastrocnemius and soleus muscle samples were collected before, immediately after and 5 h after exercise in the respective time points after allopurinol administration. Tissue samples were homogenized using mortar and pestle followed by brief sonication treatment. Protein expression was assessed using sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE). Preliminary results indicated differences in the expression of several proteins in the high molecular weight bands, whereas such differences were not observed in the soleus muscle. The protein bands detected to be differently expressed are currently analyzed using mass spectroscopy (LC/MS).

THE ASSOCIATIONS OF OBESITY AND EXERCISE PARTICIPATION WITH BLOOD LEVELS OF IL-6 AND TNF-945; IN KOREAN ADULT WOMEN

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The aim of current study was to examine the associations of obesity and exercise participation with body composition, blood levels of IL-6 and TNF-945; in adult women. We studied 84 Korean adults women who volunteered in a health promotion program. Subjects were grouped according to fat as obese (30%, n=44) or non-obese (<25%, n=40), and were divided into 2 groups based upon spontaneous exercise participation, for using a cross-sectional approach. We measured anthropometric factors (BMI, percent body fat, WHR), and abdominal fat area by CT scanning, BP, blood levels of IL-6 and TNF-945; Associations among the variables were assessed by Pearson’s partial correlation and linear regression, controlling for age. Independent t-tests were used to assess differences between two groups. Significance was accepted at P<0.05. The ratio of muscular area to fat area in abdomen and thigh of obese group was significantly (P<0.05) lower than the non-obese group. The ratio of muscular area to fat area in thigh of exercise group was significantly (P<0.05) higher than the non-exercise group. Blood levels of IL-6 and TNF-945; of non-exercise group was significantly(p<0.05) higher than the exercise group. Blood levels of IL-6 and TNF-945; of non-exercise group was significantly(p<0.05) lower than the exercise group in obese and non-obese groups. Blood level of IL-6 was significantly(p<0.05) correlated with body fat, and TNF-945; level was significantly(p<0.05) correlated with abdominal and thigh fat area.
Obesity is strongly associated with sarcopenia, blood levels of IL-6 and TNF-945; in middle-aged women. Additionally, exercise participation may be protective against development of sarcopenia and increase of IL-6 and TNF-945;.

**ADIPOPHILIN DISTRIBUTION AND COLOCALISATION WITH INTRAMYOCYTOCELLULAR LIPIDS IN SKELETAL MUSCLE**

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Intramyocellular lipids (IMCL) are a dynamic cellular pool of stored fat that plays an important role in energy provision during prolonged moderate intensity exercise and regulates the availability of intracellular lipid signalling molecules. IMCL are stored as discrete lipid droplets which are surrounded by a phospholipid monolayer, embedded in which are a number of proteins. Adipophilin is the human orthologue of adipocyte differentiation-related protein and is the most abundant lipid droplet protein in skeletal muscle (1). Adipophilin appears to play a role in the regulation of lipolysis and fat oxidation by either protecting IMCL from basal lipolysis or in the interaction with hormone sensitive lipase (HSL) during exercise-mediated lipolysis (2). It has also been suggested that adipophilin might assist with the transport of fatty acids to the mitochondria.

The aim of this study was to investigate the subcellular distribution of adipophilin in human muscle fibres and to measure the colocalisation of adipophilin with IMCL. Muscle biopsies were snap frozen in liquid nitrogen-cooled isopentane and stored at -80°C. 5 µm cryosections were stained with anti-adipophilin in combination with anti-cytochrome C oxidase or the lipid dye oil red O. Images were acquired using laser scanning confocal microscopy and analysed using Image Pro Plus computer software.

Intracellular adipophilin was distributed throughout the muscle fibres and was approximately equal in size to the IMCL. In the present study 60% of the IMCL colocalised with adipophilin which is similar to the maximum reported reduction in IMCL content seen after prolonged endurance exercise (3). As HSL translocates to IMCL and adipophilin during muscle contraction and adrenaline stimulation in rat muscle in vitro, it is possible that the proportion of adipophilin-containing IMCL determines the lipolytic potential and therefore the degree of IMCL oxidation during exercise. There was also a large proportion (>50%) of adipophilin which did not colocalise with oil red O and the function of this adipophilin pool is unknown. Adipophilin however did not colocalise with mitochondria suggesting that it does not play a role in the channeling of liberated fatty acids to the mitochondria in the resting state.

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**Oral presentations (OP)**

**OP-BN02 Biomechanics 2 - Sports**

**KNEE AND ANKLE ANGLES WHILE WALKING ON AN INCLINED SURFACE WITH AND WITHOUT HIKING POLES**

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To examine the effects of fatigue on balance and risks of stumbling while walking uphill or downhill, more information of gait characteristics is needed in undisturbed situations. Stride length increases when incline increases but when decline is increased, both longer and shorter strides have been reported (Leroux et al. 2002, McIntosh et al. 2006). Knee and ankle angles differ significantly between subjects and inclinations. Few studies have investigated walking with and without poles on inclined and declined surfaces. Therefore our pilot study focused on knee and ankle angles during uphill and downhill walking with and without hiking poles.

Five students (average age 25.6 years, four female, one male) took part in the study. They walked on a treadmill with a constant comfortable speed (4 or 5 km/h). The Lukotronic system was used to collect three dimensional positions of hip, knee, ankle and foot. The system employs active infrared markers with an accuracy of approximately 5mm. After 30 seconds of walking, data of 10 consecutive steps were gathered in 4 different conditions: incline of 20°, decline of 20°, with and without poles respectively. Knee and ankle angles were calculated by the limb positions in the sagittal plane. Means and SD of knee and ankle angles over all 10 steps were computed. Analyses of variance with the repetition factors slope (uphill or downhill) and poles (with or without poles) were calculated for knee angle and ankle angle separately.

Downhill walking resulted in lower knee angles than uphill walking. Knee angles showed a significant difference (p=0.025) between walking uphill with poles (131°) and walking downhill with poles (141°). Statistical analysis showed a trend (p=0.07) for the factor slope. The use of poles showed no effect, whereas interaction of slope and poles indicated a trend towards lower knee angles walking downhill. Walking without poles produced similar knee angles in both slope conditions. Mean ankle angles were less walking uphill, poles had no effect. Observing the range of motion, standard deviations of knee and ankle angles within each subject were greater walking downhill. This difference was strongly significant for ankle values. Poles and slope as well as their interaction showed no effect. Graphs of angle values against time revealed longer stride cycles when walking with poles. Treadmill velocity was constant, therefore we can assume that stride length increased when walking with poles both uphill and downhill.

**References.**


**MODIFIED MUSCLE ACTIVATION PATTERNS IN RUNNING OVER STEPS OF DIFFERENT HEIGHT**

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Introduction: Humans run across changing surfaces with ease. They adjust their leg stiffness and angle of attack to accommodate changes in surface stiffness (Ferris et al. 1998) and surface roughness (Grimmer 2008). An upward step in the ground results in reduced leg stiffness and a flatter angle of attack (Blickhan et al. 2007). More precisely, the ankle joint angle as well as the ankle joint moment decreases with increasing step height, whereas the knee joint angle decreases but the knee joint moment remains unchanged (Grimmer
INFLUENCE OF PHYSICAL DEVELOPMENT ON SPRINT START DURING ADOLESCENCE

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Introduction
In the sprint disciplines of track and field, a good start is of considerable importance. Besides technical skills, also strength and power exertion on the start blocks affect start performance.

Aim
The aim of this study is to examine possible influences of physical development during adolescence on the sprint start.

Methods
According to Flemish Athletics League rankings, top 10 boys and girls of each sprint discipline were invited for voluntary participation. Both in 2006 and 2007, anthropometrical measurements were taken and total body skeletal muscle mass (SMM) was calculated (Poortmans et al., 2005). A sprint start was performed with instrumented start blocks enabling the recording of horizontal forces. A laser measured time and running velocity at 5m from the start line.

Results
Both in 2006 and 2007, 25 girls and 21 boys (age in 2006: 14.8 ± 1.5 and 14.4 ± 1.8 years respectively) were tested. Between the two test periods, height increased (p < .001) for both boys and girls (167.8 ± 6.6 vs. 168.9 ± 6.1 cm and 171.1 ± 11.7 vs. 174.9 ± 9.0 cm respectively). A greater increase for the boys (p < .01). Boys increased their SMM (p < .001: 23.1 ± 4.8 vs. 25.5 ± 4.3 kg) significantly more (p < .001) than girls (p < .01: 19.5 ± 3.1 vs. 20.3 ± 3.1 kg). Velocity when leaving the start blocks was significantly higher in 2007 than in 2006 for both boys and girls (p < .05). This change in velocity correlated with the change in sum of the left and right peak forces on the blocks (girls: r = .57, boys: r = .81, both p < .01). In boys only, the change in velocity correlated (p < .05) with the change of the corrected thigh girth (r = .43) and SMM (r = .47). Only in girls, elapsed time at 5m was less in 2007 (p < .05) which correlated with a higher impulse on the rear block (r = -.57, p < .01). Neither for girls or boys, running velocity at 5m was higher in 2007 than in 2006. In boys, a change in running velocity correlated positively with the increase of corrected calf girth (r = .61, p < .01) and SMM (r = .45, p < .05).

Discussion
Velocity when leaving the start blocks is highly affected by the ability to induce higher forces on the start blocks in both sexes. Muscular development directly influences this higher force development as well as a higher running velocity at 5m in boys and a faster time at 5m in girls. A higher gain in SMM for boys compared to girls at this age may explain the differences between the sexes. Despite a higher SMM, these athletes were not running faster at 5m in 2007 than in 2006. Sufficient specific training on sprint start skills and to create a passive transfer from strength gain is proposed.

References

MUSCLE RECRUITMENT PATTERN IN LOW-BACK MUSCLES DURING CYCLING SPRINTS

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Different causative factors have been shown to be responsible for the low back pain suffered by many cyclists. However, the aetiology of the pain has not been well explained. Due to the nature of bipedal motion, we hypothesized that sudden increases in movement velocity during cycling sprints would affect the muscle activity pattern in low back muscles and might result in bilateral asymmetrical periodic load occurred around the lumbar region which triggers the incidence of further low back pain episodes. Therefore, the purpose of this study is to investigate muscle recruitment pattern in low-back muscles during 30-second cycling sprints. 7 healthy active male subject (age: 18-21, weight: 70 ± 6.04, height: 178 ± 2.73) were underwent 30-second Wingate test on Monark bicycle ergometer (894E) against the resistance of 7.5% g/kg of body mass. Following 5-minutes of warm-up, Surface EMG was recorded bilaterally from low back extensor and stabilizer muscles: Erector Spinae (lower part IES) and Multifidus (MF). Two photocells were mounted on the ergometer to collect synchronized time data as the pedal passes top and bottom dead center. Before the tests subjects performed maximal voluntary isometric back extension to obtain peak EMG activity to normalize the subsequent EMG data collected during the dynamic exertions. Raw EMG signals recorded during 30-second cycling sprint were amplified, filtered, sampled at 1000 Hz. Normalized data full-wave rectified and the root-mean-square (RMS) and average muscle activation of each muscles were computed for 5-second periods. Asymmetrical loading was observed in back muscle activation pattern during 30-second cycling sprints (p < 0.01). Average activation of low back extensor and key stabilizer muscle of the lumbar spine were higher in the left side (IES/MF). This finding could be explained by the difference in maximal and explosive force production capacity of the muscles at dominant and non dominant sides of the subject. Although, cycling...
cadence increased at the beginning of the sprint (2nd phase), both the muscle activation and the average peak power output decreased linearly. RMS values of each muscle EMG slightly increased at 5th phase probably due to the change of trunk position when bending forward and greater recruitment of fast switch fibres. In this preliminary study, the results revealed that 30 seconds of maximal cycling sprint against pre-determined load results in asymmetrical contraction pattern of low back muscles throughout the entire test which might be considered to aggravate unilateral spinal loading.

References:

BIOMECHANICAL ANALYSIS OF MAXIMUM FOREHAND TOPSPIN STrokes in TABLE TENNIS DURING FATIGUE

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Table tennis is characterized with intermittent intervals of explosive (anaerobic) muscle activity. Even though professional players still need to have a high level of aerobic abilities. Only little is known about the players’ neuromuscular ability to perform sports specific tasks with high precision as well as maximum speed until exhaustion.

A standardized protocol has been developed where top players are monitored through kinematic, kinetic and surface electromyographic (sEMG) variables when performing a repetitive maximum forehand topspin movement, practicing with a table tennis robot, in such a dynamics and duration as to induce fatigue (Baca et al., 2007).

The aim of the present case study was to analyze changes in whole body kinematics, kinetics and sEMG signal behaviour of the stroke arm during such a fatiguing movement.

According to the protocol developed, a top level young Austrian player (right hander) underwent an intensive exercise consisting of 22 consecutive sequences of 12 strokes with maximum speed. 3D-kinematics (VICON), kinetics (Kistler) and electromyographic data (Delsys) from m. deltoideus anterior, m. deltoideus medialis, m. biceps brachii and m. pectoralis major were collected. From the raw data recorded characteristic parameters and time series of these parameters (integrated EMG (iEMG), median frequency (MDF); magnitudes of distances, velocities and accelerations; time instants of maximum/minimum values of these magnitudes) were calculated and analysed.

Major findings are as follows: the time-dependent variability of kinematics, kinetics and sEMG signals decreased over time, the initial increase of the mean values of the maximum magnitudes of the right finger velocity up to 15 m/s, this parameter gives indications on how the ball was hit, could also be observed in the iEMGs of the m. biceps brachii; the player was well able to hit a marked area on the table during the whole exercise. Contrary to expectations, muscular activity (iEMG, MDF) showed either almost no changes (m. pectoralis major), or a slight decrease (m. deltoideus anterior), or an increase followed by a slight decrease (m. biceps brachii) or a considerable decrease (m. deltoideus medialis).

The results suggest that even if there are partly decreased muscular activities from agonists, which are supposed to be a result of fatigue, a professional player is able to maintain the motor task at a relatively high level.

References:

DEVELOPMENT OF A SYNCHRONIZED SYSTEM OF PIV AND MOTION ANALYSIS, AND ITS APPLICATION TO A FRONT CRAWL SWIMMER

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Schleihau evaluated a force exerted on a swimmer’s hand using a quasi-steady analysis. However, the flow field around a swimmer is extremely unsteady. To obtain a deep understanding on the generating mechanism of force in unsteady conditions, it is necessary to know the relationship between swimmer’s motion and the flow field around a swimmer. Particle Image Velocimetry (PIV) can visualize the unsteady flow field. In addition, a motion analysis system can analyze the unsteady motion of a swimmer quantitatively by Direct Linear Transformation (DLT). Yamada used these methods separately and concluded that the hand motion in swimming was closely related to the vortex generation. Our main aim was to construct a synchronized system of PIV and a motion analysis, and to apply it to a front crawl swimmer, in order to clarify the simultaneous relationship between swimmer’s hand motion and the vortex generation by hand.

In the traditional study, PIV and a motion analysis has been carried out under the quite different lighting conditions. To combine these methods, we illuminated a swimmer’s hand with the red lights, and separated the light by passing it through Laser Line Band Pass Filter and Red Band Pass Filter for a CCD camera (PIV) and for two synchronous high-speed cameras (a motion analysis), respectively. In addition, using a pulse generator we set all cameras to start at the same time and to capture images every 68 ms in PIV and every 4 ms in the motion analysis. The experiment was carried out at the flume installed in the Univ. of Tsukuba whose dimensions of the test section are 4.6 m in length, 2.0 m in width, and 1.5 m in depth. The flume has the ability of 2.5 m/s at the maximum velocity. The subject was a male with a competitive career of triathlon. The flow velocity was set to be 1.0 m/s. The measurement planes were located at the depths of 70, 64, 58 and 52 cm below the water surface. To evaluate quantitatively the orientation of hand, the palm trajectory, velocity and the angle of attack were derived from the coordinates calculated by a video motion analysis system Frame-DIAS based on DLT. In addition, the velocity and vorticity distributions were derived from the particle image data.

From the results obtained by the synchronized system, we derived the relationship between the temporal variation of the angle of attack of hand and that of the corresponding flow field when the motion was in the transition phase. It was confirmed that vortices were generated and then released from the hand in the phase.

References:
STEP-UP SENIOR: A PHYSICAL ACTIVITY PROGRAM TO IMPROVE FUNCTIONALITY IN THE ELDERLY

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We are living in the age of longevity. Population ageing represents a triumph of social development and public health. Ageing is now the norm rather than the exception, and we can exert crucial influence in increasing awareness and designing broad initiatives to highlight the opportunities brought to individuals and societies by living longer. Based on this premise some physical activity programs were developed, such as, the Step-Up Senior Exercise Program (1-4) that was designed to improve the quality of life and the participants’ fitness components. People are challenged to follow a routine, which involves stepping up and down on platforms of varying heights, at varying cadences, in order to achieve a sound workout. Three sessions per week were performed (60 minutes) subdivided into warm-up (12 minutes), cardiovascular (20 minutes, 60-79 %HRmax), strength (1-3 sets of 12-15 reps), flexibility & cool-down. The data from the 4 years follow-up assessed by the Senior Fitness Test - SFT (5) suggested that this program had a positive impact on the ageing delay by reducing the risk of making them prone to falling or other accident related injuries once the results of the 8-foot-up & go and chair stand tests are related to falls prevention (6). This was consistent to the kinetic results from walking tasks, which showed that after 2 years the participants produced Ground Reaction Force (GRF) patterns similar to youngsters during unobstructed walking (7). However, age significantly affects some force impulses during obstacle negotiation, highlighting the hypothesis that senior step exercise programs might improve gait stability in elderly. This positive effect is lessened in the case of more demanding walking tasks and this should be taken into account in the development of the program. We also find that the mechanical stress associated with the program seems to constitute a positive osteogenic stimulus and is a safe and healthy activity that may be included in the physical activity programs for the elderly. Even after six months, the 71 subjects have shown positive changes in body composition, experienced by the reduction of total and mainly central adiposity, directly related to cardiovascular risk (8). We firmly believe that increasing the adherence to this program we might counteract the effect of aging, contributing to a healthier, independent lifestyle, greatly improving the functional capacity and quality of life of this population.

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REFERENCE SCORES FOR PHYSICAL FUNCTION IN ELDERLY

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Evaluation of physical activity in elderly has been interpreted taking scores from people of the same age group and gender as reference. Purpose: This study intend to describe physical function in elderly using as reference scores from a young adult group of the same gender aged 20-29 yrs, the age range at which peak physical function is assumed to have occurred. Methods: Participants were 559 active community-residing elderly engaged in an exercise programme at least 2 sessions/week in the previous year (423 women aged 60-88 yrs. 69 ±5.8yrs and 136 men aged 60-87 yrs. 70 ±6.6yrs). 79 young adults (50 women, aged 20-28 yrs. 22.8±2.1yrs and 29 men, aged 21-26: 23.2±1.6yrs). Participants were separated into six age groups, namely: 20-29 yrs (Y), 60-64 yrs (A), 65-69 yrs (B), 70-74 yrs (C), 74-79 yrs (D) and 80 yrs (E), in both genders. Lower and upper body strength (LBS and UBS), lower and upper flexibility (LBF and UBF), agility (Ag), and aerobic endurance (AE) were evaluated by the Fullerton battery for functional fitness. All physical function attributes in elderly participants were expressed as T-scores [(elderly attribute score - mean of young adult attribute score)/standard deviation of young adult attribute score]. The T-score indicates how many standard deviations (SD) above or below the average value, the result in young adult attribute score is the norm rather than the exception, and we can exert crucial influence in increasing awareness and designing broad initiatives to highlight the opportunities brought to individuals and societies by living longer. Based on this premise some physical activity programs were developed, such as, the Step-Up Senior Exercise Program (1-4) that was designed to improve the quality of life and the participants’ fitness components. People are challenged to follow a routine, which involves stepping up and down on platforms of varying heights, at varying cadences, in order to achieve a sound workout. Three sessions per week were performed (60 minutes) subdivided into warm-up (12 minutes), cardiovascular (20 minutes, 60-79 %HRmax), strength (1-3 sets of 12-15 reps), flexibility & cool-down. The data from the 4 years follow-up assessed by the Senior Fitness Test - SFT (5) suggested that this program had a positive impact on the ageing delay by reducing the risk of making them prone to falling or other accident related injuries once the results of the 8-foot-up & go and chair stand tests are related to falls prevention (6). This was consistent to the kinetic results from walking tasks, which showed that after 2 years the participants produced Ground Reaction Force (GRF) patterns similar to youngsters during unobstructed walking (7). However, age significantly affects some force impulses during obstacle negotiation, highlighting the hypothesis that senior step exercise programs might improve gait stability in elderly. This positive effect is lessened in the case of more demanding walking tasks and this should be taken into account in the development of the program. We also find that the mechanical stress associated with the program seems to constitute a positive osteogenic stimulus and is a safe and healthy activity that may be included in the physical activity programs for the elderly. Even after six months, the 71 subjects have shown positive changes in body composition, experienced by the reduction of total and mainly central adiposity, directly related to cardiovascular risk (8). We firmly believe that increasing the adherence to this program we might counteract the effect of aging, contributing to a healthier, independent lifestyle, greatly improving the functional capacity and quality of life of this population.

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HABITUAL PHYSICAL ACTIVITY AND SELF-PERCEIVED FUNCTIONAL FITNESS AND SELF-SUFFICIENCY FITNESS AMONG MEN OVER 60 YEARS OLD

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Participation in appropriate physical activity by elderly people is usually positively related with health and functional fitness. Much less is known about the role of habitual physical activity (HPA) and potential benefits resulting from this type of activity are often omitted and underestimated.

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The aim of the study was to assess the relations between HPA and self-perceived functional fitness and self-sufficiency fitness among men over 60 years of age. The participants of the study were 137 men (60-88 years, average=72.6±5.8) living in Poznan (city in Poland, about 700 thousand inhabitants). The participants were retired, free from severe illness, who didn’t participate in any organized programme of physical activity. For measuring HPA the Coltrac accelerometer (Muscle Dynamics Fitness Network, USA) was used. HPA was expressed as a value of weekly energy expenditure related to physical activity (PA-EE). The value of PA-EE calculated per kg of weight (PA-EE/kg) was also used. Self-perceived functional fitness and self-sufficiency fitness were estimated using the questionnaire, fulfilled during the individual interview. By choosing one answer, participants estimated the level of difficulty in performing of daily activities related to functional fitness (seven types of activities) and self-sufficiency fitness (ten types of activities). Each one from three possible answers had its own point score: 1 I can’t make it by one-self, 2 I can make it with troubles, 3 I can make it without any troubles. The sum of points was used, as the expression of functional fitness and self-sufficiency fitness level. The Spearman correlation was used in statistical analysis. Significant and positive relations of self-perceived functional fitness with PA-EE (r=0.378; p<0.001) and PA-EE/kg (r=0.439, p<0.001) were noticed. Also the self-sufficiency fitness level was positively related with PA-EE (r=0.510, p<0.001) and PA-EE/kg (r=0.547, p<0.001). Obtained results allow the conclusion, that HPA has the significant relationships with maintaining functional independence and optimal quality of life of elderly men. However, the interpretation of confirmed phenomenon has to be mutual. Undoubtedly, higher levels of functional fitness and self-sufficiency fitness are favourable in undertaking wider range of activities related not only to HPA. The precise estimation of cause-effect relation is very difficult to explain.

**BODY WEIGHT UNLOADING: AN ALTERNATIVE FORM OF EXERCISE FOR OVERWEIGHT POSTMENOPAUSAL WOMEN**

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Exercise, even in the form of a single exercise session, can produce significant improvements in the glucose and lipid metabolism of overweight postmenopausal women. However, despite their benefits, weight bearing exercises such as walking can also increase the risk for injuries especially in overweight individuals that have a high prevalence of musculoskeletal problems. This study proposes using an alternative form of exercise that unloads a percentage of body weight (BWU) while exercising on the treadmill and thus potentially reduces the risk for injury. Hence, the purpose of this study was to investigate and compare the acute effects of treadmill walking with and without BWU on substrate utilisation and glucose turnover in healthy overweight postmenopausal women.

Six healthy, overweight postmenopausal women (age: 58±7 years; body mass: 66.4±4.0 kg; body mass index: 25.5±2.1 kg/m²; mean±SD) volunteered to participate in the study. All subjects participated in 3 exercise sessions: an incremental exercise test to fatigue to identify the ventilatory threshold (VT) of each subject, and two experimental exercise trials with and without BWU in a lattice square design. Each experimental trial consisted of 120 minutes of resting measurements followed by 60 minutes of exercise on the treadmill at 70% of VT with and without BWU, and 60 minutes recovery. During the duration of the experimental trials, continuous infusion of [6,6-2H2]glucose was performed, and at specific time points of the trials pulmonary gas exchange samples and blood plasma samples were collected. No significant differences were found in glucose turnover and utilisation during exercise between the experimental trials. Significant increases (+6.1±0.6 umol/kg/min, P<0.05) in glucose rate of appearance (Ra) and rate of disappearance (Rd) were found during exercise, while blood glucose was significantly reduced (-0.35±0.01 mmol/l, P<0.05) after exercise in both trials. Plasma glycerol concentration, an index of lipolysis, was significantly increased (+0.179±0.161 mmol/l, P<0.05) during exercise in both trials with no significant differences found between them. Finally, fat and carbohydrate oxidation rates did not differ between trials, and both increased as a result of exercise. In conclusion, exercising on the treadmill with BWU is an effective alternative form of exercise to regular walking in healthy overweight postmenopausal women, as it produces similar changes and benefits on the glucose and lipid metabolism of this population.

**SPORTING AND LEISURE TIME ACTIVITIES OF OLDER PEOPLE**

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Objective: Although the benefits of physical activity for health and functioning are recognized to extend throughout life, data on physical activity habits of elderly people are scarce. The aims of this study were: 1. To perform a detailed analysis of the sporting and leisure time activities in a cohort of elderly people in Germany 2. To evaluate the association between general health and physical activity in this cohort.

Methods: In a monitored prospective cohort study (German epidemiological trial on ankle brachial index, getABI), 6880 unselected patients >= 65 years were followed up by 344 representative primary care physicians in Germany since November 2001. In the 5-year follow up, 2120 patients (median age 76, 70-94 years, 53.7 % women) of the cohort were interviewed in their level of physical activity (activity of moderate intensity for at least 30 minutes per session, 1: no activities or active for less than once per week, 2: active for 1-3 times per week, 3: active for > 3 times per week) and on their general health (1: excellent to 6: very poor). In a subgroup of 1376 patients (median age 76, 70-94 years, 54.7 % women), a detailed analysis of sporting and leisure time activities was performed.

Results. Of the 2109 (out of 2120) patients, who answered the questions on activity level and on general health in the 5-year follow up, 57 % reported a high activity level (level 3), 23 % an intermediate activity level (level 2) and 19.4 % reported to be inactive (level 1). Women and men did not differ significantly in their reported activity level. Activity level was associated to self-reported general health of the previous 4 weeks. The better the health status, the higher was the specified level of physical activity (Stuart’s Tau-c = -0.15, p < 0.001, e. g. 70.1 % of the 107 patients with an “excellent general health” were physically active for more than 3 times per week, whereas only 34.9 % of the 63 patients with a “poor general health” reached the same activity level. The detailed analysis of sporting and leisure time activities in the subgroup of 1376 patients showed that 74.7 % had taken an outdoor walk and 18.8 % had made a bicycle tour or ridden on a bicycle ergometer during the previous week. During the previous month, 24.8 % of patients had made gymnastics or strength train-
ing, 16.6% had swum, and 6.2% had bowled or danced. Every other sporting activity had been performed by less than 5% of patients during the previous month.

Conclusions: The level of physical activity is associated to self-reported general health in elderly people. Only a small percentage of elderly people do sporting activities other than walking, cycling, gymnastics, strength training, swimming, bowing or dancing.

The study has been conducted within the research cooperation PRISCUS (Prerequisites for a new health care model for elderly people with multimorbidity) which is funded by the German Federal Ministry of Education and Research 01ET07

RELATIONSHIPS BETWEEN HABITUAL PHYSICAL ACTIVITY AND MORPHOLOGICAL AND METABOLICAL FACTORS OF HEALTH-RELATED FITNESS AMONG ELDERLY MEN

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Health benefits resulting from undertaking appropriate physical activity by elderly people are indisputable nowadays. However, the results of studies on the relations between habitual physical activity (HPA) and health are not clear and potential benefits resulting from this type of activity are often omitted and underestimated.

The aim of the study was to assess the relations between HPA and morphological and metabolical factors of health-related fitness (HRF) among men over 60 years of age.

The participants of the study were 137 men (60-88 years, average=72.6±5.8) living in Poznan (city in Poland, about 700 thousand inhabitants). The participants were retired, free from severe illness, who didn’t participate in any organized programme of physical activity.

For measuring HPA the Caltrac accelerometer (Muscle Dynamics Fitness Network, USA) was used. HPA was expressed as a value of weekly energy expenditure related to physical activity (PA-EE). The value of PA-EE calculated per kg of weight (PA-EE/kg) was also used. In terms of somatic characteristics body height, weight, waist and hip circumferences, body composition (FM and FFM) and bone mineral density (BMD) were established. Body Mass Index (BMI) and the waist to hip ratio (WHR) were calculated. Selected metabolic factors were marked in blood plasma. The concentration of total cholesterol (TC), HDL-cholesterol, triglycerides (TG) and glucose (Glc) were marked. Also the level of LDL-cholesterol, TC/HDL and HDL/LDL indices were calculated.

In conclusion, the significant role of HPA in more beneficial distribution of fat tissue was proved, when there is a lack of direct relationships between HPA and other somatic characteristics or between HPA and metabolical components of HRF. These observations indicate that we should appreciate the significance of HPA for the health of elderly men. It was also showed the necessity of using the relative value of HPA, when expressed by energy expenditure, it must be calculated per kg of weight.

Oral presentations (OP)

OP-PM07 Physiology 7 - Energetics

EFFECTS OF SHORT TERM HIGH-INTENSITY CYCLING EXERCISE ON LACTATE DISTRIBUTION IN RED BLOOD CELLS AND PLASMA

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Introduction

Several studies described the lactate distribution in blood under resting conditions and the effects of exercise on plasma and erythrocyte (RBC) lactate ([La]) concentrations. The ‘cell-to-cell lactate shuttle hypothesis’ is meanwhile an established theory but there is still limited knowledge about the (saturation) kinetics of lactate transport in different tissues and differently trained individuals. In this study we investigated a closed meshed time course of lactate distribution in plasma and erythrocytes after a maximal exercise test in elite cyclists.

Methods

12 healthy male cyclists participated in this study. Subjects performed a 30sec lasting maximal sprint test on a cycle ergometer. The cycle ergometer was adjusted to an isokinetic mode regulating the cadence to 120rpm. Subjects were instructed to perform the test in a sitting position on the ergometer. Blood samples were taken pre. Omin, 1min, ... 10min each minute after exercise to determine lactate concentrations in whole blood, plasma and erythrocytes. After the test subjects stayed in a resting position on a chair.

Results

Subjects reached a mean peak power (PP) of 976.1±101.5 Watt and a mean power (MP) 697.6±62.6 W. The mean ratio between RBC and plasma [La] under resting conditions was 0.54±0.04 [AU], showing a plasma [La] approximately twice as high as in RBC. The ratio between RBC and plasma [La] significantly decreased to 0.32±0.03 [AU] (40.7%) 0min past exercise, showing a faster relative/proportional increase in plasma [La] compared to RBC [La]. Afterwards [La] ratio started to increase again. After the 5th minute plasma lactate levels started to decrease while RBC lactate levels still increased. The plasma-to-RBC-concentration gradient shows that plasma lactate concentration increases faster up to 3min after exercise compared to RBC lactate levels. Between the third and fifth minute RBC lactate concentration increased faster than plasma lactate concentrations. After the fifth minute plasma lactate concentration started to decrease whereas RBC lactate levels still increased.

Discussion

The decrease in ratio is the consequence of a delayed lactate transport across RBC membrane and/or the consequence of a saturation of the transport systems. The fast congestion of lactate in plasma exceeds the transport capacity of the RBC membrane. But in this context
it should be considered that the total driving force for the (co-)transport of lactate and H+ by monocarboxylate transporters is composed of both the lactate and the proton gradients. Higher H+ concentrations in plasma increase the influx of lactate into RBC. Further investigations should measure lactate as well as H+ ions to determine flux in vivo.

PRESCRIBING EXERCISE INTENSITY BASED ON VO2MAX FAILS TO INDUCE PERIPHERAL ADAPTATIONS IN SOME PEOPLE

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INTRODUCTION: The health benefits of endurance exercise include both cardiac and skeletal muscle adaptations, the latter conferring improved functional capacity, insulin sensitivity and lipid metabolism. The response of the muscle to endurance training is highly variable between people even when training at the same percentage VO2max (1). We hypothesised that part of the variable response may be due to the muscle receiving different training stimuli as a consequence of differences between people in the relationship between muscle size and cardiac output. METHODS: Before and after training (45 min, 3/wk, 6 wks at 70-80% VO2max). 55 previously untrained female participants had their two-leg cycling VO2max measured and maximal cardiac output (Qmax) estimated (2). Participants also completed one-leg cycling VO2peak tests and quadriceps muscle volume was determined by MRI in 30 participants. Participants were ranked by the ratio, expressed as a percentage, of their one-leg VO2peak compared to their two-leg VO2max (ratio-1:2). RESULTS: Before training, the mean ratio-1:2 was 76% (+/- 9 SD; range 58-96%). Two subgroups were selected; High (n = 7) being > 1 SD above and Low (n = 9) being > 1 SD below the mean ratio-1:2. Height, body mass, two-leg VO2max and Qmax did not differ between groups but one-leg VO2peak was 50% higher (2.37 +/- 0.22 Vs 1.58 +/- 0.39 L.min-1; p = 0.003) and quadriceps muscle volume 19% greater (1.47 +/- 0.14 Vs 1.24 +/- 0.17 L; p = 0.030) in the High than the Low group. The High and Low groups had similar moderate increases in VO2max and Qmax following training but the improvement in one-leg VO2peak for the low group was 29 +/- 20% (p = 0.001) with no significant increase for the High group. DISCUSSION: The ‘balance’ between cardiac capacity, as reflected by Qmax and quadriceps muscle size varied between these untrained females. Most of the variability was attributable to differences in quadriceps muscle volume. Since VO2max is mainly determined by cardiac output, when exercising at the same percentage VO2max, participants with relatively large muscles were working at a lower percentage of their muscle capacity compared to participants with smaller muscles. This may account, at least in part, for the greater muscle adaptations seen in the High group. CONCLUSION: Endurance cycle training carried out at a fixed percentage of VO2max provided an adequate stimulus for cardiac adaptations in all participants. However, individuals with relatively large muscles may need to exercise at a higher intensity in order to provide an adequate stimulus for muscle adaptations that are the basis for some of the health benefits of exercise.

References.

EFFECT OF A SINGLE BOUT OF MODERATE-INTENSITY EXERCISE ON FAT OXIDATION KINETICS

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Introduction
During aerobic exercise, fuel substrate utilization depends largely on exercise intensity (3). Absolute fat oxidation rates increase from low to moderate exercise intensities and markedly decline at high intensities, which implies an exercise intensity (Fatmax) at which the rate of fat oxidation is maximal (WFO). In addition, muscle glycogen depletion induced by exercise duration results in an increase in fat oxidation during (5) and after exercise (2). Exercise intensity and duration appear therefore to play a predominant role in fat mobilization. The present study aimed to examine the effect of 1-h continuous exercise at an exercise intensity corresponding to Fatmax on post-exercise fat oxidation kinetics.

Methods
On a first visit, 16 healthy and moderately trained subjects (7 men and 9 women) performed a graded test to exhaustion on a treadmill (Incr), with 3-min stages and 1 km/h increments. Fat oxidation rates were determined during submaximal exercise stages using indirect calorimetry and plotted as a function of exercise intensity. A mathematical model (SIN) (1), including three independent variables (i.e. dilatation, symmetry and translation), was used to characterize and quantify the shape of fat oxidation kinetics and to determine Fatmax and MFO. On a second visit, the volunteers performed a 1-h continuous exercise at Fatmax (CONT) followed by a submaximal (i.e. until respiratory exchange ratio (RER) reached 1) graded test (IncrC) in order to determine post-exercise fat oxidation kinetics. All tests were performed under fasting conditions. Data are reported as means ± SE.

Results
Following CONT performed at 57 ± 3 %VO2max, RER during IncrC was lower at each stages compared with Incr (P < 0.05). Absolute fat oxidation rates during IncrC were significantly greater from 20 to 75 %VO2max compared with Incr (P < 0.05). A higher MFO was found in IncrC than in Incr (0.50 ± 0.03 vs. 0.41 ± 0.03 g/min, P < 0.001), whereas Fatmax tended to occur at higher intensity (58.7 ± 2.8 vs. 54.4 ± 2.9 %VO2max, P = 0.06, respectively). The three independent variables of SIN that characterize the shapes of fat oxidation kinetics were however not significantly different between Incr and IncrC (P > 0.05).

Conclusion
These results indicate that 1-h of continuous moderate-intensity exercise leads to a partial muscle glycogen depletion (4) that promotes greater post-exercise fat oxidation rates over a wide range of intensities and significantly increases MFO. Variables of SIN however show no difference in the shape of fat oxidation kinetics between before and after exercise. A longer duration exercise leading to higher glycogen depletion might increase MFO and Fatmax to a larger extent and therefore modify the pattern of fat oxidation kinetics.

References.
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Muscle length-dependent fatigue has been observed in different muscles, as the quadriceps femoris muscle group (1), the elbow flexor muscles (2) and the tibialis anterior muscle (2). In the present study length-dependent fatigue of the triceps surae muscles was investigated and related to potential differences in oxygen consumption (1). In addition, by measuring muscle oxygen consumption (mVO2), the effect of different ankle angles and different contraction intensities on the relative contribution of the gastrocnemius (GAS) and the soleus (SOL) muscles to the produced torque was estimated. During isometric plantar flexion contractions at different torque levels (40, 70 and 100% of maximal torque capacity (MTC)) near-infrared spectroscopy (NIRS) was used to measure mVO2 of the gastrocnemius lateralis (GL), SOL and the gastrocnemius medialis (GM) muscles. In addition the endurance time was determined during contractions at 70% MTC. The measurements were performed both at 20° plantar flexion (PF, short muscle length) and at 15° dorsal flexion (DF, long muscle length). The endurance time was longer at short (58 ±15.8 s) than at long muscle length (37 ±12.7 s) (P < 0.01). In addition, at all torque levels, mVO2 was smaller at short compared to long muscle length. At 70 and 100% MTC no interaction effects between ankle angle and muscle were found. This means that the differences in mVO2 between long and short muscle length were similar for GAS and SOL, probably indicating a similar relative contribution of GAS at both muscle lengths. However, at each of the ankle angles, significant interactions were observed between torque level and muscle. With increasing torque level, mVO2 increased more in GAS than in SOL, probably signifying a greater recruitment of GAS at higher torque levels. In conclusion, the fatigue resistance of the triceps surae muscles is greater at a relatively short than at a longer muscle length. The lower mVO2, and therefore likely the lower energy consumption, at short muscle length seems to contribute to this length-dependent fatigue. The relative contribution of the different triceps surae components seemed to be similar at both ankle angles and therefore this did not seem to contribute to the greater fatigability of the triceps surae muscles at long muscle length. Although no differences in the relative contribution to the plantar flexion torque were found between the ankle angles, in both PF and DF the relative contribution of GAS seemed to increase with increasing torque.

References.

ENERGETICS OF CONSTANT BALLAST BREATHE-HEIGHT DIVING IN HUMANS
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The energetics of constant ballast breath-hold diving at maximal speed was investigated on five top level breath-hold divers (age 37±2 years, mass 71±9 kg; maximal oxygen consumption 3.10±0.45 L/min). Each of them performed constant ballast breath-hold dives to 30 m in the sea (water temperature 24 °C) at their maximal diving speed. Before and after the trials, we measured oxygen volume in lungs and arterial blood, oxygen saturation, and blood hemoglobin and lactate concentrations. This allowed determination of aerobic (lungs and arterial blood) and anaerobic lactic energy expenditure. The aerobic energy from venous blood oxygen was estimated assuming an 5 L blood volume and invariant arterio-venous oxygen difference. The aerobic energy taken from tissue oxygen stores was estimated assuming that tissues contain up to 200 ml of oxygen overall. Anaerobic lactic acid energy was also accounted for, assuming that the obligatory component of the oxygen deficit has a time constant of 23.2 s. Lung oxygen content after the trials decreased from 95±5 ml 100 ml STPD to 40±21 ml 100 ml STPD. Blood and tissue oxygen content decreased to 543±261 and 157±34 ml. Lactate increased by 2.78±1.62 mM, yielding energy for 578±303 ml of oxygen equivalents. The total energy used (E) during each trial was obtained by adding the contributions of each energy source and resulted equal to 1959±571 ml of oxygen equivalents. When expressed per unit of time, it resulted equal to 2.31±1.18 L/min (75% of maximal oxygen consumption). This relative power, above the subjects’ lactate threshold, suggests that lactate accumulation is due to exercise intensity (lactate accumulated during the exercise transient) rather than to the occurrence of diving response mechanisms.

INFLUENCE OF DISTANCE FEEDBACK AND PRIOR EXPERIENCE ON PACING STRATEGY DURING A 4KM CYCLE TIME TRIAL
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Background: The Central Governor Model, based on Ulmer’s theory of teleoanticipation, is proposed to work as a safety mechanism for the body, acting through a system of central control. The brain uses a combination of prior experience and distance knowledge to work in a feedforward manner, so that a pacing strategy is set before exercise commences which ensures the bout is completed in the most efficient manner. Afferent feedback from the periphery constantly allows the central governor to make changes to this pacing strategy based on peripheral changes. Despite the apparent importance of distance knowledge and prior experience, little research has been completed in this area.
Aims: To determine the importance of distance knowledge, distance feedback and prior experience on the setting and maintenance of a pacing strategy.
Methods: Eighteen well-trained male cyclists were randomly split into a control (ICON) or experimental group (EXP) and performed four consecutive 4-km time trials (TT), separated by 17 minutes. The CON group received prior knowledge of distance to be cycled and received distance feedback throughout each TT. The EXP group received neither prior distance knowledge nor feedback, but knew that each TT was of the same distance. During each TT power output, mean and peak speed, VO2, heart rate and [EMG of the vastus lateralis (VL)] was recorded.
Results: The EXP group were significantly slower than the CON group to complete TT1 (P< 0.05). From TT2 onwards no significant differences in time to completion were found between groups. The magnitude of the difference between groups for TT2, TT3 and TT4 reduced with each consecutive time trial, characterised by successively faster times in the EXP group. By TT4 there was <1% difference in time to
completion between groups (CON TT1 367.4 ± 21 s; EXP TT1 409.4 ± 45.5 s; CON TT2 373.8 ± 19.7 s; EXP TT2 389.7 ± 30.2 s; CON TT3 375.1 ± 18 s; EXP TT3 383.7 ± 26.2 s; CON TT4 373.9 ± 20 s; EXP TT4 373.8 ± 14.4 s). Mean speed and mean power output showed a similar profile to that of time to completion across TT's, but peak power output was significantly different between groups for TT1, TT3 and TT4 (p < 0.05). iEMG tracked changes in power output during each TT in the CON and for TT3 and TT4 only in the EXP. Conclusion: The progressively improving times for completion over TT’s in the EXP shows that distance feedback is not essential in achieving optimum TT times. Prior experience of an unknown distance appears to allow the creation of an internal or relative distance that is used to create a pacing strategy. When sufficient prior experience is attained in the absence of distance knowledge and feedback, the pacing strategy created on the basis of this internal, relative distance appears to be as successful as when distance knowledge and feedback are available.

Oral presentations (OP)

OP-PM08 Physiology 8 - Chronic conditions

HAEMATOLOGICAL PROFILES OF ELITE EAST AFRICAN ATHLETES OVER A NINE YEAR PERIOD

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The World Anti-Doping Agency (WADA) is currently considering use of abnormal blood profiles that can reflect blood manipulation and therefore an anti-doping rule violation. However, chronic altitude exposure also has the potential to influence indirect indices of blood doping. While most Kenyan and Ethiopian athletes live and train in their native east African regions, they must frequently travel to lower altitudes for competitions. There is therefore an urgent need to consider the natural changes in haemopoietic indices from altitude exposure in an attempt to differentiate these responses from blood doping. Methods: 649 blood profiles collected between 1999 and 2007 from 289 (192 males, 97 females) elite athletes from east Africa were screened using the transversal [2nd generation, n=289; [1]] and longitudinal [3rd generation, n=33; [2]] approaches to erythropoietin (EPO) screening in athletes. Blood indices were compared at altitude and at sea level. Seasonal variations in haemopoietical parameters and urinary test results for EPO were also considered. Results: Mean haemopoietical indices of elite east African athletes were within published cut-off thresholds for indirect blood markers of doping. The blood profiles of all athletes varied considerably over time (i.e. coefficient of variation for haemoglobin, Hb; CV: 0.2-11.7%, haematocrit, Hct; CV: 2.0-13.9%, Reticulocytes; CV: 9.4-74.9%, and OFF-hr CV 3.8-36.5%) and attained peak levels at altitude exposure, peak Hb (range: 170-191 g/L), peak Hct (range: 49-63%). During the assessment period, the Hb cut-off of 170 g/L for males and 160 g/L for females was exceeded at least once (range: 1-4) by 14.2% (n=41) of athletes at altitude, whereas 4.2% (n=12) of athletes exceeded the Hb cut-off at sea level. At altitude, 11.1% (n=32) of athletes exceeded the Hct cut-off of 50% for males and 47% for females on at least one occasion compared to 3.5% (n=10) of athletes at sea level. 1.4% (n=4) of athletes exceeded the OFF-hr cut-off of 133 for males and 123 for females at altitude (OFF-hr range: 129-143). No athlete exceeded the OFF-hr cut-off threshold at sea level. For reticulocytes, 4.2% (n=12) of athletes exceeded the > 2.0% cut-off at altitude and 2.1% (n=6) at sea level. 51.5% (n=33) of the athletes exceed the 1 in 50 cut-off threshold for OFF-hr scores and Hb 2 scores and would therefore be deemed suspicious. During the study period, 180 urine samples were analysed for EPO with 1 positive test for a female athlete. Conclusions: A significant number of elite east African athletes tested had substantially elevated haemopoietical parameters and considerable fluctuations from historical baseline values reflecting numerous confounding factors such as ethnicity and altitude exposure.
References:
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SIMILAR MAXIMAL FAT OXIDATION DURING ACUTE EXERCISE IN PATIENTS WITH TYPE 2 DIABETES, OBESE AND LEAN CONTROLS

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Introduction:
Insulin resistance and type 2 diabetes has been associated with an imbalance between availability and oxidation of fatty acids. The aim of the present study was to examine whether maximal fat oxidation (MFO) was attenuated in patients with type 2 diabetes (T2DM) compared to obese and lean controls. Methods:
Male subjects (age: 43 +/- 2 yrs) were recruited into three groups. Healthy normoglycemic obese (n = 8) and lean (n = 7) controls and T2DM (n = 8, time since diagnosis: 4.1 +/- 0.5 yrs). The subjects were examined fasted on two occasions. Pre-tests included an OGTT, a DEXA scan and an incremental VO2 max test. On a separate day, MFO was determined using an incremental bicycle test, starting at 60 W for 8 minutes followed by 35 W increases every 3rd minute [1]. MFO was calculated with the application of indirect calorimetry using Frayn’s formula [2].

Results:
The groups were matched for age. BMI and % body fat were lower (P<0.05) in lean compared to obese and T2DM (24.7 +/- 0.6 vs. 31.7 +/- 1.4 vs. 31.9 +/- 1.7 kg/m^2) and 122.7 +/- 11. vs. 32.0 +/- 1.3 vs. 32.6 +/- 2.2 %, respectively. VO2 MAX was higher (P<0.05) in lean compared to obese and T2DM (42.4 +/- 1.1 vs. 30.9 +/- 1.8 vs. 26.2 +/- 1.5 ml/kg &#829;min), respectively. No difference was seen in the above mentioned parameters between obese and T2DM. No difference was found in basal plasma FFA concentration between lean, obese and T2DM (345 +/- 54 vs. 365 +/- 48 vs. 377 +/- 33 pmol/l). MFO during bicycle exercise was not different between the groups (Lean: 0.30 +/- 0.02; Obese: 0.31 +/- 0.04; T2DM: 0.33 +/- 0.05 g/min). The intensity at which MFO occurred (FatMax) was not different between groups (Lean: 0.30 +/- 0.02; Obese: 0.31 +/- 0.04; T2DM: 0.33 +/- 0.05 g/min). The intensity at which MFO occurred (FatMax) was not different between groups (Lean: 0.30 +/- 0.02; Obese: 0.31 +/- 0.04; T2DM: 0.33 +/- 0.05 g/min). The intensity at which MFO occurred (FatMax) was not different between groups (Lean: 0.30 +/- 0.02; Obese: 0.31 +/- 0.04; T2DM: 0.33 +/- 0.05 g/min). The intensity at which MFO occurred (FatMax) was not different between groups (Lean: 0.30 +/- 0.02; Obese: 0.31 +/- 0.04; T2DM: 0.33 +/- 0.05 g/min).

Discussion:
MFO and FatMax were similar between the groups. Prior studies have shown that trained subjects have a higher MFO compared to untrained and the relative workload where it occurred was higher (3). Thus, in significant contrast to our expectations MFO was not lower in T2DM
compared to obese and lean controls, despite a higher VO2 MAX in lean. A higher FatMax was expected in lean controls, but in fact a trend was seen here for the opposite, compared to T2DM.

Conclusion:
Surprisingly no difference was seen in MFO and FatMax between T2DM, obese and lean subjects.

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STRUCTURAL REMODELING OF HUMAN SKELETAL MUSCLE WITH CHRONIC UNLOADING

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Exposure to actual or simulated microgravity is known to lead to muscle atrophy and weakness. Recent evidence obtained in our laboratories on young men (n=18) undergoing chronic unloading shows that muscle atrophy involves rapid remodeling of muscle architecture. Indeed, vastus lateralis (VL) fibre fascicle length (Lf), assessed by ultrasound, was found to decrease by 5.5% after just 10 days of unilateral lower limb suspension (ULLS) and by 9% after 35 days of bedrest. This decrease in Lf, indicating a rapid loss of sarcomere in series, was associated with a concomitant decrease in concentration (-20%) and activity (-30%) of focal adhesion kinase (FAK, an integrin-associated phosphoprotein involved in mechanotransduction), measured on VL muscle biopsy samples obtained in the same individuals. Furthermore, using stable isotopes, we found that myofibrillar fractional rate of protein synthesis measured on the same biopsy samples dropped by 50% within 10 days of unloading. We conclude that sarcomere remodeling in response to unloading in humans, is a very fast process involving significant changes in cytoskeletal proteins involved in mechanotransduction. The results also suggest that countermeasures aimed at preventing muscle atrophy should start from the very early phases of the disuse period. Financial support of ASI (OSMA Bed Rest project) and ESA (ULLS study) is acknowledged.

THE EFFECTS OF AEROBIC TRAINING ON LEPTIN, CORTISOL AND SERUM TESTOSTERONE LEVELS IN OBESE AND LEAN MEN

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The purpose of this study was to determine the effects of aerobic training on leptin, cortisol and serum testosterone levels in obese and lean men. To this end healthy and volunteers men, who had 25 to 35 years old were asked to complete a questionnaire including individual characteristics, health history, amount of physical activity and smoking. Body mass index(BMI) were measured using the body composition analyzer and 40 untrained people were selected and divided in two groups: 20 people with 30 to 35 kg/m² BMI in obese group and 20 people with 16 to 18.5 kg/m² BMI in lean group.

To measure the leptin, cortisol and serum testosterone levels by the radioimmunoassay (RIA) method, blood samples were taken 2 days before starting of aerobic training program, prior to breakfast time. Both groups performed aerobic training program including running with 65-85% of individual maximum heart rate on treadmill in 2 months consecutives, 3 sessions a week, and 30 minutes per session. Then were taken blood samples 2 days after the end of training program and all the parameters in both groups were measured again. The analysis of data before and after aerobic training using T test particularly in correlated and independent groups showed that: There was significant decrease among weight (p<.001), BMI (p=.012) serum leptin(p<.001) and significant increase cortisol(p=.027) in obese group. Also was significant decrease among serum leptin (p=.004) and significant increase BMI (p=.008), and cortisol (p=.070) in lean group. Moreover the result of between obese and lean groups, indicated that serum leptin levels (p=.000), BMI (p<.001) and weight (p<.001) was significantly higher and serum testosterone (p=.009) were significantly reduced in obese group as compared to lean group.

Considering the results, it seem that aerobic training via alternating in some hormones including leptin, cortisol, and testosterone has an important role to regulation of body weight. Meanwhile probably there are different mechanisms which effects the regulation of body weight in obese and lean groups to response aerobic training.

References.

CHILDREN’S PARTICIPATION IN VOLUNTARY SPORT AS A PROTECTIVE MEASURE AGAINST OVERWEIGHT AND OBESITY

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Introduction
As the number of children who are overweight or obese grows, a variety of approaches, including ways to increase physical activity, are necessary to address the problem. Recent studies on children’s physical activity and children’s health have shown that children from low socioeconomic backgrounds are less likely to be sport active and more likely to become sedentary, overweight and socially excluded.

In a Danish 3 year intervention program the aim was to improve the physical activity level and welfare among sedentary 6-10 year old children in public after school day care institutions. The intervention included 2,500 children from 25 county districts on the island of Funen who were given the opportunity for participating in extra 2-4 hours of physical activity per week.

Methods
Base line (N=1,373) and end line (N=1,176) questionnaires with 6-10 year old children were filled out with the assistance of pedagogues. Questionnaire items included height, weight, sport participation and motivation for play and sporting activities and reasons for not playing or doing sports.

Results
Findings show that children who are not sport active in a sports club were one and a half times as likely to be overweight or obese (OR=1.48, CI (1.14,1.93) adjusted for age and sex). Results show that 15-20 % of sport active children are overweight or obese opposed to
20-30% of non-sport active children. Boys were less likely to be overweight and obese than girls. The inactive girls aged 6-7 showed significantly higher tendency to be overweight than the 8-9 year olds. The average percentages of overweight and obese were relatively stable throughout the intervention period (18.6% to 19.1%). The active children were also more likely to be using self transport such as biking or walking.

Discussion

Though findings indicate that the sport active children are less likely to be overweight and obese, it has not been sufficiently investigated whether it relates to the actually energy expenditure while doing sports in a sports club or the indirect effect of social inclusion. It may be hypothesised that the inactive children may find it harder to overcome social barriers and subsequently are unable to compensate for the lack of physical activity in other settings such as school breaks, school sport, self-organised physical activity or family activities.

COOLING DURING THE EXERCISE IN SPINAL CORD INJURED INDIVIDUALS: A PILOT STUDY

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Introduction

Individuals with spinal cord injury display impaired regulation of body temperature against warmth and cold, when compared to able-bodied individuals. Namely, the effectiveness of their thermoregulatory response corresponds to the location of injury and reflects the amount of nervous system preserved. Consequently, when exercising in warm environment, thermal imbalance and risk for heat injury are likely to occur earlier than in able-bodied individuals (Price 2006). Thus, it is suggested that external cooling applied during situations of thermal stress, e.g. exercise, could favour thermal balance and avoid such risk. This was under investigation in the present study, where external cooling was provided by a lightweight portable cooling garment (PCG).

Methods

A tetraplegic (TP), a high paraplegic (HP) and a low paraplegic (LP) participated in the study. Ambient conditions were set at 30°C and 80% relative humidity, with wind velocity of 6 m/s over a subject. The TP subject was asked to perform 15 minutes of wheelchair ergometry, while HP and LP subject were asked to perform 30 minutes. Subjects visited laboratory three times where: i) no cooling (control), ii) wearing PCG, without cooling (no-cooling) and iii) wearing PCG, with cooling (cooling) was applied. Trials began with five minutes warm up and, subsequently time trial exercise was performed. During trials body core temperature (Tc) and heart rate (HR) were continually monitored. Furthermore, thermal perception and thermal comfort were assessed after each five minutes. Body weight was noted before and after the exercise.

Results

At the end of the cooling trial, the increase of Tc in TP was 0.5°C lower than that observed in no-cooling trial, and 0.3°C lower than observed in the control trial. Furthermore, cooling in HP lowered the increase in Tc by 0.2°C when compared with no-cooling and by 0.4°C when compared with control trial. We did not obtain sufficient data for comparison in LP. On most occasions investigated, thermal perception and thermal comfort was promoted in cooling trial, when compared with control trial, but not always when compared with non-cooling trial. Furthermore, in HP increase in HR was lower when cooling was applied, but this was not the case in LP. Due to autonomic reflexes that occurred in TP, data on HR are not comparable. In all subjects, the body weight loss was the lowest after the cooling trial.

Conclusions

In TP and HP cooling slowed an increase of Tc and promoted unfavourable subjective thermal perception. Furthermore, it positively influenced body weight which is likely to result in promoted fluid balance. A positive effect of improved thermal balance was observed also on HR of HP, though not in LP, which might suggest the role of lesion level. Thus, it is suggested that cooling during the exercise favours thermal balance in individuals with spinal cord injury.

References


Oral presentations (OP)

OP-PS02 Psychology 2

THE TRANSITION OF YOUTH PLAYERS IN ELITE EUROPEAN FOOTBALL CLUBS: STRUCTURES, PHILOSOPHIES AND WORKING PRACTICES

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Introduction

Professional football clubs are enterprises looking for sportive and financial results. Clubs aspire to spend less but accumulate profit for long term sustainability. However, football is an expensive business. The increased commercialisation of the game alongside spiralling transfer fees has encouraged clubs to invest in youth development.

Objectives

This study forms part of a research project that explores the preparation and promotion of youth footballers to the professional environment in elite European football clubs. This paper explores the influence of a club’s organisational structure, philosophy and working practices in the transition of young players from the youth to professional environment.

Material and Methods

Face-to-face semi-structured interviews were conducted with the Head of Youth Development (or equivalent) within elite football clubs (n=26) across countries in Europe (n=5). Interviews were transcribed verbatim and analysed utilising the principles of content analysis (Biddle et al., 2001). Interviews were supplemented with additional information sourced directly from club administrators and club websites.

Results

Specific ‘development’ practices are not peculiar to, or a characteristic of, any one particular country. All clubs identified that the main objective of the youth department was to ‘produce players for the 1st Team’. Player’s personal development (i.e., social and academic)
and financial reward (i.e., received for players sold) were also identified as specific objectives. Only Swedish clubs presented a National orientation towards the development of players. All clubs tend to employ similar staff, but the operational roles of such staff often differ between both club and country. Such roles are dependent on the club’s overall philosophy of practice (i.e., typically guided by the club Chairman, President and/or Board). The communication process and proximity of the 1st Team and the youth department proved to be difficult.

Discussion and Conclusions

The secret of a successful youth development programme appears to be based on three aspects; stability, proximity and communication. Moreover, the apparent difficulty in communication between the 1st Team and the youth departments seem to contribute to dissatisfaction amongst the youth staff members and a subsequent lack of cohesiveness between youth and professional environments. Poor communication and incoherency is likely to hinder a successful player transition to the professional team.

Findings showed a high turnover of staff responsible for youth development and a lack of clearly defined roles and/or responsibility. The turnover of staff and a lack of clearly defined roles and/or responsibility between both club and country. Such roles are dependent on the club’s overall philosophy of practice (i.e., typically guided by the club Chairman, President and/or Board). The communication process and proximity of the 1st Team and the youth department proved to be difficult.

Moreover, the apparent difficulty in communication between the 1st Team and the youth departments seem to contribute to dissatisfaction amongst the youth staff members and a subsequent lack of cohesiveness between youth and professional environments. Poor communication and incoherency is likely to hinder a successful player transition to the professional team.

References

PEER MOTIVATIONAL CLIMATE IN YOUNG ATHLETES AND PERCEIVED AUTONOMY SUPPORT FROM ADULTS

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Previous research based on goal achievement theory has shown that perceived autonomy support from coaches among young athletes is related with perceived motivational climate (Sarrazin, et al., 2007). The effect of perceived autonomy support from significant others (e.g. parents) on motivational climate has remained unclear. The present study aimed to retest Peer MCYSQ questionnaire (Ntoumanis, & Vazou, 2005) in Estonian young athletes and to estimate how perceived autonomy support from the coaches and parents is related with dimensions of perceived peer motivational climate.

The perceptions of the peer motivational climate (Peer MCYSQ) were measured in 747 young athletes aged 12 to 18 years from different sport clubs in Estonia. Athletes’ perceptions of the autonomy-supportive behaviors exhibited by their coaches and perceived autonomy support from parents were assessed using the short version of the Sport Climate Questionnaire (SCQ). Structural equation modelling procedures were used. The goodness-of-fit indices that were used to test the adequacy of the 5-factor structure model of the Peer MCYSQ improvement, relatedness support, effort, intra-team competition and intra-team conflict supported, however, the 4-factor structure model. In the 4-factor model improvement and relatedness support scales entered into one factor. The fit indices of the structural equation model about the effect of perceived autonomy support from adults on peer perceived motivational climate were acceptable [NNFI = 0.98, CR = 0.98 and RMSEA = 0.04]. Perceived autonomy support from coach was positively related with improvement/relatedness and effort and negatively with intra-team conflict. Perceived autonomy support from parent was related with improvement/relatedness, effort and intra-team competition. Perceived autonomy support from coach influenced the peer motivational constructs like improvement/relatedness and effort more than perceived autonomy support from parent. Intra-team competition was affected by the perceived autonomy support from parent, whereas the intra-team conflict by the perceived autonomy support from coach.

From an applied perspective, these results highlighted beyond the role of the perceived autonomy support from coach also the perceived autonomy support from parent on peer motivational climate of young athletes.

References

CHANGES IN MENTAL DISTRESS IN PATIENTS WITH CHEMICAL DEPENDENCE FOLLOWING INDIVIDUALISED PHYSICAL TRAINING

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Physical training has been used in the treatment of chemical dependence for several decades, but the training is usually not adapted to the individual patient. This may be of importance, as the development of long-lasting, good training habits is easier to accomplish with a suitable training load, adapted to the individual. Thirty-six persons, seven females, who took part in a drug rehabilitation project, served as participants. Pre-post measurements comprised VO2peak, lactate profile, depression (Beck Depression Inventory, BDI), anxiety (Beck Anxiety Inventory, BAI), social phobia (Brief Social Phobia Scale, BSPS total), psychiatric symptoms (Symptom Checklist-90-R-Global Severity Index, SCL-90R-GSI) and alcoholism (Short Michigan Alcoholism Screening Test, SMAST). The duration of the intervention, median (inter-quartile range), was: 282 (114) days with training together with an assigned training partner who had taken a course in sport science and psychiatry. The training was conducted on a regular schedule, with a variety of activities adapted to the preference of the participants. Intensity zones were established based on the first lactate threshold test. VO2peak showed little improvement (mean ± SD: 4 ± 11%) and the lactate threshold performance increased moderately (11 ± 15%). Participants who increased their VO2peak (n=25) also showed improvements in terms of moderate to large effect size (95%CI on BDI: 0.81 (0.22-1.38), BAI: 0.82 (0.22-1.39), BSPS total: 0.73 (0.15-1.29), and SCL-90R-GSI: 0.96 (0.35-1.53). Participants who had unchanged or decreased VO2peak (n=11) showed improvements in terms of effect sizes of small magnitude (<0.28) on BDI, BAI and SCL-90R-GSI. On BSPS total, this group worsened, shown by a negative effect size of -0.41 to -1.25. The results suggest that improvement of physical capacity is necessary for improving mental health.

PRELIMINARY VALIDATION WITH ELDERLY PEOPLE OF THE PORTUGUESE SHORT CLINICAL VERSION OF THE PHYSICAL SELF-PERCEPTION PROFILE

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The PSPP (Fox & Corbin, 1989) is one of the most widely used instruments to assess self-perceptions in the physical domain and several studies have confirmed the hypothesized hierarchical three-level organization. Four sub-domains contribute to a super-ordinate construct, termed physical self-worth (PSW), which in turn produces moderately strong relationships with global self-esteem. The 30-item PSPP is often seen as too long for use as an outcome measure in clinical studies and omits some sub-domains of self-perception that may be important for elderly groups or those with infirmity. Recent work was published with an English language 18-item short clinical version the PSPP-SC. This showed good factors structure and reliability with an elderly population (Fox et al., 2006). The purpose of this study was to provide preliminary evidence of reliability and validity of a new Portuguese version - the PSPP-SC, under development with elderly groups. The participants were elderly people (N=657) from central Portugal. Two samples were used. Sample A (n=257) were 184 females (74 69±6.7) yrs and 73 males (75 12±6.6 yrs) attending different Social Service and Welfare institutions and local clubs with exercise programmes for elderly groups. Sample B subjects (n=400) were 200 females (74 14±7.4 yrs) and 200 females (74 21±7 yrs) also attending similar programmes. EFA (with varimax rotation) was used in Sample A participants to establish the independence and integrity of the proposed five sub-domain scales. The results of the exploratory factor analysis conducted by gender revealed five factors that explained a total of 66.75% of the variance for female and 75.74% for male Portuguese elderly people among the sub-items. However, several cross-loadings were found between factors. The Physical Function, Physical Health and Attractive Body sub-scales showed good internal consistency with coefficient Cronbach alpha values of 76, 63 and 70 for females and 77, 77 and 70 for males. The Sport Competence and Strength subscales presented the lowest levels of internal consistency with alpha values of .50 and .45 for females and 48 and .52 for males. A CFA was run with sample B subjects to confirm the goodness of fit for the original model in both groups. CFI, GFI
and AGFI ranged from .88 to .90 in females and from .74 to .83 in males. SRMR values were .057 for females and .089 for males. Portuguese data did not replicate the psychometric integrity of the PSPP-SC and did not support the widespread use of this version of the instrument in Portuguese elderly groups. The analyses indicated that Physical Function was clearly defined both in female and male groups while Attractive Body was defined in the female group. This may be due to the salience of these sub-domains for the lives and autonomy of Portuguese elderly people. Physical Health, Physical Strength and Physical Competence have some items which do not load adequately and require further attention.

Oral presentations (OP)

OP-TT03 Training and Testing 3

VALIDATION OF THE OXYCON MOBILE PORTABLE ERGOSPIROMETRIC DEVICE DURING INCREMENTAL MAXIMAL EXERCISE TEST

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Introduction
The portable breath-by-breath system Oxycon Mobile® (OM) records parameters such as VE, VO2 and VCO2, and has been validated against the Oxycon Pro® (Perret et al, 2006), but to our knowledge not against the gold standard Douglas Bag (DB). The purpose of this study was to test the validity of the OM against the DB, during a maximal incremental exercise test.

Methods/Instruments
Twelve well-trained healthy male subjects (Age 22 ± 1 y; VO2max 4.08 ± 0.59 l/min) completed an incremental test on an electromagnetically braked cycle ergometer (Lode Excalibur Sport, Groningen, the Netherlands) in an air conditioned laboratory with constant environmental conditions (temperature 21 °C, humidity between 50 % and 60 %).

The test protocol started at 95 Watt and was increased by 35 Watt every 5 minutes until volitional exhaustion. After 3 minutes in each step the OM was disconnected and a DB (Relitech, the Netherlands) was filled with air during 30 seconds to 1 minute (depending on the ventilation).

Results
Compared to the DB the OM showed significantly higher values for the VE at 200 Watt (P < .05) and for the VO2 at 95 W (P < .05) during the incremental exercise test. No significant differences for the VCO2 were found. High correlations were found between the values of the DB and OM (VE: P < .001, r² 0.956; VO2: P < .001, r² 0.977; VCO2 P < .001, r² 0.971). Bland and Altman analysis of validity demonstrated minimal bias and low standard deviations.

Discussion/Conclusion
We used the DB method as the reference system. Still it is important to notice that the DB technique is not without problems (such as diffusion of gases through the bag, and gas remaining trapped inside the bag, especially in the rigged neck area). Modern systems also have their problems and one of the greatest problems, especially in breath-by-breath systems, is the exact alignment of the gas flows with gas analysis (Macfarlane, 2001).

A comparison of measurements between two devices is most accurately when they are placed in series. In this study we did not place the devices in series because of the mobile features of the OM. Unlike the DB method, this portable breath-by-breath system can be used for accurate and continuous determination of ventilatory variables during exercise.

References.

VALIDITY OF A RESPIRATORY SNORKEL FOR DETERMINATION OF OXYGEN UPTAKE KINETICS IN SWIMMING

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In pursuit of direct measurement of cardio-respiratory parameters in swimming Toussaint et al. (1987) developed a respiratory and vegetable system that was shown to be valid and to only slightly increase the hydrodynamic drag. The more recent version of this respiratory snorkel (RS) (Aquatrainer, Cosmed, Roma, Italy) connected to a breath-by-breath (BxB) gas analyser (K4b2, Cosmed, Roma, Italy) was evaluated by Rodriguez et al (2008). It was reported that although the Fi O2 was significantly larger when measured with the RS, there were no significant differences in VO2 and VCO2 between the RS and a mechanical gas exchange simulation system. However, in what concerns oxygen uptake kinetics, the use of the RS has not yet been evaluated.

The purpose of this study was to compare the parameters of the VO2 kinetics in constant-power exercise, using a conventional face mask (CM) or a respiratory snorkel (IRI) designed for breath-by-breath analysis in swimming. Ten trained triathletes (29.3±8.3 yrs, 67.5±7.3 kg, 177.2±6.9 cm) performed two testing sessions involving an incremental test to exhaustion for determination of VO2max and Ventilatory Threshold (VT1) and two 8-min constant load exercise at 25% [= VT1 + 0.25 x (VO2max - VT1)] in each condition. The VO2 kinetics parameters ηd1, ηa1, A1, ηd2, ηa2, A2, i.e. time delay, time constant and amplitude of the primary phase and slow component, respectively) were modelled with two exponential functions (Borraní 2001), which also incorporated the determination of an individual snorkel delay (ISD) in the case of the RS tests. This time was calculated as the difference between the start of the exercise and the time when the following breaths summed a tidal volume superior to the outlet tube volume, therefore making the VO2 data to be exercise representative. Only ηd1 was significantly different between RS and CM (13.80±1.77 and 8.95±2.99 s, respectively) due to the delay introduced by tube’s volume. Otherwise, the variability of the primary phase parameters was not different between RS and CM.
In conclusion, direct measurement of VO2 in swimming for estimating VO2 kinetics is appropriate and comparable to terrestrial activities (i.e., running, cycling), as long as a suitable numerical method is used to model the data, since the use of a respiratory snorkel does not interfere with the kinetic parameters obtained in heavy intensity constant load exercise.

References.

TIME COURSE OF ADAPTIVE RESPONSES TO ONE YEAR OF AEROBIC ENDURANCE TRAINING
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Purpose: Only limited information is available about the time course of adaptive responses to an aerobic endurance training program during the first year after its onset. Long-term studies observed training regimens which were not suitable for health maintenance and promotion, i.e. exercise intensities and volumes were too high or increased markedly over time. Therefore, the magnitude and the time course of adaptive responses to one year of aerobic endurance training with a constant heart rate (HR) prescription was investigated in this study.

Methods: Eighteen previously untrained subjects (42 ± 5 years, BMI: 24.3 ± 2.5 kg/m², maximal oxygen uptake (VO2max): 37.7 ± 4.6 ml/min/kg) completed a one-year walking or jogging program 45 min/day/3 days/week at 60% of their pre-training HR reserve. Training data were recorded in training HR monitors to assess compliance compared to actual training intensity of HR and gas exchange variables. HR and gas exchange variables were conducted prior to the training program and after 3, 6, 9, and 12 months of training. Additionally, submaximal 4-stage tests (only simultaneous HR measurements) were performed on an indoor track every 2 weeks during the first 3 months and once a month in the remaining time. Results: Subjects trained on average of 48 ± 2 min/day on 2.8 ± 0.2 days/week and compliance was not different during the 4 periods between the treadmill tests (p > 0.13). Mean blood lactate concentration during the training sessions decreased significantly from 1.37 ± 0.18 mmol/l in the 11th week to 1.15 ± 0.24 mmol/l in the 47th week (p < 0.01). After 12 months, VO2max increased by 5.7 ± 4.1 ml/min/kg (p < 0.001). After 3, 6, and 9 months, 58, 75, and 84% of the total increase were reached, respectively. Resting HR was observed to decrease by 9 ± 6 /min (p < 0.001) after 12 months, and 47 and 100% of this change had occurred after 3 and 6 months, respectively. During the study, HR on submaximal stages of the treadmill test decreased by 11 ± 7 /min on average (p < 0.001). After 3 and 6 months 93 and 100% of this change were observed, respectively. The submaximal 4-stage tests revealed that submaximal HR did not change significantly beyond the 9th week of training (p > 0.59). Conclusions: Beginners in recreational endurance training are advised to increase their training stimulus after 6 months because all chosen descriptors of endurance capacity showed at least 75% of their one-year-changes within this period of time. It cannot be decided from this study whether an increase in intensity or in the volume of training is preferable. When planning future endurance training studies in untrained subjects it should be taken into account that resting and exercise HR might reflect endurance changes during the first weeks of training only whereas VO2max remains responsive after several months.

MOTION CHARACTERISTICS ACCORDING TO PLAYING POSITION IN INTERNATIONAL MEN'S TEAM HANDBALL
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Introduction:
Supported by fundamental rule changes the dynamics in international men's team handball have increased during the last decade. Recent data on running profiles of international top level players are not available. Therefore, this paper provides a large scale study into analysing motion characteristics of world class team handball players during international competition.

Methods:
About 170 players were monitored with cameras from the top of the sport halls during nine games of the 2007 Men's World Cup in Germany using a computer based match analysis system (SAGIT, University of Ljubljana, Slovenia). The system is validated for handball, basketball and squash. The recorded player trajectories delivered information about total distances covered and individual motion velocities of the players. By defining four categories of intensity (walking: 0 - 1.5 m/s, slow running: 1.6 - 4.0 m/s, fast running: 4.1 - 6.0 m/s, and sprinting: > 6 m/s), we were able to analyse a differentiated motion profile according to player position.

Results:
Mean time of player's action was 32.11 ± 15.34 min. Wing players (37.37 ± 2.37 min) and goalkeepers (37.11 ± 3.28 min) had significantly higher shares (p < 0.05) of playing time than backcourt players (29.16 ± 1.70 min) and pivot players (29.37 ± 2.70 min). Mean distance of the players. By defining four categories of intensity (walking: 0 - 1.5 m/s, slow running: 1.6 - 4.0 m/s, fast running: 4.1 - 6.0 m/s, and sprinting: > 6 m/s), we were able to analyse a differentiated motion profile according to player position.

Discussion:
The results clearly indicate position-specific differences in mean playing time, total distance covered and run intensity profiles in international top level men's handball. These differences should lead to position-specific training loads not only concerning tactical and technical training, but also concerning endurance and sprint training.

The study has been sponsored by the Bundesinstitut für Sportwissenschaft, Bonn: 01A1-071601/07.
INFLUENCE OF INSPIRATION, EXPIRATION AND APNOEA ON ISOMETRIC STRENGTH EXPRESSION AND EMG ACTIVITY DURING QUADRICEPS MAXIMAL VOLUNTARY CONTRACTIONS

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In technical sport literature (1,2), several textbooks generally correlate respiratory phases with maximal strength expression. Even if there is a paucity of researches on this topic, textbooks underline that during apnoea athletes have the highest muscular strength value. The expiration phase has intermediate values. Aim of the study was to investigate the influence of Apnoea (A), Expiration (E) and Inspiration (I) on quadriceps EMG activity and strength expression during a Maximal Voluntary Contraction. 12 students were involved in the study. They were asked to perform 3 days a week 18 MVC divided in 3 sets as follow: 6 maximal isometric repetitions in Apnoea, 6 in inspiration and 6 in expiration. Each contraction was maintained for 3 seconds and was followed by 27 seconds rest. A recovery period of 4 minutes between sets was selected. After two weeks of training, each subject performed in 3 different days 18 quadriceps MVCs starting with sequence I, A, E the first day, sequence A, E, I the second day and sequence E, I, A the last day. Time duration of the isometric contractions and recovery time within and between sets were the same of the training period. Quadriceps isometric force was recorded by means of a load cell while surface EMG activity with a Muscle Lab® 4100e (Europe Ergotest, Boscossystem srl, Italy). Muscles analyzed were: vastus medialis (VM), vastus lateralis (VL) and rectus femoris (RF) of both legs. The means of rmsEMG of each repetition for each respiratory phase was calculated and then the mean of the means was obtained. The peak and average force obtained from the load cell were also compared in the three respiratory conditions. Analysis of variance showed that rmsEMG of VM and VL was significantly lower during Inspiration than during Expiration and Apnoea. Strength values showed no significant differences for mean and peak values.

Results indicate that exercises in like leg extension, where trunk muscles are not directly involved, different respiratory phases do not influence maximal isometric strength even if small but significant differences in rmsEMG were recorded. Further investigations on more complex exercises with muscles trunk involvement such as for example back squats are necessary to better explain the present data.

References.

MOMENT-LENGTH PROPERTIES OF ATHLETE’S QUADRICEPS AND HAMSTRING MUSCLES AFTER ANGLE AND RANGE SPECIFIC EXERCISE

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Muscular force and power production at specific joint angles are main determinants of athletic performance (1). Evidence exists that length-dependent force generation capacities of the M. quadriceps femoris (QF) and hamstring muscles (HAM) are not a constant property, but can adapt to functional requirements (2,3). However, a recent study failed to demonstrate that athletes with specific loading schemes of the QF show differences in the moment-knee angle relation of the QF (1). The purpose of this study was to investigate if different modes of angle and range specific strength training cause medio-lateral shifts in (i) isometric moment-knee angle relations and (ii) concentric power-load curves of QF and HAM.

N = 32 young athletes participated in a controlled nine weeks strength training period for QF and HAM. Week six of the training period was used for testing and no training was conducted. Subjects were randomly divided into three different training groups (G1-3): G1 performed knee angle specific cyclic (hold and relax) isometric training at long muscle-tendon unit (MTU) lengths. G2 conducted explosive concentric-eccentric training cycles that were restricted to the ascending part of the moment-knee angle relation of both muscles. G3 spent half of their training sessions with the isometric and half with the dynamic protocol. Isometric moment-and EMG-knee angle relations and power-load curves during maximal voluntary concentric actions with loads corresponding to 40%, 60% and 80% of 1 RPM were measured for QF and HAM at five different occasions: two times before start of the training period, after five and eight weeks of training and four weeks after the end of training. To investigate possible adaptations in length-dependent force generation capacities, moments, power values and EMG-data of each subject were normalized to the largest value produced at any knee joint position (% Max.). A second order polynomial curve fitting approach of the normalized moment and power values of each subject was used to determine the optimal knee joint angle for moment and power production.

G1-3 showed an increased potential in the ascending part of the moment-knee angle relation of QF in response to the training period. With only minor differences among G1-3, the optimal knee joint angle for QF-moment production was shifted about 6-9° in the direction of longer MTU lengths. The optimal knee joint angle for HAM-moment production was shifted about 3-4° in the direction of longer MTU lengths in G1 and G3, but remained rather constant in G2. For all testing loads, no medio-lateral shifts in knee angle-dependent power-load curves of QF and HAM were detected for any training group. These results provide evidence for training-induced medio-lateral shifts of isometric moment-joint angle relations, but question the transfer to explosive concentric muscle actions.

References.
2) Savelberg & Meijer [2]
Invited symposia (IS)

IS-BN05 Talent: identification and promotion

DERIVING THREE-DIMENSIONAL FORCES AND TORQUES IN SWIMMING

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Forces and torques changing the motion of humans performing sport skills can be transduced directly or can be derived from kinematic data. Measuring forces and torques acting on free swimmers directly, and in a manner that doesn’t affect the performance, is complicated by the swimming movement at the interface of two fluids, air and water, rather than being in contact with a solid supporting surface. The purpose of this presentation is to describe methods by which net three-dimensional (3D) forces and torques acting on swimmers can be derived from digitised position-time data and to provide examples of how those methods can yield original insights into swimming performance. Prior to the presentation of original and interesting findings the methods will be briefly outlined. These include the marking of swimmers to define a full segmented body model; obtaining body segment parameter data including segment masses and centre of mass locations relative to segment endpoints, and segment moments of inertia using the ‘Elliptical Zone’ method; calibrating the 3D space; simultaneous recording by multiple under water and above water cameras; transformation of the calibration and body markers digitised from each camera into 3D position-time data using the direct linear transformation (DLT) technique; and calculation of the net force components and torques about the three principal axes using a bespoke MATLAB program. The methods enable fresh insights into the mechanisms of propulsion in swimming, the contributions to body roll, and the influences of the forces and torques on the timing and rhythms of the swimmers’ linear and rotational motions.

COMPUTATIONAL FLUID DYNAMICS: A FUNDAMENTAL TOOL FOR SWIMMING RESEARCH

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Introduction
Swimming hydrodynamics has been studied since long with experimental tests and recently with numerical techniques using Computational Fluid Dynamics (CFD) models (e.g. Silva et al., 2008). The aim of this work was to present the already applied CFD techniques and to suggest new procedures that may be used by the research community in further studies under similar research topics.

Methods
The CFD methodology consists of a mathematical model applied to the fluid flow in a given domain that replaces the Navier-Stokes equations with discretized algebraic expressions and solved by iterative calculations. This domain consists of a grid or mesh of cells that simulate the fluid flow around physical structures. The boundary conditions were considered and implemented in the CFD commercial code Fluent®. In order to be able to simulate the fluid flow, models of the human body were used. Whole body human models were used to analyse the hydrodynamic drag while the hand and forearm models were used to analyse the upper arm propulsion during swimming.

Results
Regarding the studies involving the hydrodynamic drag it was found that: (i) in a drafting situation the drag of the back swimmer increased with the distance between swimmers and at a 0.50 m distance the drag of the back swimmer was around 50% of that of the front swimmer; (ii) during the gliding after the starts and turns, the position with the arms extended at the front presented lower values of hydrodynamic drag (60%) than the position with the arms along the trunk.

Regarding the upper arm propulsion, it was found that: (i) the hand/forearm drag was the coefficient that accounts more for propulsion; (ii) the coefficient of lift seemed to play a residual influence in the generation of propulsive force by the hand/forearm segment at angles of pitch of 0º and 90º, but it is important with an angle of pitch of 45º; (iii) under the accelerated flow conditions the hand/forearm models presented higher values of drag and lift coefficients than under the steady flow conditions.

Conclusion
The recent evidence suggests that the CFD technique can be considered an interesting new approach for hydrodynamic forces calculation in swimming, providing valuable considerations for defining new swimming techniques and other flow fields.

References.

Acknowledgments
This work was supported by the Portuguese Government by a grant of the Science and Technology Foundation (POCTI/DES/58872/2004, SFRH/BD/25241/2005).

LACTATE CHARACTERISTICS IN CYCLISTS OF DIFFERENT AGE AFTER MAXIMAL CYCLING EFFORT

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Introduction
Several studies show that, in terms of maximal lactate concentration, children have a lower anaerobic capacity than adolescents and adults. The higher absolute maximal blood lactate values of youth and adults are taken to confirm this statement. Studies investigating athletes of different ages only compared maximal lactate values. In this study the time course of blood lactate after a maximal cycling test was measured, furthermore all subjects had a common training situation, so that they are highly comparable.

Methods
10 boys (13±0.9years) and 13 male adolescents (17.2±0.9years) participated in the study.
The subjects performed a 30 sec lasting maximal sprint test on a cycle ergometer. The cycle ergometer was adjusted to an isokinetic mode regulating the cadence to 120 rpm. The subjects were instructed to perform the test only in a sitting position on the ergometer.

Blood samples were taken pre, 0min, 1min, until the 10th min, every minute to determine lactate concentrations in whole blood. After the test, the subjects recovered ten minutes passive in a sedentary position, to keep lactate elimination as low as possible.

Results

The adolescent group had a significant higher mean Peak Power (PP) in the 30 sec trial than the boys (976.1±101.5 Watt [W] vs. 600.3±168.0 W). The relative PP (relPP) reached by the adolescents (14.0±4 W/kg) was also significantly higher compared with the boys (relPP 11.4±1.8 W/kg).

During the 30sec a mean power output of 445.4±104.0 W was reached by the boys and 697.4±62.6 W by the adolescents. The relative mean power reached by the adolescents was 10.0±0.7 W/kg bodyweight and the boys reached 8.5±1.2 W/kg bodyweight.

The adolescent group reached a significant higher peak lactate level of 11.5±1.5 mmol/l in the 6th minute of recovery. The boys reached their peak lactate level of 9.4±1.0 mmol/l in the 4th minute. In contrast to the absolute lactate values, rel. lactate values were significantly higher for the boys. The values were 0.18±0.02 mmol/l/kg for the boys and 0.16±0.02 mmol/l/kg for the adolescents.

Discussion

Adolescents reached higher absolute lactate values, but related to the bodyweight, boys even showed significant higher lactate values, which might be hint for similar anaerobic energy production.


Comparing the PP of the two groups, the adolescents achieved a significantly higher meanPP, a significantly higher relPP and a significantly higher mean power output over the 30sec than the boys. This is likely due to the more limited ability of younger athletes to recruit and use higher-hierarchy motor units.

Invited symposia (IS)

IS-PM06 ACSM Exchange Symposium. Clinical sports medicine - pre-participation screening

CURRENT STATUS OF THE PRE-PARTICIPATION EVALUATION IN THE USA

Dexter, W.

Maine Medical Center, United States

This talk (American College of Sports Medicine Exchange Lecture) will review the current status and trends in the pre-participation evaluation of athletes in the USA. The most recent changes in the Pre-participation Evaluation Monograph (fourth edition in press) will be discussed including the controversy surrounding decisions regarding the use of routine cardiovascular tests in screening.

PREPARTICIPATION EXAMINATION: A NEED FOR UNIFORMITY

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Vrije Universiteit Brussel, Belgium

The preparticipation physical exam (PPE) is a very important aspect for the care and safety of active and athletic individuals. Objectives of the evaluation include the discovery of conditions that may be life-threatening or disabling, that may limit participation, or that predispose to injury. The exam is not designed to exclude individuals from participation, but rather to assist athletes in safe participation. The preparticipation examination includes taking a proper history, performing the physical examination, and ordering appropriate laboratory tests. Athletes with medical illnesses can be directed to the sports activities that are best and safest for them. Although the preparticipation exam should not substitute for the individual’s regular routine health care, it is often the only exposure many of athletes have to a physician, and therefore offers a unique opportunity for health care evaluation and screening.

One can question if there is available evidence establishing the validity of the preparticipation evaluation as a method for screening health risk prior to participation in exercise and sport. Specific emphasis will be placed on reviewing original research evaluating methods to screen participants for risk of sudden cardiovascular death. The majority of the literature on the PPE consists of type III evidence-case-based opinion papers and position papers from respected authors and sports medicine societies and reports of expert committees. The format of the PPE is not always standardized and does not consistently address the recommendations for cardiovascular screening history and physical exams. A variety of health care professionals, some without proper training, administer the PPE.

A PPE is required by most sport organizations, but research as to its effectiveness is very limited. PPEs have been mandatory in Italy for many years, and we can draw on some of the data recorded over this time. Otherwise, very few studies have been performed on the PPE process. The research available indicates that the PPE is not implemented adequately or uniformly. An opportunity exists to create a standardized, validated PPE that meets medical standards for quality and provides sensitive, specific screening of potential participants in sport and exercise.
PERFORMANCE TRENDS AND PACING IN ELITE TRIATHLON

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University of Westminster, Trainerbildung Swiss Olympic, United Kingdom

This presentation first provides an overview of the evolution of performance in Elite Triathlon by comparing the relationships between overall performance times in each discipline, finishing position, and world ranking, over the consecutive ITU World Cup races within each of the qualification cycles for the Sydney 2000, Athens 2004 (Vleck, Grubb and Bentley, 2002) and Beijing 2008 Olympic Games Triathlons. The trends in pacing of the top vs. bottom placed finishers within the swimming, cycling and running sections of a specified ITU World Cup triathlon (Lausanne, Switzerland), for which the race course (Vleck et al., 2006) remained identical over consecutive years within the period 2001-2004, are then described.

The extent to which the relationships between pacing and performance in elite triathlon are further influenced by 'field composition' (Vleck et al., 2001-2004) are then described. An examination of the extent to which the above relationships may be influenced by or affect the 'performance power' of the athletes who are involved, both for the above ITU cup event location and the Beijing course, is then presented.

Finally, the above results are placed into context with the current state of knowledge (Millet et al., 2007) as regards what constitutes 'competitively significant performance' (Hopkins and Paton, 1999), and the mechanisms of fatigue (Abbiss and Laursen, 2005) in, Elite triathlon. Selected areas where additional research appears to be needed are identified.

References.

TRAINING AND COMPETING IN TRIATHLON: WHAT CAN SCIENTISTS TELL COACHES?

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The relationship between the scientific investigation and the evolution of the sport of triathlon have be reciprocally influenced. Scientific areas are related to changes in sporting rules, whereas science can use this sport as a model for general investigations (e.g. cardiac function, hypertratema, cross-training, underperformance syndrome) or as a specific area per se (e.g. wetsuit, drafting, transitions, pacing) where scientists can generate analyses of specific use for coaches and athletes (Millet et al 2007) First, by comparing physiological variables as maximal oxygen consumption (VO2max), anaerobic threshold, VO2 kinetics, heart rate, economy or delta efficiency measured in cycling and running in triathletes, runners or cyclists, scientists can identify the effects of exercise modality on the underlying mechanisms (e.g. ventilatory responses, blood flow, muscle oxidative capacity, peripheral innervations, neuromuscular fatigue) of adaptation (Millet et al 2008). Most of these information are still missing in swimming. Second, by quantifying training loads and investigating the cross-training effects between swimming, cycling and running (Millet et al 2002), scientists can help coaches to better design the overall content of their training program. Thirdly, by suggesting innovative methods of intermittent or interval-training based on the individual characteristics of the triathletes (e.g. VO2 kinetics), scientists give tools to coaches for optimizing their sessions in the three sports (Millet et al 2003). Fourthly, by analyzing the effects of swimming or cycling modalities on subsequent physiological/performance responses, scientists help to better design brick-training sessions specific to triathlon (Bentley et al 2007). Fifthly, by designing specific testing protocols to assess specific physiological profiles in triathletes, scientists provide relevant information to coaches on the changes in physiological characteristics of their athletes and therefore in the efficiency on their training program (Millet and Bentley 2004). Sixthly, by analyzing the responses (speed, power output..) during elite competitions, scientists help coaches to better design sessions, especially during the final preparation phase for a given competition (Vleck et al 2007).

To conclude, scientists can support coaches in better measuring, analyzing, and prescribing/individualizing/optimizing training content. However, the concept of scientific training is a misconception since the coach has to integrate parameters that are much more complex and beyond the scientific analysis.

References.

STANDARDISED PHYSIOLOGICAL TESTING IN ELITE TRIATHLON: MAJOR CONCERNS AND COMMONLY USED METHODOLOGIES

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Elite Olympic Distance (OD) triathlon consists of a 1.5km swim, 40km cycle and 10km run performed in sequential order. Elite triathletes will complete a typical OD triathlon in 100-130 minutes. Due to the nature of OD triathlon, the event is predominantly suited to aerobically gifted athletes, highly trained in all 3 disciplines and the physiological tests used in OD triathlon are a reflection of this. Any sporting performance is the outcome of an extremely complex interaction of multiple physiological systems which may be influenced by nutritional status, cognitive ability, motivation, aerobic fitness and anaerobic reserved. In comparison to a performance trial, standardised physiological tests aim to quantify the underlying change in ideally one, or more usually, several aspects of an athlete's physiology. A well-developed test will provide athletes and coaches with information of practical
significant, assisting in training prescription and detailing an athlete's progression, irrespective of training-induced fatigue, life stresses, etc. Similar to all scientific methods, standardised physiological testing in elite sport is susceptible to two major pitfalls: validity and typical error of measurement (TE). It is vital these concepts are considered and understood.

Validity can be described as how well a test predicts, describes or explains the variable you are trying to measure. Validity is the most important consideration when developing or utilising a test protocol. The TE is the intra-individual variability and allows quantification of the reliability of a measurement, which includes both biological and technical variation. TE provides information on the 'noise' of a test and, for interpretation, it is imperative that researchers consider the magnitude of their 'signal' in relation to the 'noise'.

All testing procedures should be clearly explained, replicated carefully and adhere to strict standards for environmental conditions, and equipment selection, calibration and maintenance.

The most commonly used physiological tests for elite triathlon are incremental tests, designed to investigate an athlete's physiological capability at a range of workloads. These tests can be conducted exclusively over submaximal workloads, or extended until volitional exhaustion. Elite triathlon performance has been shown to be highly correlated with both maximal and submaximal laboratory measures (2). At a minimum, most testing procedures will monitor heart rate, [blood lactate], and a subjective rating of exertion at the conclusion of each workload. Cycling and running protocols often measure the metabolic cost of each workload by monitoring O2 consumption and CO2 production.

Refinement of physiological tests will allow greater differentiation of the components of each major physiological system and mechanisms responsible for detected changes. References:

Oral presentations (OP)

OP-HF04 Health and Fitness 4 - Disease

PEAK FORCE IN FAMILIAL AMILIOIDOTIC POLINEUROPATHY

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Introduction. Familial Amyloidotic Polineuropathy (FAP) is a neurodegenerative disease related with systemic deposition of amyloid fibres mainly at the level of the peripheral nervous system. Clinically, the disease is characterized by an autonomous sensitive-motor neuropathy, beginning nearly always in foot, and subsequently involving the hands. Until now, the unique treatment for FAP disease is a liver transplant with aggressive medication to muscle metabolism and force production. To our knowledge, there are no quantitative characterizations of peak force levels in these patients or comparisons with healthy people. This knowledge will be extremely important to check the clinical and functional evolution of this disease.

Purpose. The purpose of this study was to compare the levels of hand grip strength (peak force) in FAP patients with (FAPT) or without (FAPNT) liver transplant and in a healthy group (HG).

Methods and Material. One hundred and one subjects where assigned to 3 groups: 57 (35 male, 22 female) patients FAPT (age, 34.9+/−8.2 years); 23 (9 male, 14 female) patients FAPNT (age, 34.2+/−8.3 years); and 21 (9 male, 12 female) HG (age, 33.6+/−8.4 years). Peak force levels in these patients or comparisons with healthy people. This knowledge will be extremely important to check the clinical and functional evolution of this disease.

Results. When comparing the 3 groups, no differences in age were found. However, significant differences (p<0.05), were found between groups, FAPT, FAPNT and HG for BMI (21.1+/−3.5, 22.9+/−5.4, 23.9+/−2.7 respectively), peak force on right hand (29.5+/−11.3, 31.2+/−13, 42.7+/−12.8 kg respectively) and left hand (28.2+/−11.5, 28.3+/−11.7, 37.9+/−11.7 kg respectively), and in classification norms according ACSM (3.8+/−0.7, 3.6+/−0.9, 2.3+/−1.3 respectively). Negative correlations between age and peak force were found in both hands for FAPNT (r=-0.513 p<0.05) and FAPT (r=-0.433 P<0.05), but not for the HG. A positive correlation between BMI and peak force in both hands for group FAPNT (r=0.643 p<0.05) was observed, but not in FAPT and HG. Furthermore, a positive correlation between age and BMI for FAPT group (r=0.270 p<0.05) was found, but not FAPNT or HG. When comparing peak forces between males and females in each group, significant higher values were observed (p<0.05) in males, but these differences seem to disappear in the grip strength norms according ACSM.

Conclusions. According our results and as expected, the FAP patients had lower values for peak force than healthy subjects, and consequently a worse classification in ACSM norms. For FAP patients it seems also that grip strength is more affected by age and BMI than for the HG. These results suggest also improvements in strength after liver transplantation.

ASSESSMENT IN PHYSICAL FUNCTIONAL FITNESS IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE

Pereira, A., Santa-Clara, H., Pereira, E., Simões, S., Carrão, L., Baptista, F., Pereira, C., Remédios, I., Cabri, J.
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Introduction. Chronic Obstructive Pulmonary Disease (COPD) is a chronic lung disease characterized by a progressive airflow limitation that is not fully reversible, and by an abnormal chronic inflammatory response of the airways. The main symptoms are dyspnea and impaired exercise capacity, which lead to progressive disability, poor health status and clinically relevant systemic effects at skeletal muscle, cardiovascular, neurologic, psychological level and endocrine system dysfunction. This pathology is being recognized a major and growing health problem worldwide, affecting particularly people over 60 years old.

Objectives. The purpose of this study was to identify differences in physical status and exercise capacity, between healthy subjects and COPD patients in the afore mentioned segment of age. Methods and Material. Forty-seven men with moderate COPD (FEV1 49.±±10.2%), age 66±4 yrs, weight, 73.9±11 kg, height, 168±6.7 cm, constituted the COPD group (COPD) and 110 healthy subjects (healthy group HG) age, 67.7±4 yrs; weight, 77.9±12.4 kg, height, 167,0±6,4 cm, were included. The physical parameters assessed were strength, aerobic
endurance, flexibility and agility/balance, by the Furlerton’s functional fitness tests. For upper body strength maximal amount of weighted arm curls was measured, for lower body strength the maximal amount of chair-ups were registered. Aerobic endurance was measured as the maximal distance covered in 6 minutes (6-min walk test). Upper body flexibility was assessed by back-scratch and lower body flexibility was assessed by sit-and-reach test. For testing agility/balance, an 8-foot up-and-go test was used.

Results. The values of the functional fitness test were significantly different (p<0.05) between COPDG and HG groups for the following variables: body mass index, 23.9±3 vs 27.7±4.1 kg/m2, 30-second stool chair times, arm curl 14.6±2.9 vs 18.8±4.9 time, 6-minute walk 502.9±70 vs. 594.4±92.4 m, 8-foot up-and-go 4.5±0.6 vs. 5.1±1 sec, chair sit-and-reach 0.79±1.02 vs. -8.1±10.9 cm respectively and no differences were observed for the back scratch test (DPOCG, -9.1±10.4 cm and HG, -12.0±11.9 cm).

Conclusions. COPD patients have lower physical functional ability than healthy subjects, which may promote a declining cycle including physical inactivity, impairment dyspnea and deconditioning, leading to disease progression, and, consequently to disability, poor health-related quality of life and premature mortality.

LEVELS, PATTERNS AND DETERMINANTS OF PHYSICAL ACTIVITY IN CHILDREN AND ADOLESCENTS WITH CONGENITAL HEART DISEASE

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Children and the adolescents are usually seen as the healthiest elements of the population. Their health needs are usually preventive in character. However, for a certain segment of the youth population reality proves to be different. Children and adolescents with congenital heart disease (CHD) are many times kept from engaging in physical activity (PA) as a way to avoid complications. Consequently, they present an added risk of developing other health problems associated with a sedentary lifestyle. The aim of the present study was to evaluate the levels and determinants of PA in children and adolescents with congenital heart disease. Sixty-three children and adolescents with diagnosed clinical CHD participated in this study, 36 boys and 25 girls from the ages of 6 to 17 (age, 12.3±3.0 years), divided in two categories of complexity of CHD (46% mild CHD and 54% complex CHD). The data was collected by a validated questionnaire of AF -Activitygram and an interview with a closed script to evaluate the barriers and beliefs associated with doing PA. Only 2 (3.2%) subjects obtained values that respect international recommendations for doing PA. It was also verified that about 85% of the day time assessed were spent in situations of inactivity. Of the all subjects, 87% engaged in PA daily, 65% practiced aerobic activity, 6% engaged in exercises of muscular strength and none engaged in exercises of flexibility. Boys and girls showed identical levels of PA. Differences were not detected amongst both categories of complexity of CHD. Finally, negative associations were shown between the time spent in PA and the behavioural factors (rho=-0.395, p<0.01), the emotional and the cognitive psychological factors (rho=-0.383, p<0.01), and the biological and demographic factors (rho=-0.281, p<0.05). Positive associations were found between physical education classes in school and the time spent in PA (rho=0.555, p<0.001). Children and adolescents with CHD in this study show very low levels of PA from moderate to vigorous intensity. The behavioural factors seem to be the barrier that most influences the PA levels. Physical education classes in school can be a way for these children and adolescents to do more moderate and vigorous physical activity.

EFFECTS OF DIET AND EXERCISE ON THE BODY COMPOSITION, RESTING METABOLIC RATE AND EXERCISE CAPACITY OF PATIENTS WITH SEVERE MENTAL ILLNESS

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University of Strathclyde; Harokopio University; Iaso Hospital, Greece

Weight gain is an established side effect of atypical antipsychotics in patients with severe mental illness (SMI). Previous studies have shown positive effects of lifestyle interventions of diet and exercise in weight loss in this population. The purpose of this study was to investigate the effects of a 3-month nutrition and exercise intervention on the body composition, resting metabolic rate and exercise capacity of SMI patients in Greece.

Forty-seven (females: N=34, males: N=13) obese patients diagnosed with SMI (age: 41.51±1.8 years; body mass: 91.6±18.6 kg; body mass index: 33.4±5.6 kg/m2; mean±SD) volunteered to participate in the study. The duration of the study was 3 months and patients had to attend nutritional and exercise counselling sessions every 15 days. Prior to the start of the study patients’ body weight, body composition (Bodpod, Life Measurement Inc, CA) and resting metabolic rate (IRMR, Cosmed, Italy) were assessed. Patients also participated in a sub-maximal exercise stress test in order to assess their maximal oxygen consumption (VO2max) (Cosmed, Italy). At the end of the study the same experimental measurements were performed to assess differences in body composition, RMR and VO2max.

Significant improvements were found in the body weight (l-5.3±0.7 kg, P<0.01), fat mass (l-5.3±0.1 kg, P<0.01) and RMR (l+244.4±39.2 kcal, P<0.01) of the patients in the 3-month intervention period. Exercise capacity was also found to be increased as a result of the intervention from 26.9±5.5 ml/kg/min to 30.4±5.3 ml/kg/min (P<0.01). The changes in VO2max were correlated to the changes in body weight (r=0.33, p<0.05) and fat mass (r=0.30, p<0.05) of the patients. When dividing the patients by gender, no differences among genders were found in the responses to the intervention in the body weight, body composition and RMR. However, significant gender differences were found in the improvements in exercise capacity, with females significantly improving VO2max by 15% (pre: 25.27±4.73 to post: 29.60±5.41 ml/kg/min, P<0.01) of the patients in the 3-month intervention period. Exercise capacity was also found to be increased as a result of the intervention from 26.9±5.5 ml/kg/min to 30.4±5.3 ml/kg/min (P<0.01).

In conclusion, SMI patients respond favourably to lifestyle interventions of diet and exercise as demonstrated by improvements in their body weight, body composition, RMR and exercise capacity. More investigation is needed to examine whether gender differences exist in the exercise capacity of this population.

REFERENCES


FREQUENCY OF CYCLE TRIPS PER WEEK AND BICYCLING DAYS PER YEAR

Schantz, P., Stigell, E.
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Purpose.
Values on frequency of bicycle trips are used in cost-benefit analyses within the transport sector and in a health economic assessment tool for cycling recently developed by WHO Europe. Such data should preferably be assessed in different environmental settings, e.g. in relation to climate and hours of light over the year. The aim of this study was therefore to illuminate these issues in commuters bicycling in the metropolitan area of Stockholm, Sweden.

Methods
The subjects cycled to work or study place, lived in the County of Stockholm and volunteered after being contacted through advertisements in morning newspapers. Questionnaires were sent to all of them in September 2005. The bicyclists were divided into single mode bicyclists, n = 1158, and those that sometimes cycled, sometimes walked to work (dual mode bicyclists, n = 535). They responded to questions on average number of trips per week for each month as well as their normal trip pattern in relation to proportion of return journeys per day.

Results
The table below presents median number of bicycle commuting trips per week during different months for single mode (sm) and dual mode (dm) bicyclists.

<table>
<thead>
<tr>
<th>Months</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicyclists (sm)</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>8</td>
<td>9</td>
<td>8</td>
<td>1</td>
<td>6</td>
<td>8</td>
<td>7</td>
<td>4</td>
<td>0.5</td>
</tr>
<tr>
<td>Bicyclists (dm)</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>8</td>
<td>10</td>
<td>8</td>
<td>0</td>
<td>6</td>
<td>10</td>
<td>8</td>
<td>4</td>
<td>0</td>
</tr>
</tbody>
</table>

Mean value of median numbers of trips during the year was 4.54 per week for the single mode bicyclists and 4.75 for the dual mode bicyclists. Given the fact that the normal trip pattern was 97% return journeys on the same day for both groups, the number of commuting cycling days per year was estimated to be 122 for single mode bicyclists and 127 for dual mode bicyclists.

Conclusion
Physically active commuting appears to be associated with a high number of physically active days per year. The frequency of bicycle trips for commuting can, however, vary substantially over the year. The consequence of this is that using spot data for this variable can mislead and create substantial over- or underestimations of the level of physical activity connected to bicycle commuting over the year. The variations in number of bicycle trips over the year point to the value of more studies of these aspects in different environmental settings.

FREE-RUNNING CIRCADIAN RHYTHM OF ISOMETRIC AND ISOKINETIC CONCENTRIC FORCE IN BLIND ATHLETES

Squarcini, C., Pires, M., Benedito-Silva, A., Cornelissen-Guillaume, G., Lopes, C., Matarazzo, C., Garcia, D., Peccin, S., Tufik, S., De Mello, M.

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Light is considered the main endogenous stimulus synchronizing circadian rhythms to 24 hours with the environment through body temperature, hormonal secretion and variables related to physical performance, particularly muscular strength. In light absence, as in the case of totally blind individuals, the circadian rhythms of body temperature and hormonal secretion tend to be free-run, with endogenous periods (tau) usually exceeding 24 hours in humans. However, the circadian rhythm of muscular strength in this population is not known. The present study aimed at analyzing the circadian rhythms of isometric and isokinetic concentric muscular contraction strength in totally blind athletes with free-running circadian rhythms. Data from participants six blind athletes with free-running rhythms for melatonin (or cortisol) secretion were collected for isometric force (handgrip and back flexion-extension), and isokinetic concentric knee flexion (at speeds 60º/s and 90º/s), and body temperature during three sessions at one- and two-week intervals. In each session, data were collected at 6 different times of day, with a minimum of 8-hour apart. Statistical analysis employed the cosinor method to determine each subject’s individual acrophases. Independently of circadian rhythm detection by cosinor analysis, acrophases were converted to lags from initial acrophase (first session). Relative acrophases were pooled across all 6 subjects and linear regression as a function of days from start, the slope as a gauge of average daily shift. The results show that regardless of muscle group or contraction speed, the endogenous period of force and body temperature was statically significantly longer than 24 hours, suggesting free-running of strength in these athletes. Like as example: endogenous period (tau) of body temperature estimated as 24.8 hours, with 95% confidence limits of ±0.7 hour, for back strength tau = 24.7 hours (95%CI = ±0.6 hour) and for dominant extension of knee in 90º/s tau = 24.9 hours (95%CI = ±0.8 hour). It is concluded that the muscular strength rhythm is generated by an internal mechanism, since in absence of light perception the organism expresses a circadian rhythm. As far as we know, this is the first research to show the circadian rhythm of sports-related variable in blind individuals. Therefore, trainers and health professionals working with blind people should be aware of the importance of including a circadian rhythm evaluation in their routines.

CEMSA, FAEPSP/CEPID-SONIO, CEPE, CAPES, CNpq

Oral presentations (OP)

OP-PM09 Physiology 9 - Cardiovascular

RELATIONSHIP BETWEEN MEASURES OF FITNESS, PHYSICAL ACTIVITY, BODY COMPOSITION AND VASCULAR FUNCTION IN CHILDREN

Hopkins, N., Stratton, G., Tinken, T., McWhannell, N., Ridgers, N., Graves, L., Cable, N., Green, D.

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Background. Flow mediated dilatation (FMD), the increase in artery diameter which occurs following a brief period of distal limb ischaemia as a consequence of increased luminal blood flow and wall shear stress, is now established as a valid index of vascular endothelial function. Endothelial dysfunction has been proposed as an early event in atherosclerosis, the health of the endothelium therefore represents a barometer for cardiovascular risk. Endothelial dysfunction is evident in children exposed to risk factor such as hypercholesterolaemia, smoking and homocysteinaemia. It is also evident in obese children, exercise training reverses endothelial function in such subjects. The increased prevalence of obesity and type 2 diabetes in young people represents a future cardiovascular health time-bomb and effective prevention depends upon early detection and appropriate management of specific risk factors. Given that no studies have attempted to examine the complex relationship between physical activity, cardiorespiratory fitness, body composition and vascular function in children, the present study aimed to identify the predictors of artery health in children with impaired FMD.
HETEROGENEITY IN CONDUIT ARTERY FUNCTION IN HUMANS: IMPACT OF ARTERIAL SIZE

Thijssen, D., Dawson, E., Black, M., Hopman, M., Cable, N., Green, D.
Liverpool John Moores University, United Kingdom

Direct in vivo measurement of the function of arteries such as the brachial, radial, popliteal and femoral, has recently become a powerful method of predicting those at risk of future cardiovascular disease. Vascular adaptations to exercise training, which may decrease cardiovascular risk, can also be directly assessed by measuring changes in artery function. However, artery function measures may be dependent on the structure or size of the artery in question.

Purpose. Therefore, the aim of this study was to determine whether conduit artery size affects functional responses in humans.

Methods. We compared the magnitude, time-course and eliciting shear rate stimulus for flow-mediated dilatation (FMD) and glyceryl trinitrate (GTN) mediated dilation in 11 healthy men (33±6 yrs). Upper limb (brachial and radial) and lower limb (common and superficial femoral) FMD responses were simultaneously assessed, whilst popliteal responses were measured in the same subjects during a separate visit. GTN-mediated responses were similarly examined. Edge-detection and wall-tracking of high resolution 8-mode arterial ultrasound images, combined with synchronized Doppler waveform envelope analysis, was used to calculate conduit artery diameter, blood flow and shear rate continuously across the cardiac cycle.

Results. Baseline artery size correlated strongly and inversely with the FMD response (r=-0.56, p<0.001). Normalization of FMD responses for differences in eliciting shear rate did not abolish this relationship between artery function and size (r=-0.48, p=0.001), suggesting that differences between artery function responses were not due to size-related differences in shear rate. This was reinforced by a significant correlation between baseline artery size and responses to GTN, a shear rate-independent dilator (r=-0.75, p<0.001). Together with the observation that time to peak dilatation during the FMD strongly correlated with baseline artery size (r=0.62, p<0.001), these data confirm the impact of artery size on the magnitude and timing of functional responses and, furthermore, indicate that shear stress independent factors contribute to differences in vasodilatation between arteries of varying dimension.

Conclusion. We have therefore established a physiological tenet, that the size of arteries has a direct impact on their functional responses. This has implications for all studies that have previously assessed FMD as a surrogate marker of artery health in humans, where differences in baseline artery diameter within individuals (different arteries or after an intervention) or between groups were not taken into account.

CARDIAC AUTONOMIC REGULATION IN CORONARY ARTERY DISEASE WITH AND WITHOUT DIABETES

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BACKGROUND: Cardiovascular autonomic regulation measured by 24-hour heart rate variability (HRV) is impaired in diabetic subjects compared to matched non-diabetic subjects. However, it is not known whether reduced HRV is predominantly associated to diabetes itself or to reduced exercise tolerance of diabetic patients. This case-control study assessed exercise tolerance as determinant of cardiac autonomic function among patients with diabetes and coronary artery disease (CAD) compared to their matched counterparts without diabetes.

METHODS: Consecutive series of CAD patients with a recent myocardial infarction (n=700) underwent Holter recording, symptom-limited exercise test by bicycle ergometer and echocardiography. All patients were under beta-blocking medication. Diabetic and non-diabetic patients were matched 1:3 in respect to gender, age, body mass index and left ventricular ejection fraction. Thereafter, the patients were matched 1:1 additionally according to exercise capacity. HRV indexes, such as standard deviation of R-R intervals (SDNN), very low- (VLF, 0.003-0.04 Hz), low- (LF, 0.04-0.15 Hz) and high-frequency (HF, 0.15-0.4 Hz) spectral components, were analyzed from Holter recordings.

Chronicotropic response to exercise was evaluated by heart rate (HR) reserve (= peak HR - resting HR). RESULTS: Initial matched population included 52 diabetic and 156 non-diabetic patients (176 males, 32 females, age: 63±9 years, body mass index: 27±3, ejection fraction: 47±7%). Compared to non-diabetic counterparts, diabetic patients had significantly lower exercise capacity (5.1±3 vs. 5.7±1.3 METs, p=0.006), SDNN (86±30 vs. 103±32 ms, p=0.001), VLF (6.3±0.7 vs. 6.7±0.8 ln ms2, p=0.010), LF (5.3±1.0 vs. 5.7±0.9 ln ms2, p=0.005) and HF reserve (53±19 vs. 67±20 bpm, p<0.001). When patients were matched in respect to exercise capacity (n=44 for both groups), no differences were observed in any HRV variable. HR reserve was still significantly lower in diabetic patients compared to non-diabetic patients (54±19 vs. 66±17 bpm, p=0.002).

CONCLUSION: Reduced 24-hour HRV is predominantly a result of impaired exercise capacity among the diabetic patients with CAD. Chronotropic incompetence seems to be specific feature of abnormal autonomic function in diabetic patients, which is not directly related to exercise performance.
Introduction.
In humans, heat stress leads to pronounced increases in cardiac output and heart rate (HR). Recently, a heat stress induced significant increase in ejection fraction (EF) was reported (Crandall et al 2008). Whilst these findings may indicate an increase in LV systolic function, EF is an imperfect measure of contractility. In order to further elaborate the influence of passive heating on LV function, the present study sought to evaluate the hypothesis that passive heat stress increases myocardial strain, rate and torsion.

Methods.
Six active male subjects (21±2yr) completed the study. Measurements were made at 4 different resting conditions: 1) Control (Tcore ~37°C, Tskn ~32°C), 2) skin hyperthermia (Tc ~37°C, Tsk ~36°C), 3) skin and core hyperthermia (Tc ~38°C, Tsk ~37°C), and 4) high skin and core hyperthermia (Tc ~39°C, Tsk ~38°C). Subjects were fully hydrated throughout the study. Echocardiographic images were acquired at each stage of heat stress. Two-dimensional images were analysed for EF, stroke volume (SV), LV circumferential, radial and longitudinal strain (Scirc, Srad and Slon) and strain rates (SRcirc, SRrad and SRlon). LV torsion was calculated as the net difference in degrees of rotation between the LV apex and base (Notomi 2005). End-diastolic volume (EDV) and mean arterial pressure (MAP) were measured as surrogates of preload and afterload, respectively. Heart rate (HR) was assessed throughout the trial using a three lead ECG. A repeated measures ANOVA was used to detect effects over time and paired student t-test was applied post-hoc to ascertain differences between conditions. Alpha was set at 0.05, Bonferroni adjustment was made for repeated comparisons.

Results.
EF increased between control and high core hyperthermia (61±4 vs. 76±7%, p<0.05). Whilst these findings may indicate an increase in LV systolic function, EF is an imperfect measure of contractility. In order to further elaborate the influence of passive heating on LV function, the present study sought to evaluate the hypothesis that passive heat stress increases myocardial strain, rate and torsion. Improvements in intrinsic systolic function may compensate for heat induced reductions in EDV.

References.
Supported by the Gatorade Sports Science Institute

THE EFFECT OF 60-HOUR SLEEP DEPRIVATION ON CARDIOVASCULAR REGULATION AND AEROBIC PERFORMANCE

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INTRODUCTION. Sleep deprivation (SD) is common in sustained military operations and in some sport events (VanHelder & Radomski 1989). This study examined the effect of 60-hour sleep deprivation on aerobic performance and cardiovascular regulation.

METHODS. Twenty healthy cadets (17 men, 3 women, age 26 ± 3 yrs) volunteered. During SD they performed military tasks related to tactics but their physical activity was restricted to minimum and they were constantly under observation for not falling asleep. They were not allowed to drink any caffeine containing liquids, but water and food could be consumed ad libitum. Cardiovascular regulation was assessed by measuring heart rate variability (HRV) in orthostatic test (5 min sitting, 3 min standing) each day in the morning and evening. Heart rate (HR, Polar Advantage), oxygen uptake (VO2) and ventilation (VE, Cosmed K4b2) were measured constantly during performance. Blood lactate (Lacta, Lactate pro) and rate of perceived exertion (RPE) were measured every two minutes. Also time to exhaustion was measured.

RESULTS. In sitting and standing positions HF, LF and RMSSD increased and HR decreased between the first and third day (P<0.05 for all). At submaximal work loads (100-250 W) HR, VO2 and VE decreased (P<0.05 for all). However, maximal values of HR, VO2, VE, RPE or time to exhaustion did not change after SD. Maximal Bla decreased after SD (P<0.05)

CONCLUSION. Sleep loss results in an increased vagal outflow, documented by increased vagally mediated heart rate variability indices and decreased heart rate. Maximal aerobic performance was not affected, but however, at submaximal exercise intensity levels the heart rate and respiratory parameters were decreased. The changes in cardiorespiratory parameters at submaximal exercise intensity levels and during orthostatic test may occur via altered function of circulatory and respiratory regulation centers at the central nervous system level.

References.

Keywords: sleep deprivation, aerobic performance, heart rate variability

EXERCISE TRAINING PROTECTS CARDIAC FUNCTION AND STRUCTURE IN ANIMALS SUBMITTED TO ACUTE PRESSURE OVERLOAD

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Emerging evidences indicate that exercise training provides significant protection to the myocardium against several deleterious insults such as ischemia, ischemia-reperfusion and cardiotoxicity. Less studied, is the eventual cardiac protection conferred by exercise to an
structural alterations, which seems to precede hemodynamic alteration, highlighting ventricular interaction. This study highlights that function was also improved. Although the observed disturbances in function and structure in LV of sedentary animals, RV only suffered increased LVPmax during the entire protocol (154.7± 26 vs 77.4±25.6 mmHg/s) and responded with a significant increase of LVdP/dtmax evaluated by time constant tau. Peak pressure (Pmax), peak rate of pressure elevation and fall (dP/dtmax and dP/dtmin) and relaxation rate evaluated by time constant tau were assessed. Papillary muscles were collected from both ventricles and prepared for transmission electron microscopy (TEM) analysis. The severity of tissue damage was scored (0-3) taking into account the amount of cardiomyocytes exhibiting intracellular edema and/or mitochondrial swelling.

Results are presented as mean±SD; p<0.05. There were no differences regarding RV function. Contrary to Sh, Tr were able to maintain an increased LVPmax during the entire protocol (154.7±26 vs 77.4±25.6 mmHg/s) and an impairment in time constant tau in Sh (15±3 vs 22±9 ms) with no changes in Tr (13±1 vs 13±3 ms). Regarding TEM, Sh presented significantly higher grades of intracellular edema and mitochondrial swelling in both ventricles in comparison to Tr (LV: 2.5±0.5 vs 1.3±0.7; RV: 2.1±0.6 vs 0.9±0.7).

Two hours of pressure overload by aortic banding enhanced systolic function in trained animals, in opposition to sham group. Diastolic function was also improved. Although the observed disturbances in function and structure in LV of sedentary animals, RV only suffered structural alterations, which seems to precede hemodynamic alteration, highlighting ventricular interaction. This study highlights that chronic exercise has advantages in RV and LV adaptation to a cardiac insult like an acute and sustained cardiac pressure overload.

References

Oral presentations (OP)

OP-PM10 Physiology 10 - Thermoregulation

THE EFFECT OF A HEAT EXTRACTION DEVICE ON RECOVERY AND PERFORMANCE IN HOT AND HUMID CONDITIONS

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Introduction.
In situations where physical performance is limited by elevations in core temperature, extraction of excess heat from the body core should enhance performance capacity [1]. The rapid thermal exchange device (RTX, AVACore Technologies, Ann Arbor, MI) aims to achieve this via the combined application of sub-atmospheric pressure and a heat sink to the palm of the hand [2]. However, the optimal operation and scope of RTX implementation during exercise and recovery are yet to be determined.

Methods.
Using a random crossover design, nine moderately trained male team sport athletes (24.8 ± 4.4 yrs, 78.4 ± 9.3 kg, VO2max = 43.2 ± 6.8 mL.kg-1.min-1) participated in two separate experimental trials on a cycle ergometer in a hot and humid environment chamber (33°C, 62% RH). Each trial consisted of a brief warm-up followed by 15 minutes cycling at 70% work max (Wmax) (Preload) before five minutes of passive recovery (Recovery 1). Subjects then completed a second 15 minute cycling bout at 70% Wmax (Steady State) followed by ten minutes of passive recovery (Recovery 2) and finally a ten minute Time-trial. During both Recovery 1 and Recovery 2 subjects used either the RTX device (15°C) or no intervention (CON). Tympanic temperature (TyT), mean skin temperature (Tsk), heart rate (HR), sweat rate, blood lactate ([BLa-]), rating of perceived exertion (RPE), thermal sensation (THS), thermal comfort (THC), work and power output were measured throughout both trials. Bonferroni adjusted paired t-tests were used to evaluate the effect of the RTX. Significance was set at p<0.05.

Results.
In the RTX trial there was a significant reduction in TyT following Recovery 2 compared to the CON trial (37.5 ± 0.3°C vs 37.7 ± 0.4°C). Additionally, HR was lower during both Recovery 1 (107 ± 5 bpm vs 114 ± 13 bpm) and Recovery 2 (115 ± 9 bpm vs 123 ± 13 bpm) and Tsk was lower following the Steady State (34.06 ± 0.51°C vs 36.26 ± 0.47°C) and Recovery 2 (34.07 ± 0.42°C vs 36.29 ± 0.42°C) in the RTX trial. There were no differences in sweat rate, [BLa-], RPE, THS or THC between trials. In the Time-trial subjects performed significantly more work (134.0 ± 9.6 kJ vs 126.8 ± 18.6 kJ) and had a greater mean power output (223.3 ± 16.0 W vs 211.3 ± 31.0 W) in the RTX trial compared to the CON trial.

Conclusion.
These results suggest that a heat sink temperature of 15°C in a vacuum facilitates a significant thermal gradient whilst simultaneously minimising reflex vasoconstriction in the palm. This enables sufficient palmar blood flow for effective heat transfer, minimising thermal strain during recovery. Potentially the RTX is an effective ergogenic aid for exercise performance in hot and humid conditions when used during recovery periods.

References.

HEAT STRESS INCREASES LEG MUSCLE AND SKIN BLOOD FLOW IN RESTING AND EXERCISING HUMANS

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Introduction.
Heat stress increases cardiac output (Q) at rest and during exercise in humans largely to meet the augmented thermoregulatory demands of the skin circulation (González-Alonso et al. 2008). Whether heat stress causes muscle vasodilatation and thereby increases
muscle perfusion remains uncertain. This study tested the hypothesis that local leg and systemic hyperthermia increases leg muscle, leg skin and systemic perfusion at rest and during exercise.

Methods.
Leg and systemic hemodynamics, O2 transport and VO2 were measured at rest and during 6-min of one-legged knee-extensor exercise (23±3 W) in 7 active males (21±2 yr) in 4 conditions, in which participants' hydration status was maintained. 1) control (Tcore ~37°C, Tsmin ~33°C), 2) skin hyperthermia (Tc ~37°C, Ts ~36°C), 3) skin and mild core hyperthermia (Tc ~38°C, Tsk ~36°C), and 4) high skin and core hyperthermia (Tc ~39°C, Tsk ~37°C). Femoral artery blood flow (LBF; Doppler ultrasound), vastus lateralis skin blood flow (SkBF; laser Doppler flowmetry) and blood gas and haematological variables (ABL 825, Radiometer) were measured in each condition. Data were analysed using a one-way ANOVA with repeated measures and Tukey’s post hoc analysis with significance accepted at P<0.05. Data represent means±SEM.

Results.
At rest and during exercise, LBF and Q increased with each elevation in heat stress compared to control (peak delta LBF= 1.1±0.1 and 0.9±0.2 L/min from 0.5±0.1 and 2.4±0.2 L/min, respectively; peak delta Q= 4.0±0.2 and 3.1±0.3 L/min from 5.1±0.2 and 7.4±0.4 L/min, respectively). However, the increase in LBF and Q due to exercise (exercise hyperemia) was the same (~1.6 L/min) in all heat stress conditions. Correspondingly, SkBF initially increased with heat stress and skin and mild core hyperthermia (8.5±1.4-fold) but showed no additional elevation with high skin and core hyperthermia. The increased muscle perfusion accounted for the further increase in LBF. In addition, the increase in SkBF due to exercise was not different among conditions. Mean arterial and perfusion pressure declined, yet leg vascular conductance increased with heat stress, indicating that the increased leg perfusion was due to local vasodilatation. The elevation in leg muscle and skin temperature alone accounted for by >50% of the increase in LBF and SkBF with high skin and core hyperthermia. The elevated leg perfusion with each level of heat stress was accompanied by a parallel reduction in leg O2 extraction such as that leg VO2 remained unaltered either at rest or during exercise.

Conclusions.
These findings demonstrate that heat stress increases leg muscle and skin blood flow in resting and exercising humans. Further, the results suggest that increases in muscle tissue temperature per se might contribute to local muscle blood flow regulation and exercise hyperemia.

References.


Supported by Gatorade.

THERMOREGULATION AND PERFORMANCE IN NORMAL AND HIGH AMBIENT TEMPERATURE: NO EFFECT OF A SELECTIVE SEROTONERGIC REUPTAKE INHIBITOR

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Introduction
The central fatigue hypothesis is based on the assumption that the synthesis and metabolism of central monoamines, in particular serotonin (5-HT), dopamine (DA) and noradrenaline (NA), are involved in the development of fatigue (Meeusen, 2006). Acute DA/NA reuptake inhibition (bupropion) significantly improved time trial performance, hormonal responses to exercise and thermoregulation in the heat (30°C, Watson, 2005). A selective DA reuptake inhibitor had similar or even more pronounced effects on performance and core temperature in 30°C (Tcore, Roelands, 2008a). In contrast, acute NA reuptake inhibition decreased performance (Roelands, 2008b). Since the original central fatigue hypothesis states that fatigue during prolonged exercise could be due to a higher 5-HT activity, we examined the effects of acute administration of a selective 5-HT reuptake inhibitor (SSRI) on performance and thermoregulation.

Methods
Eleven healthy trained male cyclists completed four experimental trials (two in 18°C, two in 30°C) in a double blind-randomized crossover design. Subjects ingested either a placebo (PLAC; 2x10mg) or Citalopram (CITAL; 2x10mg) on the evening before and the morning of the trial. Subjects cycled for 60 min at 55%Wmax, immediately followed by a time trial (TT) to measure performance. Tcore, skin temperature, heart rate, blood pressure, sweat loss, RPE, thermal stress, blood lactate and hormonal data were recorded. The significance level was set at p<0.05.

Results
Acute SSRI did not change performance on the preloaded TT (18°C p=.518; 30°C p=.112). Tcore was identical between PLAC and CITAL during exercise in each temperature setting. During recovery in 30°C Tcore was significantly lower in the CITAL trial (p<.012). In 30°C heart rate was significantly lower after exercise in CITAL (p=0.13). In 18°C there was no difference in heart rate. No differences were observed for skin temperature, RPE and thermal stress. CITAL significantly increased CORT values at rest (p=.016), after the TT (p=.006) and after 15 minutes of recovery (p=.041).

Discussion/Conclusion
The lack of effect on performance is in accordance with previous studies performed with SSRI (Meeusen, 1997, Strachan, 2004, Strachan, 2005). The effects of SSRI on core temperature are inconsistent and probably depend on which receptors are activated (Strachan, 2004). Our results suggest that, in these specific circumstances, the 5-HT neurotransmitter system has no direct influence on performance and thermoregulation.

References

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SHORT DURATION NECK COOLING DOES NOT IMPROVE 15-MIN TREADMILL TIME-TRIAL PERFORMANCE IN THE HEAT

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INTRODUCTION: Running performance is impaired in hot, compared to moderate, conditions (Tyler & Sunderland, 2008) and it has been proposed that a high brain temperature may be the reason for this (Capuata et al., 1986). Cooling the neck might be an effective way of lowering brain temperature by reducing the temperature of the carotid blood (Zhu, 2000) and it seems prudent to suggest that this may attenuate the performance impairment observed. Cooling the neck during exercise in the heat has been shown to elicit potentially beneficial thermo-regulatory and cardiovascular changes (Bulbulian et al., 1999; Gordon et al., 1990) however the effect of cooling the neck on exercise performance has not been investigated. AIM: To investigate the effect of cooling the neck during 15-minute treadmill running on performance in high ambient temperatures. METHODS: Eight, familiarised, trained males completed two 20-min trials in the heat (30.5 ± 0.1°C, 53 ± 2% rh) on a motorised treadmill with (CC) or without (NC) a neck-cooling collar. The trial consisted of a 5-min warm-up at 9km.hr-1 followed by a 15-min self-paced time-trial. Distance covered, heart rate, rectal temperature, neck temperature, rating of perceived exertion, thermal sensation and water consumption were recorded throughout. Nude body mass was recorded pre- and post-exercise. Paired t-tests and one-way and two-way ANOVA with repeated measures were used with Tukey’s HSD post hoc tests were appropriate. Significance was accepted as P < 0.05. RESULTS: There was no significant difference in the distances covered during the 15-minute TT with the application of the cooling collar (CC: 3.239 ± 267m; NC: 3.180 ± 271m; P = 0.351). Mean neck temperature was cooler throughout the trial with the collar (mean difference -11.05 ± 1.08°C; P = 0.000). Subjects commenced the time-trial feeling significantly cooler (P = 0.006) however there were no differences during the time-trial. There were no differences for heart rate (P = 0.305; rectal temperature (P = 0.665); RPE (P = 0.925) or sweat loss (P = 0.756) between trials. The cooling collar significantly reduced voluntary water intake (P = 0.033). CONCLUSION: Time-trial performance in the heat was not significantly improved by the short-term application of a cooling collar despite a significant reduction in the mean neck temperature throughout the trial. The effectiveness of such a cooling intervention appears to be dependent upon the magnitude of the thermal stress experienced during exercise (Nunneley et al., 1971) and so it is likely that the 20-min bout provided an insufficient thermal stress to benefit from the cooling intervention.

Effects of Different Water Temperature on Reactivation in Cardiac Parasympathetic Nervous System during Supine Floating After Exercise

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Introduction: In the water, humans have different physical responses compared to land due to influences of physical characteristics of water such as water temperature, water pressure, buoyancy and viscosity. We suggested that the supine floating after exercise could increase the cardiac parasympathetic nervous system activity which was inhabited by exercise. During immersion at rest, humans made different responses by water temperature. We hypothesized that influences of different water temperature made different responses not only at rest, but also during recovery after exercise. The purpose of this study was to determine the effects of different water temperature on reactivation cardiac parasympathetic nervous system during supine floating after exercise. Methods: Six healthy Japanese males volunteered for this study. Their mean age, height, body weight, %body fat and maximum oxygen uptake were 21.3 ± 2.1yeras (mean ± SD), 169.3 ± 2.9cm, 66.6 ± 10.1kg, 17.1 ± 2.1%, 46.0 ± 8.2ml/kg/min., respectively. All subjects signed an informed consent form prior to participation in this study. Subjects maintained their supine position for 30 minutes on bed or floating, after exercise for 15 minutes. Water temperature of the supine floating was 25 (WT-25), 30 (WT-30) and 35 (WT-35) degrees Celsius. Exercise intensity was 50%VO2max. Measurement items were heart rate, cardiac autonomic nervous system activity. Cardiac autonomic nervous system activity was calculated using Maximum Entropy Calculation Methodology (MemmCalc). The cardiac parasympathetic nervous system activity was estimated by two indexes. One is log HF, the high frequency domain (HF; 0.15-0.40Hz) was transformed into logarithmic values to obtain a statistically normal distribution. Another is the slope in PNS. We calculated regression line in appearance time and peak of HF. The slope of regression line defines reactivation in cardiac parasympathetic nervous system (Slope in PNS). Results and Discussion: Heart rate increased about 160 bpm. Heart rate and log HF of post exercise were no significant differences under the four conditions. During the recovery process, log HF was significantly increased under the WT-25 and WT-30, as compared to the WT-35 and C-condition (p< 0.05, respectively). Peak of HF in WT-25 (166.8 ± 152.5%) was significantly higher than WT-35 (75.6 ± 94.7%) and C-condition (33.2 ± 38.8%) (p< 0.05, respectively). The Slope in PNS of WT-25 (167.4 ± 153.6) was significantly higher than WT-35 (75.7 ± 95.0) and C-condition (33.2 ± 38.8) (p< 0.05, respectively). These data suggest that it is significant differences on reactivation in cardiac parasympathetic nervous system to different water temperature during supine floating after exercise. And, reactivation in cardiac parasympathetic nervous system was significantly increased, when water temperature was lower than body temperature.

Functional Architecture of Human Thermoregulation under Increasing Levels of Exercise in the Heat

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Thermoregulatory investigations have been an integral part of physiological research generating voluminous evidence that have illuminated latent physiological mechanisms at all levels of biological organization as early as in the 18th and 19th century (Richet, 1885, Ott, 1887, Greene, 1913). Yet, our knowledge remains limited on topics as critical as the functional architecture of human thermoregulation. The most prominent hypothesis proposed to date recognizes a thermal set point which the body’s control systems attempt to maintain, but it remains unknown whether the identification, monitoring, and maintenance of this set point are based on temperature or heat. In this experiment we examined whether the human body regulates core temperature or heat loss by assessing changes in these variables under environmental heat exposure and increasing levels of heat production through exercise leading to uncompensable heat stress.
using 10 healthy male (age 27.3±8.76y, height: 1.77±0.03m, weight: 77.0±12.23kg, body fat: 11.0±5.87%; maximum oxygen uptake: 53.8±7.40ml•kg•1•min-1) volunteers. Participants’ maximal oxygen uptake was assessed during one trial, while in the second trial they entered an environmentally controlled chamber set at ambient temperature and relative humidity of 42ºC and 30%, respectively. During their first hour inside the chamber, participants were resting seated in a comfortable chair. Thereafter, they exercised to volitional exhaustion on a cycle ergometer at an initial workload equal to 20W with 20W increments every subsequent hour. Results showed that heat loss followed precisely the changes in heat production without substantial delay, while rectal temperature increased linearly with time. This was confirmed using auto-regressive, integrative, moving average (ARMA) time series analysis which showed that, unlike rectal temperature (t=0.569, P>0.05), heat loss (t=28.746, P<0.001) systematically followed fluctuations in heat production across time. In addition, the integral of heat storage (i.e., the integral of the difference between heat loss and heat production) did not differ statistically from rectal temperature across time. It is concluded that, under environmental heat exposure and increasing levels of heat production through exercise leading to uncompensable heat stress, the human body regulates heat loss and not rectal temperature. Further, under the conditions of the present experiment, rectal temperature is the eventuality of adaptations in heat loss and, in turn, in heat storage.

References.

**SIMULATED ALTITUDE DURING THE NIGHT AMELIORATES SYMPTOMS OF ACUTE MOUNTAIN SICKNESS**

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Acute mountain sickness (AMS) occurs after rapid ascent to high altitude in otherwise healthy mountaineers. The risk of AMS is influenced by individual susceptibility, absolute altitude, rate of ascent and preacclimatisation. All these risk factors have been shown to have approximately the same weight. Since individual susceptibility and absolute altitude and in most cases also rate of ascent are given for a particular expedition or trekking tour, preacclimatisation is the only preventive factor that can be influenced individually. Thus we hypothesised that regular exposure to normobaric hypoxia during the night leads to ventilatory acclimatisation and reduces incidence and severity of AMS.

To test this hypothesis 75 healthy men at the age between 18 and 55 years were included in a randomized double blinded study. For preexamination subjects were exposed for 4 h at a FiO2 of 12% (approx. 4500m). Before and at the end of this exposure AMS (Lake Louise Ill-score, AMS-c score), ventilation and blood gases were assessed. Then an acclimatisation period of 14 nights in commercially available “hypoxia-tents” followed. Hypoxia (HYP) and control (CON) group received visually identical equipment which was technically adapted to the assigned group. Handling of the equipment was the same in both groups. All subjects were advised to set the level of hypoxia to a FiO2 of 15.4% (approx. 2500m) in the first night, then gradually decrease FiO2 each night by 0.2% until the final “altitude” of 3300m (FiO2=14%) was reached. This altitude then was constant until the 14th night. After a break of 4 days subjects were examined during one day (20 h, 3:00 p.m. – 11:00 a.m.) at FiO2 of 12%. Again AMS, ventilation and blood gases were assessed before, after 4 and after 20 h of hypoxia.

For technical reason most subjects did not reach the desired sleeping altitude of 3043m at average. We therefore analysed the 21 “highest” (=HYP) and the 21 “lowest” (=CON) according to the performed power analysis. Mean sleeping altitude in HYP was 2599m compared to 325m in CON. Both, LL- and AMS-c score were significantly reduced by sleeping in hypoxia (LL: 3.1±2.2 vs 5.6±3.6, p=0.039; AMS-c: 0.38±0.38 vs. 1.10±1.23, p=0,014). The reduction of oxygen saturation by 4 h of hypoxia was significantly less after acclimatisation in HYP, while there was no difference in CON. Ventilatory parameters showed no significant difference between HYP and CON. Sleepquality during the acclimatisation period in the tents was not affected by hypoxia.

The results of the study indicate that preacclimatisation during 14 nights in normobaric hypoxia reduces symptoms of AMS and therefore is useful to prevent AMS if acclimatisation in natural altitude is not possible. The effects can be expected to be even more pronounced if a higher degree of hypoxia can be attained in the tent.

**Oral presentations (OP)**

**OP-PS03 Psychology 3 - Motivation**

**IMAGERY PERSPECTIVES AND MODALITIES: AN INVESTIGATION OF THREE ISSUES**

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The present study explored three issues in imagery perspective and modality research: the angle used to imagine performing a movement when using external visual imagery (EVI); the relationship between imagery perspective preference and imagery ability; and the order with which visual and kinaesthetic imagery are experienced. One hundred and fifty nine athletes (M age = 19.6 years, SD = 2.67) completed the Vividness of Movement Imagery Questionnaire 2 (VMIQ-2). Roberts, Callow, Hardy, Markland, & Bringer, 2008, which assesses internal visual imagery (IVI) ability, EVI ability, and kinaesthetic imagery (KIN) ability. On completion of the VMIQ-2, participants completed three further questions. First, they marked the angle that they imaged from when completing the EVI factor on a 3-D diagram. Second, they rated their preference for using a particular visual imagery perspective on a Likert type scale from 0 (strong preference for IVI) through to 5 (no preference) to 10 (strong preference for EVI). Finally, participants reported whether they experienced KIN when completing the IVI and EVI factors of the VMIQ-2. If participants did experience KIN, they were asked to highlight the order (i.e., visual and kinaesthetic concurrently, visual then kinaesthetic, kinaesthetic then visual) that the two modalities were experienced. To assess whether the angle of EVI affected EVI ability, responses from the angle question were inspected, and the number of times each angle was reported by participants was summed. Although participants reported imaging from a variety of external angles, the four most common angles were from above, behind, from the right, and from the left. A single factor ANOVA revealed no significant difference in EVI ability between these four angles. To examine the relationship between imagery perspective preference and imagery ability, correlations were performed between the preference scale and the requisite factors of the VMIQ-2 (i.e., the IVI and EVI factors). Results revealed moderate significant...
correlations between preference and ability (r = -0.301 for EVI and r = -0.317 for IVI). The order data revealed that for EVI, participants reported experiencing visual imagery and kinaesthetic imagery concurrently to the same extent as visual then kinaesthetic imagery. However, these orders were experienced significantly more often than kinaesthetic then visual imagery. For IVI, visual and kinaesthetic imagery were experienced concurrently more often than visual then kinaesthetic imagery, and also kinaesthetic then visual imagery. The results are discussed in terms of their implications for both research and applied practice.

References


SELF-TALK CAN MEDIATE THE EFFECTS OF AUTONOMY-SUPPORTIVE AND CONTROLLING ENVIRONMENTS ON MOTIVATIONAL STATE

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Using Self-Determination Theory as a theoretical framework, this study examined whether self-talk mediates the effects of social contexts on individuals’ motivational state. Within sport, relative to controlling contexts, autonomy supportive environments elicit more self-determined forms of behavioural regulation, greater persistence, and enhanced well-being (e.g., Pelletier, Fortier, Vallerand & Brière, 2001). Additionally, there is evidence that self-talk mediates the effects of social factors, such as coaches’ behaviours, on outcomes including athletes’ fear of failure and self-concept (e.g., Conroy & Coatsworth, 2007). As such, a model was tested by which the type of self-talk used by individuals varies as a function of social context, and that this in turn causes changes in one’s motivational and affective state.

70 male and female student volunteers (mean age = 24.19, sd = 9.07) were randomly assigned to an autonomy-supportive or controlling condition. Participants were instructed to ‘think-aloud’ throughout a ten-minute computerised task and self-verbalizations were recorded. A five-minute-free-choice period followed, after which participants completed the Intrinsic Motivation Inventory (Perceived choice, Interest / Enjoyment / Pressure / Tension subscales). Lexical frequency analysis software was used to examine self-talk transcripts. Independent t-tests identified that participants in the autonomy-supportive condition used significantly more positive emotional words (p = .004) and positive assertions (e.g., yes, ok) (p < .001), fewer swear words (p < .05), fewer anger words (p = .054), and reported significantly greater interest and enjoyment (p < .001) and spent longer on the task during a free-choice period (p < .01). Multiple mediator analyses revealed that certain self-talk factors predicted motivational outcomes and furthermore, some acted as mediators in the manner hypothesised. For example, 1st person speech was a significant mediator of the relationship between social context and interest/enjoyment, with autonomy-supportive contexts predicting fewer 1st person self-talk, which in turn negatively predicted interest and enjoyment. In addition, 1st person speech partially mediated the effects of social context on perceived choice, with greater perceived choice predicted by lower levels of 1st person speech. This study highlights the importance of theory-based research into the antecedents and effects of self-talk.

References


HEART RATE PATTERNS AND FOCUS OF ATTENTION DURING BALANCE BEAM PERFORMANCE

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Preparatory heart rate (HR) deceleration is believed to be a marker of optimal functioning of attentional processes leading to excellent performance and is related to an external focus of attention (Radlo et al., 2002). An external focus of attention has been associated with optimal balance performance (for review, Wulff, 2001). However, research on sport related complex balance movements (e.g., gymnastics) appear to be limited.

The preparation period of an acrobatic element (flic flac) on the balance beam was studied in fourteen female gymnasts. HR was measured beat-per-beat with a telemetric heart rate monitor and four time points during the preparation period (T1 at the beginning, T2: mean during the first half, T3: mean during the second half, T4: at the end) were calculated in order to investigate the HR deceleration effect. A significant HR deceleration (F[3,33] = 8.16, p < 0.001) was found during the preparation period of the attempts with a fall in the consecutive acrobatic element. No HR deceleration (F[3,33] = 2.59, NS) was found in the attempts without a fall. These data suggest that preparatory HR deceleration is associated with a detrimental effect upon the performance of complex balance movements. Thus, the findings question the generalization of the beneficial effect of an external focus of attention on balance. An external focus of attention is defined as attention that is directed to the effect of the movements on an apparatus or implement. In the present study, the balance beam is a static apparatus, which by definition is unable to give additional information on the movement effect. In literature, the beneficial effect of an external focus of attention has been demonstrated in dynamic balance tasks on a stabilometer, but not in static balance tasks. Moreover, several authors demonstrated that gymnasts shift their sensorimotor dominance from vision to proprioception (Vuillerme et al., 2001), indicating that an internal focus of attention could be beneficial in balance beam performance. A direct manipulation of the focus of attention is necessary to further explore the role of preparatory HR deceleration on the performance of complex movements on the balance beam.

References

IS SPORT MOTIVATION IN YOUTH RELATED TO THE OUTCOME SUCCESS IN ADULTHOOD? EVIDENCE FROM DUTCH FIELD HOCKEY PLAYERS

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The developmental course of professional performers from childhood to adolescence has been shown to be fundamentally different from that of amateurs. Differences exist in terms of number of hours devoted to improvement of current levels of performance and in the quality and quantity of practice. Unlike amateurs, professionals continuously seek excellence, are highly motivated to improve and do well, and continue to practice with effort. Unknown, however, is whether this also holds for a group of talented youth athletes; i.e., athletes who are better than their peers during training and competition (Elferink-Gemser et al., 2004). Although during their developing years all are expected to have the potential to reach elite level, only few of them eventually do.

To examine whether sport motivation during youth years is predictive of sport outcome success in adulthood, 98 talented field hockey players (mean age 16.5, sd 1.1) filled in the Task and Ego Orientation in Sport Questionnaire and the Sport Motivation Scale. Based on their performance level three years later, they were divided into elite (n=21) and non-elite players (n=77). Unlike non-elite, elite players competed in the highest national Dutch field hockey competition. Multivariate analyses were conducted to examine if motivational differences were evident across performance levels. In addition, Spearman correlations between motivational variables and training characteristics were examined.

All talented players scored high on motivation when compared to population scores (p<.05). Compared to non-elites, elite players reported higher levels of intrinsic motivation (to experience stimulation and to accomplish), identified regulation, and external regulation when they were younger (p<.05). The number of field hockey specific training hours per week was positively related to intrinsic motivation (r = .23, p<.05), the number of field hockey matches to external regulation (r = .25, p<.05).

In a group of all talented youth field hockey players aged 15-18, sport motivation is related to training characteristics and outcome success. The building of a solid foundation of intrinsic motivation seems paramount in the development of highly successful, self-determined experts (Ryan & Deci, 2000). In line with Ericsson's expertise model (1998) talented youth field hockey players who ultimately reached elite level of performance had higher motivation when they were younger than those with an arrested development. Examination of a relation between motivation, practice, and outcome success has been suggested in literature but attempts to provide empirical evidence have been very limited to date. Results from the present study are amongst the first to provide support for a positive relation between sport motivation, practice, and outcome success.

References.

SELF-REGULATION AND PERFORMANCE LEVEL IN YOUTH SOCCER PLAYERS

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Why do some athletes reach the top in their sports while others fail to succeed? This question has frequently been asked in talent identification and development research. In their review on talent identification and development research in soccer, Williams & Reilly (2000, p.660) claimed that ‘a talented player possesses personality characteristics that facilitate learning, training, and competition’. Self-regulation, the ability to exert control over one’s metacognitive, motivational, and behavioral processes (Baumeister & Vohs, 2004; Zimmerman, 1986), might be such a characteristic that talented players can use to develop performance. The purpose of this study is to examine the relationship between self-regulation and performance level in youth soccer players.

Self-regulation was assessed with a questionnaire containing the following aspects of self-regulation: planning (= .79), evaluation (= .82), reflection (= .75), self-efficacy (= .78), and effort (= .84). The 388 participants were youth male soccer players aged 11 to 17 years (mean age ± SE: 13.90 ± 1.39 years). Players were classified in talents and regional players. In contrast to regional players, talents played in the U13, U15, or U17 youth soccer team of a professional soccer club at the highest national competition level in the Netherlands. Multivariate and univariate analyses of covariance were conducted. A significance level of .05 was adopted and we corrected for multiple tests.

The results revealed that talents scored significantly higher than regional players on effort and reflection. Because of the correction for multiple tests, for self-monitoring only a trend was visible, with talents scoring higher than regional players.

Talents outscored regional players on effort and reflection, which may mean talents invest more effort in practice and are better able to translate what they know into what they do. In many self-regulation studies effort has been studied as a motivational component (Hong & O’Neil, 2001). Deliberate practice is not always motivating, but commitment to practice is very important, since for expert performance a long period of sustained effort to improve performance is needed (Ericsson et al., 1993). Reflection is the key process of expert learning, which translates knowledge into action, making it possible to gain strategy knowledge from specific activities (Ertmer & Newby, 1996). Because of their better scores on effort and reflection, talents may be better able to develop their performance than regional players.

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SYNCHRONIZED SWIMMERS MOTIVATIONS FOR THE ACTIVITY

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Introduction
Synchronized swimming is a relatively young sport, but its development has been important in terms of numbers of practitioners as well as the quality of performance (Pawson, 2005).
Several authors (Vickers, 1965; Lundholm, 1976; Elkington & Chamberlain, 1986) appeal to the educational and fitness value of this modality. In this paper, we will present part of the results of a larger study concerning the positive and negative motivations of synchronized swimmers towards the activity.

Methods
From a total population of 38 swimmers in the region of Lisbon, Portugal, a total of 31 have collaborated in our study. A sub-group of 11 are federated, competition athletes. The other 20, non-federated, belong to exhibition groups.

A specific questionnaire was used to understand how these athletes relate to their preferred sport. We inquired about what they prefer in the activity, and what they dislike the most in this practice, to completely open questions. The questionnaires were applied by direct application. The data was treated by content analysis, looking for the most frequent categories of answers, in order to better understand the subjects motivations.

Results
This study allowed us to bring out the most important factors influencing the practice, and some differences between federated and exhibition athletes.

The federated athletes, mostly used to practice for competition value mostly the expressive and creative aspects, related to the creation of the choreographies, followed by the pleasure of the contact with the water, on one side, and the team spirit and human relations. The synchronization movement music and the development of fitness qualities are also mentioned by approximately half of the subjects.

In the non-federated sub-group, the synchronization with the music/dancing aspects are the most valued, immediately followed by the importance of team work, the control of the body in the water and the variety of activity. In this sub-group, there are very few items they dislike in this activity.

The federated athlete has more negative impressions about the activity, mostly related to the bad moments in competition and problems with the evaluation, but also with the lack of infra-structures for the modality.

References.

Oral presentations (OP)

OP-SM02 Sports Medicine 2 - General

DOES STANDARD ISOKINETIC EVALUATION REFLECTS OF FIRST 30° RANGE’S RESULTS ON HEALTHY PEOPLE?
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Background: Clinicians generally use the peak torque (PT) of concentric hamstring (H) to PT of concentric quadriceps (Q) ratio (conventional H/Q ratio) and PT of eccentric H to PT of concentric Q ratio (functional H/Q ratio) for isokinetic strength evaluation in 90° of range of motion. But, the range for the angle of PT is between 40°-75° for the Q and 17°-47° for the H. And biomechanical and video analysis methods show us, non-contact ACL injuries frequently occur when the knee is close to full extension combined with some rotation of the tibia.

So, evaluation of the first 30° (ACL sensitive area) might be better than the evaluation of the full range.

Objective: This study was conducted to compare between the standard isokinetic results and first 30° range’s results.

Design: We evaluated cross-sectionally 31 healthy subjects (21 female and 10 male). We provided two teaching sessions for subjects to familiarize with the testing procedures for the isokinetic testing. All subjects had been tested bilaterally in four isokinetic conditions: one velocity (60°/s), two modes (concentric, reciprocal eccentric), two ranges (30°-limited, 90°-full). A one min rest between testing conditions allowed for re-adjustment of the isokinetic dynamometer.

We correlated between limited and full isokinetic evaluations.

Results: There was no correlation on functional H/Q ratio between limited and full range. But the study showed correlation on conventional H/Q ratio between limited and full range (r: 0.507, p<0.000). There were no correlation between functional H/Q ratio and conventional H/Q ratio for limited and full range.

Conclusion: These data indicate evaluation of the full range of isokinetic knee strength is not reflects limited range of knee strength. So, evaluation of the limited range might be better for ACL sensitive area.

THE INTERACTION BETWEEN EXERCISE AND CYCLOSPORINE-A IN ANTIOXIDANT CAPACITY AND OXIDATIVE STRESS IN MOUSE SKELETAL MUSCLES
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Cyclosporine-A (CsA) is a commonly used immunosuppressive agent in organ transplantation. CsA has been reported to reduce antioxidant capacity. Regular exercise training has been shown to increase antioxidant enzyme activities. The purpose of this study was to investigate the effect of exercise and CsA on antioxidant capacity and oxidative stress in mouse skeletal muscle.

Forty-eight adult female BALB/c mice were randomly assigned to one of the 6 groups: 0-Ex (no CSA, no exercise), 0+Ex (no CSA, exercise), 10-Ex (10 mg/kg/d CSA, no exercise), 10+Ex (10 mg/kg/d CSA, exercise), 20-Ex (20 mg/kg/d CSA, no exercise), 20+Ex (20 mg/kg/d CSA, exercise). The 3 exercise groups were trained 3 times a week at approximately 75% VO2max for 6 weeks. Activities of antioxidant enzymes, oxidative stress markers, and total antioxidant status (TAS) were analyzed in quadriceps with commercial kits. The data were analyzed by two-way ANOVA.

Data was presented as mean±SD. There were significant exercise, drug, and exercise x drug effects in SOD, GPX, and TAS. In non-exercise groups, CSA significantly reduced activities of SOD (0-Ex: 7.93±2.17, 10-Ex: 7.20±1.42, 20-Ex: 7.40±1.46 U/mg protein) and GPX (0-Ex: 1.84±0.28, 10-Ex: 1.48±0.24, 20-Ex: 1.56±0.26 U/mg protein) and TAS (0-Ex: 0.57±0.15, 10-Ex: 0.44±0.04, 20-Ex: 0.43±0.06 nmol/mg protein). On the other hand, exercise prevented the CsA-induced reductions in activities of SOD (0-Ex: 7.25±1.58, 10-Ex: 7.0±1.46, 20-Ex: 10.0±1.42 U/mg protein) and GPX (0-Ex: 1.55±0.28, 10-Ex: 1.63±0.30, 20-Ex: 2.03±0.27 U/mg protein) and TAS (0-Ex: 0.43±0.05, 10-Ex: 0.49±0.06, 20-Ex: 0.41±0.08 mol/mg protein). There were significant exercise, drug, and exercise x drug effects in protein carbonyl (PC) concentration. PC levels were similar in the 3 non-exercise groups (0-Ex: 92.9±30.4, 10-Ex: 74.1±50.1, 20-Ex: 71.5±20.2 nmol/mg protein).
The study compares the arthrokinematics of asymptomatic handball players with six handball players demonstrating borderline grade I internal impingement. Intra-articular glenohumeral kinematics was assessed by means of 3D reconstruction of helical CT-scans in 90° abduction/90° external rotation and the apprehension test pose. Osteokinematic ex/intershoulder rotation and posterior shoulder tightness was assessed goniometrically. Scapularoactivity motion was evaluated using electromagnetic trackers.

Internal impingement III presented with an augmented intra-articular external rotation angle (+32.3°, +28.6°, +32.7°) compared to the asymptomatic shoulders (AS: [-0.5°, ±0°]). In the apprehension test, III presented a posterior position of the humeral head on the glenoid (-6.8°, -7.4°, -6.2 mm) comparable to the AS (-7.6°, -8.5°, -6.4 mm) and also no apparent differences for superior position.

III presented with an internal rotation deficit (IRD) of -35.5±7.6° or 1.2 SD under the average in Meyers study (1), a posterior shoulder tightness of -8.9±1.2 mm or 1.0 SD under the average in Meyers study (1), and an external rotation gain of 30.6±3.7° or 2.4 SD above the average in Meyers study (1). This tightness has been hypothesized by Burkhart et al. (2) to result from shifting the glenohumeral fulcrum posterosuperiorly, hence increasing contact of the rotator cuff and labrum. However, despite the IRD and posterior shoulder tightness found, no significant differences in superior and posterior position of the humeral head on the glenoid cavity could be demonstrated with external rotation. As such, IRD and posterior shoulder tightness may be related to internal impingement but not in the hypothesized causal cascade point of view. The only difference found between II and AS was the enhanced intraarticular glenohumeral external rotation. II might be compounded with scapula dysfunction. Recently, Laudner et al. (3) demonstrated that throwers with II exhibit an increased sternoclavicular elevation during humeral elevation from 30 to 120°, an increased posterior scapular tilt position and a more protracted scapula. However, in this study scapularoactivity position and rotation during scaption remained within one SD of the AS measurements presented by Laudner et al. (3).

lipids and glucose. Furthermore, a prospective analysis, pre and post the intervention analysing 60 obese children of the same age with respect on equal parameters. Additionally non-invasive sonographic measurements of carotid IMT were performed. Results: Main outcomes of the retrospective study were as follows: Average BMI of 31.72 kg/m² (+/- 5.73) at the beginning and of 28.56 kg/m² (+/- 5.20) at discharge, equivalent to an average reduction of 10% body weight. Systolic blood pressure in 25.1% of the patients above the 95th percentile, total-cholesterol in 69.9% above age related norm values, LDL-cholesterol in 73.4% increased, glucose in 41%. A stra ng positive association (p<0.01) of the pathologies with weight classifications was found. Especially in extreme obese patients, significant reductions of all examined parameters were investigated after the intervention. Prospective study: IMT with a mean of 0.517 +/- 0.049mm was above age related healthy peers without significant reduction at discharge.

Conclusions: There is a high incidence of subclinical and evident cardiovascular and metabolic disease. The alterations of the analyzed cardiovascular risk factors were positively associated with the weight loss throughout the intervention program. Increased IMT is present in the obese paediatric population. In advantage to invasive diagnostics, the ultrasound measurement can demonstrate the effect of the intervention program clearly on the level of the vascular system since it enables an insight into the health of the blood vessel, but obviously pathological changes need longer time to be reduced.

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PHYSICAL ACTIVITY IN DIABETES PATIENTS AND HEALTHY SUBJECTS
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BACKGROUND: Physical activity is a well recognized and recommended treatment for diabetes patients. However, the physical activity levels among elderly diabetes patients and age matched healthy subjects are not well known. The purpose of this study was to measure long-term physical activity among coronary artery disease (CAD) patients with type II diabetes and age matched healthy subjects.

METHODS: Maximal oxygen uptake was measured by bicycle ergometer with 12-lead ECG recordings for 12 healthy subjects (61±5 years) and for 13 CAD patients with diabetes (age 61±5 years). None of the healthy subjects have any clinical changes in ECG during exercise test. After the exercise test the physical activity was measured over 7 days during waking hours by Polar AW200 device.

RESULTS: The maximal oxygen uptake was 23±6 ml/kg/min for patients and 30±7 ml/kg/min for healthy subjects (P<0.05). The average physical activity measured over 7 days was 25±5 kcal/kg/waking hours for patients and 31±4 kcal/kg/waking hours for healthy subjects (P=0.005) corresponding as an average 1.96±0.27 vs. 1.62±0.39 METs (P<0.05). Patients had a higher BMI (30±4 vs 25±4, P<0.005) and HbA1c levels (6.0±0.8 vs. 5.2±0.3, P<0.03) compared with healthy subjects. Systolic and diastolic blood pressure was at the same level between patients and healthy controls (85±6/141±17 vs. 84±4/141±19 mmHg, for patients and healthy subjects, respectively).

CONCLUSIONS: Elderly diabetes patients have reduced physical activity compared to age matched healthy subjects. Community wide strategies to increase physical activity among diabetes patients are warranted.

VEGF CONTENT AND BLOOD FLOW IN HUMAN PATELLA TENDON AFTER ACL RECONSTRUCTION
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ACL ruptures are common sports injuries, and surgically obtained autographs from the mid-portion of the patellar tendon are routine procedures for reconstruction. However, this has a severe impact on the patella tendon with poor healing prognosis. Generation of patellar tendon after autograft surgery has remained an under-researched area and the aim of this study was to examine progression of the healing in the mid-portion of the patella tendon after surgery and the involvement of different growth factors. One of these growth factors with a potential role is Vascular Endothelial Growth Factor (VEGF), a major angiogenic factor (Petersen et al., 2003).

Subjects underwent ACL reconstruction six (n= 7) and 24 months (n= 7) prior to the experiment. Microdialysis catheters were inserted through the peritendinous space at mid-patella to measure the content of VEGF (Langberg et al., 1999). The blood flow in the area was determined with the Ultrason-sonography Doppler technique. The contralateral, healthy tendon served as a control.

Six months post surgery, patellar tendon revealed increased VEGF synthesis and enhanced blood flow compared to control (P< 0.05).

Both VEGF and blood flow were back to basic and not significant different from the control tendon 24 months following harvesting.

The observed increase in blood flow 6 months post surgery indicates that neovascularisation in the mid-portion of healing tendon takes place and that VEGF may play a role in the healing response in traumatized tendon. Although augmented blood supply might benefit regeneration, VEGF is also known to be related to induction of hyperemia in degenerative tendon. Noteworthy, the results suggest a relatively short-termed response due to the decline of increased blood flow 24 months post operation, i.e. an induction of new blood vessels as an early phase response, which decreases again during tendon regeneration.

The present study reveals VEGF induction and enhanced blood flow in human tendon after ACL reconstruction and proposes essential healing mechanisms. I recommends further studies on VEGF, its potential role in angiogenesis of regenerating tendon and possible negative effects of VEGF.

References.
KNEE INJURIES IN TEAM SPORTS: EVALUATION AND ASSESSMENT OF RISK FACTORS
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Purpose: Presently, there is a trend towards individualising the training process in team sports to efficiently develop the respective athletes' performance. With regard to sports injuries, such a development would be desirable for preventive training as well. Up to now, injury prevention measures are generally used for an entire team. Thus, individual factors predisposing single athletes for specific injuries remains disregarded. Similarly to performance diagnostics in ball sports, there is a need for assessment tools to evaluate the athletes' predisposition for specific injuries according to established risk factors. A suchlike prediction of injury risk could result in individualised injury prevention training.

Methods: Sports club members who reported their injury to the insurance company received a questionnaire containing questions with regard to the circumstances of the accident, the injury itself and the treatment. Currently, the database contains approximately 170,000 sports club injuries. Information on gender, age, previous injuries, height, weight and BMI will be included in analyses. Additionally, literature relating to intrinsic risk factors and assessment tools has been compiled.

Results: Analysing German club sports, football (fb), handball (hb), basketball (bb) and volleyball (vb) result in highest frequencies of injuries. In these ball sports the lower extremities are most frequently injured (fb=61.5%, hb=51.7%, bb=62.1%, vb=69.9%). Muscle strains as well as ankle and knee ligament sprains are dominating. Since knee ligament and more precisely ACL injuries are not only frequent but also serious injuries, they have been analysed concerning risk factors in the following. Thereby, according to the residuals, the relation between knee ligament injuries and female gender, previous injury as well as higher age is higher-than-average. Moreover, residual values for knee injury prevention tools do not seem to be related to knee ligament injuries.

Conclusions: Aiming to own data analyses and a literature review female gender, previous injury and higher age are well-established risk factors for knee injuries. Additionally, an increased Q-angle, general ligament laxity, mechanical instability of the knee, excessive foot pronation as well as proprioceptive and strength deficits seem to be risk factors, all abetting a dynamic valgus position being a risk factor itself. Measures to assess the respective risk factors for knee injuries are suggested. They encompass assessment of leg alignment, mobility, stability and functional movement. Thus, athletes at risk may be identified and consequently may be given the chance to work up their individual deficits to prevent knee injuries.

GLYCINE-ARGININE-ALPHA-KETOISOCAPROIC ACID DOES NOT IMPROVE PERFORMANCE OF REPEATED SUPRAXIMAL CYCLING SPRINTS IN TRAINED CYCLISTS
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Amino acids are essential for protein synthesis and muscle formation and are involved in numerous metabolic pathways affecting exercise metabolism. Consequently, it has been suggested that athletes involved in intense training and competition, supplement their diet with specific amino acids. For example, oral supplementation with glycine-arginine-alpha-ketoisocapric acid (GAKIC) has previously been shown to improve performance during exhaustive high-intensity anaerobic isokinetic exercise [1] and attenuate the decline in mean power during five repeated cycle sprints [2]. PURPOSE: The aim of the present study was to examine the effects of GAKIC on fatigue during repeated supramaximal repeated cycle sprints in trained cyclists. METHODS: After at least two familiarisation tests, seven well-trained male cyclists (Aged 25-44 years) completed two supramaximal sprint tests each involving 10 sprints of 10 s separated by 50 s rest intervals on an electrically braked cycle ergometer. Computer software was used to calculate mean and peak power output and the fatigue index. During a period of 45 min prior to the two experimental trials, subjects ingested 11.2 g of GAKIC (2.0 g glycine plus 6.0 g l-arginine monohydrochloride plus 3.2 g (alpha)-ketosocaproic acid calcium salt) or placebo (Pl) (composed of 9.46 g sucrose plus 3.2 g calcium carbonate) administered in a randomised and double blind fashion. Supplements were dissolved in 450 ml of sugar free fruit juice, divided into 3 equal aliquots of 150ml and consumed 30, 20 and 20 min prior to the trial. RESULTS: Peak power declined from the 1st sprint (mean +/- s.d.) (Pl: 1332 +/- 307, GAKIC: 1367 +/- 342 W) to the 10th sprint (Pl: 1091 +/- 229, GAKIC: 1061 +/- 272 W) but did not differ between treatments (P=0.88). Power mean declined from the 1st sprint (Pl: 892 +/- 151, GAKIC: 892 +/- 153 W) to the 10th sprint (Pl: 766 +/- 120, GAKIC: 752 +/- 138 W) but did not differ between treatments (P=0.96). In general, the fatigue index remained stable at ~38% throughout the series of sprints and did not differ between treatments (P=0.99). The subjective rating of perceived exertion increased from 766 +/- 120, GAKIC: 752 +/- 138 W) but did not differ between treatments (P=0.99).

MONITORING TRAINING LOAD IN YOUNG ELITE SOCCER PLAYERS
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Monitoring training load in young elite soccer players is important for optimizing their performance and avoiding overtraining. Methods using Rate of Perceived Exertion (RPE) have become popular for this purpose, especially in endurance athletes. However, validity of this method is largely unknown, especially in young elite soccer players [1]. The purpose of this study was to validate the RPE method in young elite soccer players by comparing the RPE method with the Modified TRIPW method, a well-known method based on heart rate measurements [2].

References:

MONITORING TRAINING LOAD IN YOUNG ELITE SOCCER PLAYERS
Lemmink, K., Brink, M.
University Medical Centre Groningen, University of Groningen, Netherlands

Monitoring training load in young elite soccer players is important for optimizing their performance and avoiding overtraining. Methods using Rate of Perceived Exertion (RPE) have become popular for this purpose, especially in endurance athletes. However, validity of this method is largely unknown, especially in young elite soccer players [1]. The purpose of this study was to validate the RPE method in young elite soccer players by comparing the RPE method with the Modified TRIPW method, a well-known method based on heart rate measurements [2].
Two age groups of young elite soccer players, i.e., 17 players with a mean age of 17.8±0.4 years and 14 players with a mean age of 14.6±0.5 years, all playing for a professional soccer club on the highest level in the Netherlands, participated in the study. Four respectively 6 training sessions with different training intensities were monitored in the oldest and youngest age group using the RPE method (RPE × duration) and the (modified) TRIMP method. Data were analyzed using Pearson Correlation Coefficients.

In both age groups results showed a reasonable relationship between the RPE method and the (modified) TRIMP method with correlation coefficients of 0.67 and 0.65 for the oldest age group and 0.66 and 0.67 for the youngest age group (p<0.01). At individual level, 24 out of 31 players showed a correlation coefficient of 0.80 or higher.

The RPE method seems a reasonable method to monitor training load of a team of young elite soccer players on a daily and weekly basis. However, some players have problems in rating the perceived exertion of their training sessions. Those players should be trained properly in using the RPE method.

References.

ATHLETIC PERFORMANCE EVALUATION SYSTEM
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In order to design an athlete’s follow-up or training program, a quantitative knowledge of the evaluated physical condition is needed[1]. The use of technology in this task[2] is becoming more usual, introducing automation and new insight to the evaluation process and results.

We present a pilot installation for an integrated athletic performance monitoring and evaluation system, which comprehends: (a) wireless measurement sensors and data acquisition hardware, (b) data analysis and reporting software modules, and (c) integrated athlete and protocol management software modules. The system works on a workstation/protocol basis. Each workstation is instrumented with a wireless measurement unit that collects the signals from the corresponding sensors. The acquired data is transmitted in real time to a base station via Bluetooth, where they are processed and represented. Each workstation is instrumented with the appropriate wireless sensor kit and can assess multiple parameters. The athlete has real-time feedback about his performance during the evaluations, with automated visual and acoustic aids to support the protocol execution.

The athlete’s progress history can be accessed allowing the follow-up and performance gains comparison throughout different evaluation sessions. The software consists of 5 modules: sensor control, acquisition and display, automatic signal processing, reporting and database. Currently three workstations are predefined: (a) leg-press: with force sensors for evaluation force production characteristics of the lower extremities, (b) jumping: with a force platform for evaluation of reactive force and related parameters in squat, countermovement and drop jumps; and (c) multi-power device: with a displacement sensor and a force platform for evaluation of dynamic parameters, such as power and velocity [3, 4].

Each evaluation session is defined by a protocol that is specifically created by the coach for the athlete, in which he chooses what workstations and evaluations will be executed by the athlete as well as their sequence. This provides a comprehensive evaluation which objectively shows the athlete’s strengths and weaknesses, allowing the design of a specific and optimized training program.

References.

TALENT IDENTIFICATION IN YOUNG BASKETBALL PLAYERS
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Introduction
Talent Identification (TID) is crucial for the selection of high performance athletes. Yet, TID is most frequently based on subjective criteria (coaches’ perception). The aim of this study is identifying the variables that best predict U-16 masculine basketball players’ success using different groups of variables.

Methods
Our sample consists of 83 Basketball male athletes aged 14-16. The morphological variables were obtained according to ISAK norms described by Fragoso & Vieira (2005). The equations of Slaughter et al. (1988) and Lohman (1986) were used to calculate relative fat and the ones proposed by Carter (1996) to determine somatotype. Fitness level was assessed with 7 field tests and questionnaires were used to assess technical/tactical and psychological variables. Maturational measures consisted of a skeletal age evaluation obtained according to TW3 method (Tanner et al., 2001) and the sexual maturity was self-evaluated according to Tanner (1962). The descriptive statistic and the logistic regression were generated by SPSS 15.

Conclusion
The explaining variables included in the final model were: sitting height (SH), horizontal jump (HJ) and long basketball throw (BT). The logit of the fitted logistic regression model is:

\[ g(x) = -84.113 + 0.725 * SH + 1.839 * BT + 0.058 * HJ \]

The odds ratio showed that an increase of one centimetre in SH almost duplicates the probability of being selected, that one cm more in BT, the same probability increases 6.3 times and for each cm increase in HJ the probability only raises 1.1 times.

The adjusted model is significant (2 loglikelihood = 25.537, p< 0.001) and shows a R2 of Nagelkerke of 0.843. Regarding the percentages of correct classifications found to the model described (93.9%) we may conclude that it seems to be an adequate one for talent identification in this sport.
ANALYSIS OF PLAYER INTERACTIONS IN SMALL-SIDED SOCCER GAMES

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Both time-motion and notational analyses have identified key determinants for successful performance in soccer. From this, optimal strategies and tactics are developed. However, less attention has been paid directly to tactics and player interactions in soccer. Yet, professional soccer clubs ‘scout’ their opponents, in order to identify patterns in game play. Therefore, tactics seem to be a crucial factor for success. This is supported by findings of Borrie et al. (2002), who have shown that successful teams display more and richer patterns, whereas compared to less successful teams. In this light, dynamical systems theory (DST) provides a sound theoretical framework for the analysis of player interaction patterns in match situations. Previously, McGarry et al. (2002) suggested that during a match, players are coupled. These couplings are not fixed, but formed and broken continuously, both within and between players and teams. In this study, the purpose was to investigate these couplings. Therefore, we analyzed players’ speed and acceleration profiles during 4 small-sided soccer games (4-a-side). Positional data (x,y) of elite youth soccer players (U19’s) was recorded at 1000Hz, using Local Positioning Measurement (LPM, Inmotio Object Tracking, Amsterdam, the Netherlands). In addition, the centers of both teams (mean(x,y)) were analysed similarly. Cross-correlations of speed and acceleration profiles were calculated over sliding 2,5s intervals, for all individual players and the centers of both teams. Preliminary results show that overall, all players are positively cross-correlated during small-sided games. Smallest player coupling values are found for both goalkeepers with all outfield players. On numerous occasions, decreases in couplings coincide with critical moments in the game, indicating perturbations. Finally, analyses show that calculations of cross-correlations are more sensitive for player interaction patterns in match situations. It can be concluded that couplings between individual players and between teams can be measured properly using cross-correlations of acceleration profiles when compared to speed profiles. It can be concluded that couplings between individual players and between teams can be measured properly using cross-correlations of acceleration profiles. In addition, results indicate that perturbations can be identified by decreased or negative correlations. These analyses are very promising in the light of dynamical systems and performance analysis and require further investigation. Above results will be discussed along with practical implications and suggestions for future research.

References.


Oral presentations (OP)

OP-TT05 Training and Testing 5 - Training

RESISTIVE TRAINING OF VARIOUS INTENSITIES: EFFECTS UPON FORCE-VELOCITY AND MORPHOLOGICAL INDICES

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The study was designed to reveal the effect of resistive training intensity upon physiological and morphological indices of trained muscle. Responses to 8-week resistive training at various intensities were investigated in 30 male subjects using a leg press exercise machine. Training loads were approximately 20-25%, 60-70% and 85-90% of one repetition maximum (1 RM) for low (LI), medium (MI) and high intensity (HI) training groups, respectively. The medium intensity training was performed without relaxation, i.e. under conditions of restricted blood supply. The total work done during the training session was identical for 3 groups. The increments of muscle strength in trained multi-joint movement were quite different in LI- and HI-groups, but in one-joint movement (knee extension) differences between the groups disappeared. It might be connected with biomechanics of movements and with the types of muscles involved. Velocity trained HI-group demonstrated the lowest increases of maximal speed of leg extension. Maximal increases of speed were recorded in HI-group which used highest external loads with rather slow speeds. That observation confirmed the speculation that muscle contraction speed is a function of its strength potential. Analysis of knee extension isokinetic torques produced under concentric and eccentric conditions revealed no differences between HI- and LI-groups. Medium intensity training without relaxation did not induce strength increments in eccentric regime. This result might be connected with practically absent stroke loads in MI-group in comparison with other groups. Medium intensity training without relaxation led to a decrease of IEMG-activity of m. vastus lateralis during maximal knee extensions in the whole range of angular velocities tested. At the same time HI-group demonstrated the opposite tendency and LI-group did not demonstrate significant changes of IEMG activity. We believe it to be connected with the organization of motor command in groups. Resistance to fatigue during 45 rhythmic contractions of knee extensors increased after medium intensity training without relaxation and did not change after training of two other types. Three training regimes affected the size of trained muscles in different ways. In HI-group an increase of size for muscle fibers II was noticeably higher than for MF I. In MI-group the increases of size for MF of both types were similar, whereas after low intensity training the...
SUPPLEMENTAL TRAINING TO IMPROVE DANCE TECHNIQUE: THE EXAMPLE OF FRONTAL FALL SKILL

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To improve technique and prevent injuries, dancers need to follow a conditioning program. This plane can balance strength and flexibility in order to prepare the bodies for classes, rehearsals and performances.

Dance classes are not enough to develop those qualities, because the learning process of dance technique takes of the time, developing patterns of coordination required for specific dance movements.

The ballet technique and other dance styles might contribute to muscular imbalances. We need good dance conditioning programs to complete the work in technique classes.

In this study we analysed the frontal fall, a skill of modern dance technique that requires strong arms and shoulder girdle muscles and strong trunk flexors. Dancers, particularly the female dancers, have many difficulties (fear, light wrist injuries, etc.) in performing this skill.

In most technique classes, lot of time is spent exercising the lower limbs and, to a lesser extent, the torso and upper limbs. The majority of dance students are not prepared to dive to the ground and support their bodies’ weight.

Twelve female dance students participated in the experiment, ranging in age from 19 to 24 years. All subjects were enrolled in dance classes for 1 hour and a half to 3 hours a day, four to five times a week.

To evaluate the arms and torso strength it was applied the Push-ups and Sit-ups tests. For the evaluation of shoulder and torso flexibility it was used the tests of back-scratch and trunk-lift.

The duration of the conditioning program was twenty minutes, three times a week during five weeks. It consisted of a five minutes warm-up period, ten minutes of coaching and five minutes to cool-down. In spite of the diversity of exercises, all focused on the muscles groups mentioned before (shoulder, arm and trunk).

Six parameters were considered to evaluate the skill before and after the conditioning program: forward projection of the trunk, elbows position, lower limbs position, movement fluidity, control of the body when contacts the ground, and evident effort.

Statistical analysis of data collected shows no significant difference between the two moments of evaluation of the frontal fall. Program duration might have been too short to achieve results. We are applying the same test during a longer period (8, 10, 12 weeks) and results will be presented later.

EFFECTS OF 8 WEEKS OF HEAVY RESISTANCE CIRCUIT TRAINING VS. TRADITIONAL STRENGTH TRAINING ON PHYSICAL PERFORMANCE AND BODY COMPOSITION: A PILOT STUDY

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INTRODUCTION: Circuit training effectively reduces the time devoted to strength training while allowing an adequate training volume to be achieved. Nonetheless, circuit training has traditionally been performed using relatively low loads for a relatively high number of repetitions, which is not conducive to maximal muscle size and strength gain. PURPOSE: To compare the effects of 8 wk of heavy resistance circuit training (HRC) vs. traditional strength training (TS) on physical performance parameters, metabolic response and body composition.

METHODS: Twelve healthy subjects with strength training experience were randomly assigned to a HRC (n=6) (22.2 ± 1.6 years; 71.1 ± 6.0 kg; 176.4 ± 3.0 cm) or to a TS (n=6) (22.5 ± 2.1 years; 72.7 ± 7.9 kg; 179.3 ± 5.6 cm). Training consisted of weight lifting 3 times a week during eight weeks. Prior to and at the end of the training program, maximum dynamic strength (1RM) on bench press and half squat exercises, peak power output in both exercises using resistances of 30%, 45%, 60%, 70%, and 80% of 1RM and body composition (DXA) were determined. In addition, maximum lactate (Lactmax) was obtained after a 30 s Wingate test. T-tests for dependent and independent samples were used (p<0.05).

RESULTS: There were no between-group differences. The data confirm that upper limb (UL) and lower limb (LL) 1RM significantly increased in both groups (HRC = 23.6 ± 15.1%, and 27.7 ± 16.8%, and TS = 15.0 ± 7.0% and 19.1 ± 8.0%, respectively). In addition, UL peak power at 30% and 45% of 1RM was significantly higher in post-test for the groups (HRC = 15.8 ± 14.2%, and 15.8 ± 14.5%, and TS = 11.5 ± 7.4% and 20.6 ± 18.4%, respectively), and significantly higher at 70% of 1RM in TS group (17.3 ± 14.4%), while LL peak power was only increased significantly at 45% of 1RM (34.2 ± 24.0%) in HRC group. Lactmax was significantly higher after the training in the HRC group (HRC = 15.4 ± 10.8% vs. TS = 7.82 ± 10.6%). Regarding body composition, significant increases were found in the total body area, and a tendency to signification (p = 0.054) was established in the total lean mass in TS (3.6 ± 3.2%). CONCLUSION: The HRC and TS were effective methods to improve 1RM and peak power output, the metabolic response was greater in the HRC while the TS seemed to be more appropriate than HRC for enhancing lean mass.

References.

PLYOMETRIC TRAINING AND VERTICAL JUMP HEIGHT PERFORMANCE: A META-ANALYSIS

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It is commonly accepted that plyometric training improves vertical jump height (VJH). However, the effectiveness of plyometric training depends on various factors. A meta-analysis of 56 studies with a total of 22% size effects (ES) was carried out to analyze the role of various factors on the effects of plyometric training on VJH performance. The inclusion criteria for the analysis were: a) studies using plyometric training programs for lower limb muscles b) studies employing true experimental design and valid and reliable measurements; c) studies including enough data to calculate ES. According to the results, subjects with more experience in sport obtained greater enhancement in
vertical jump height performance (p<0.01) On the other hand, subjects in both good and bad physical condition benefit equally from plyometric work (p<0.05), although men obtain better power results than women following plyometric training (p<0.05). With relation to the variables of performance, training volume for more than 10 weeks and with more than 20 sessions, and to utilize high intensities programs with more than 50 jumps per session were the strategies that will maximize the probability to obtain significant greater improvements in performance (p<0.05). Other important conclusion was that in order to optimize jumping enhancement it would be recommended to combine different types of plyometrics (squat jump+countermovement jump+drop jump) compared to to utilize only one form (p<0.05) Although, better results are obtained with treatment in dry rather than in wet conditions, no extra benefits gained from doing plyometrics with added weight were found. These conclusions are essential for the strength and conditioning professional to consider the most appropriate plyometric training approach based on the fundamental movement patterns, technique, volume and intensity, energy system requirements, and potential injury analysis for a given sport.

EFFECTS OF WEIGHTLIFTING TRAINING ON KNEE MUSCLE CO-CONTRACTION AND VERTICAL JUMP POWER

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Introduction: The efficient coordination of agonist and antagonist muscles is an important early training adaptation. However, little research has been conducted on the role of training on agonist and antagonist muscle interplay and power improvement. Weak antagonist muscles may limit speed of movement (1) consequently, strengthening them may increase training results (2). The purpose of this study was to examine the effects of 8-weeks Olympic weightlifting training on muscle co-contraction and vertical jump performance.

Methods: Nineteen males (age = 20.4 ± 2.6 years, height = 175.8 ± 5.3cm, mass = 71.9 ± 3.5kg) randomly divided into 2 groups, the Weight Lifting (WL), and the Control (C) groups performed a 8-week programme (3sessions / week, 4 sets of 5 exercises at 80-100% of 1 Repetition Maximum ). Participants performed 3 vertical jumps squat jump(SJ), countermovement jump (CMJ) and drop jump (DJ), from 20, 40, 60 cm, onto a force platform. Electromyographic (EMG) activity of rectus femoris (RF) and biceps femoris (BF). Signals were sampled at a frequency of 1000 Hz. Co-contraction index was assessed as the BF to RF EMG activity ratio (BF/RF).

Results: Analysis of variance with repeated measures showed that, maximum height significantly (p<0.05) improved in all jumps for the WL group. The WL group increased significantly concentric power during CMJ and DJ60cm and eccentric power in DJ60cm. The co-contraction ratio decreased significantly (p<0.05) during the eccentric phase of CMJ and DJs. The results indicated significant changes in EMG activity of RF with simultaneous reduction of BF EMG activity, especially in eccentric phase of vertical jumps.

Discussion/conclusion: Our results confirmed the adequacy of Olympic weight lifting exercises in improving vertical jump performance. The mean power gains were accompanied by significant increases in neural activation of the agonist (RF) muscles recorded in both eccentric and concentric phases with significant reductions in the antagonistic co-activation during the eccentric phase of the vertical jump. The reduction of antagonistic muscle activity after power training may assist to reduce the braking phase duration about halfway the push off phase. In turn, this may increase resultant power. Olympic lifting exercises seem to be effective in improving jumping performance by reducing co-activation and improving muscle coordination.

References:

THE EFFECTS OF WEIGHTED ROPE JUMP TRAINING ON STRENGTH PERFORMANCE IN ADOLESCENT VOLLEYBALL PLAYERS

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Introduction: Rope jumping can be used to develop coordination of neuromuscular skills, muscular strength, and cardiovascular endurance. The aim of this study was to investigate the effect of a 12-week rope jumping and weighted rope jumping exercise programme on body composition and strength performance of female adolescent volleyball players.

Method: Twenty-six female volleyball players (age:14.66±1.16yrs) who had at least 2 years volleyball experience were recruited to participate in the study and were divided into there groups. Group 1 took on the weighted rope jumping (WRJ;n =8) diet as well as volleyball training, Group 2 on rope jumping (RJ;n=9) diet as well as volleyball training and Group 3, the control (C;n=7), participated only volleyball training. The exercise sessions were carried out 3 times each week for 12 weeks. Percentage body fat and subsequent fat free mass were estimated using Sloan and Weir’s equation. The hand grip strength of the subjects was measured by using Takei Grip-D trade mark hand dynamometer. Sit-ups and push-ups for 30 s for endurance and standing long jump, Sergeant Jump, and medicine ball javelin tests for lower and upper extremity muscular strength were applied to the subjects as described before.3 The effects of these exercise programs on subjects’ performance on the body composition and strength were analyzed with Kruskal-Wallis test.

Results: There was not a considerable change in the body weight among three groups exercising rope jumping. There was a decrease of the body fat between WRJ and RJ groups (p<0.01). The values of WRJ group were highly increased for the mean of sit-ups, standing long jump and the values of throwing the ball to the front part with two hands (p<0.01). There was a significant difference in the values of push-up, right hand grip strength at the end of training both two groups. Moreover, a considerable gap was determined between values of WRJ and C groups for left hand grip strength (p<0.01).

Discussion / Conclusions: Hong4investigated the effect of 8-week rope jumping training program on the development of neuromuscular coordination. It was determined that the rope jumping increased the neuromuscular coordination at a meaningful level (p<0.01). In this study a group doing exercises for 12-week programme with weighted rope would be gained a considerable power. The results indicate that a weighted rope jumping exercise programme has the potential to improve shoulder performance in a number of muscle strength and functional activities in volleyball players.

References:
3. Hong Y. Neuromuscular Coordination to Rope Skipping Training: Kinematics and Emg Study, 5 th IOC World Congress on Sport Sciences, 31 October- 5 November, Sydney.
REMOTE COACHING
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A system architecture for monitoring, transmitting and processing performance data in sport is proposed. Sensors acquire the relevant performance data, the digitized signals are transmitted to a mobile client over a wireless interface (Bluetooth, ANT) and from this sent to an internet server. Coaches and sports scientists may thus give fast feedback not only at the training site but also from remote locations.

In more detail, physical and physiological values (e.g. force, acceleration, pressure, heart rate, breathing rate) are collected from the athlete with appropriate sensors. The produced analog signals are then digitized using a µC (Microchip PIC) with integrated ADCs (analog/digital converters). After preprocessing the signals (offset, scaling, filtering) either a Bluetooth or an ANT module is used to establish a connection between the measurement device(s) and a mobile client (e.g. PDA, Smartphone) in order to transfer the data (serial data stream). On the mobile device an embedded RichClientPlatform Application (eRCP) handles the Bluetooth communication to the sensors and the data storage process. Depending on the connection status (offline/online) the captured data are buffered either temporary local or transmitted directly to the server database (DB2everyplace). Possible communication profiles for the internet connection are GPRS, UMTS, and if available also WLAN.

Basically, the framework described above allows to monitor physical performance parameters of athletes and, moreover, to use the bidirectional route to positively affect the training process. Coaches, athletes and sports scientists (e.g. from the areas of exercise physiology or biomechanics) should be able to use this system not only at the training site but also from remote locations. It is not necessary to have a continuous internet connection during exercising. In case of interruptions the data will be buffered locally and sent later.

The different components of the system are currently developed in parallel. Upon availability of the complete system, coaches and sports scientists (experts) will be in a position to give rapid feedback to athletes during training (online training sessions) from any remote location having internet access. Athletes may easily compare their performance to others or put it in relation to norm profiles during exercising. Information exchange between athletes could be facilitated. Moreover, the system could be applied for training documentation purposes and as a tool to illustrate media presentations.
Results of various studies will be presented. In cross-sectional designs opposite stimuli conditions (high- and zero-load) at high level of hypoxic or mechanical stimulation, often is so low and the intra-group variability is so high traditional statistical testing cannot indicate the magnitude of effects that can be attributed to known physiological mechanisms, such as vessel degradation and/or formation after pre-adaptation. In groups of low level of performance, i.e. pre-adaptation, indicate a variety of subtle physiological responses that can be in-line with traditional physiological interpretation or are completely contradictory. This result is similar to those groups of low level of performance. In longitudinal studies the magnitude of effects that can be attributed to known physiological mechanisms, such as vessel degradation and/or formation after hypoxic or mechanical stimulation, often is so low and the intra-group variability is so high traditional statistical testing cannot indicate significant results.

Summary

Physiological models that lead to physiological pathways in the sense of multiple cause-effect chains are so complex that the attempt of an empirical verification of hypotheses normally is only possible under extremely controlled situation with homogenous groups of subjects at a low level of pre-adaptation. In groups of high-level pre-adaptation the magnitude of the stimuli often is too low, the time-course of effects normally is so inhomogenous and the individuality of the response is so high that statistically significant results are rare.

**Summary**

Physiological models that lead to physiological pathways in the sense of multiple cause-effect chains are so complex that the attempt of an empirical verification of hypotheses normally is only possible under extremely controlled situation with homogenous groups of subjects at a low level of pre-adaptation. In groups of high-level pre-adaptation the magnitude of the stimuli often is too low, the time-course of effects normally is so inhomogenous and the individuality of the response is so high that statistically significant results are rare.
TESTING AND MONITORING TECHNIQUES TO DETERMINE INDIVIDUAL PHYSIOLOGICAL ADAPTATIONS AND ACUTE RESPONSIVENESS TO TRAINING IN ELITE ATHLETES

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Athletic excellence has been defined as the ability to maintain technical excellence, at speed, under pressure and when fatigued (adapted from Goldsmith, 2003). An analysis of the performance gap should include a performance technical analysis, also recognizing that the continuum of performance from optimal to under-performance is influenced by the competitive schedule and sequence of training on physiological, technical, psychological, tactical and health factors. Testing - the measurement of chronic structural and functional adaptations to training and monitoring techniques measuring acute functional responses to exercise provide tools for predicting and assessing stimuli effects. Outcome variables should be known to impact performance, be reliable and sensitive to training. Furthermore, test selection including submaximal, incremental, constant load, time-trial, and/or maximal tests can impact the timing of testing and the psychological effect on the athlete and coach. Thus regular physiological testing, anthropometric and nutrition assessments should be programmed into the Yearly Training Plan. A profile may be constructed of specific and non-specific tests establishing a performance time curve from short to medium duration including a 4 to 5 min exhaustive test together with a maximal lactate steady state evaluation. Monitoring techniques including blood profile, heart rate variability, orthostatic response and heart rate and lactate measures within a training set provide time-sensitive functional response data to the coach that should be evaluated against the sequence of training undertaken. Sport scientists conduct many different tests but monitoring/t test selection, timing, interpretation and action steps in conjunction with the coach are the keys to success.


Invited symposia (IS)

IS-PM08 Intermittent hypoxia for the improvement of performance

DOES INTERMITTENT HYPOXIA IMPROVE PERFORMANCE AT SEA LEVEL?

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Two modalities of applying hypoxia at rest are reviewed in this overview. Intermittent hypoxic exposure (IHE), which consists of breathing hypoxic air for 5 - 6 minutes alternating with breathing room air for 4 - 5 minutes during sessions lasting 60 - 90 minutes, and prolonged hypoxic exposure (PHE) to normobaric or hypobaric hypoxia over up to 3 hours per day. The level of normobaric hypoxia used with IHE is usually in the range of 12 - 10 % O2, corresponding to an altitude of about 4000 - 6000 m. Normobaric or hypobaric hypoxia in studies applying PHE corresponds to altitudes of 4000 - 5500 m. Five of 6 controlled studies applying IHE and all 4 well controlled studies using PHE did not show a significant improvement with either modality of hypoxic exposure for aerobic or anaerobic performance at sea level after 14 - 20 sessions, with the exception of swimmers in whom there might be a slight improvement by PHE in combination with a subsequent tapering. There is no direct or indirect evidence that IHE or PHE induce any significant physiological changes that might be associated with improving athletic performance at sea level. Therefore, IHE and PHE cannot be recommended for preparation of competitions held at sea level.

IS INTERMITTENT HYPOXIA HELPFUL IN PREPARATION FOR HIGH ALTITUDE EXPOSURE?

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Ascend to high altitude frequently causes high altitude illnesses. In most cases this is the harmless but unpleasant syndrome of acute mountain sickness (AMS). In some cases, however, harmful high altitude pulmonary (HAPE) or cerebral edema (HACE) may develop, particularly at altitudes above 4000 m. It has been shown that major determinants of the prevalence of these illnesses are individual susceptibility, absolute altitude reached, rate of ascent and the degree of pre-acclimatization. For a particular mountaineering trip the first two are given, whereas the last two can be modified. Reducing the rate of ascent is often not possible. Thus pre-acclimatization is often the only option to avoid or reduce severity of altitude illnesses. Since acclimatization at natural altitude is very time consuming and usually also expensive, attempts were made to acclimatize with repeated exposures to simulated altitude at rest or during exercise. Studies examining the effect of intermittent hypoxia at rest or during sleep used a variable time of exposure from 1.5 - 10 hours during 5 - 18 sessions at altitudes from 3000 - 6000 m. Reported results from these studies are inconsistent. While most of them showed an increased hypoxic ventilatory response only some also showed an increase in ventilation and/or an improvement of oxygenation during a subsequent hypoxic exposure. The fact that alterations in the hypoxic ventilatory response are still detectable several days to weeks after the end of the acclimatization period point to a carry over effect for ventilatory acclimatization. The few studies examining symptoms of AMS consistently report reduced severity of AMS. A weak point of almost all studies in this field is the low number of subjects and/or the lack of an adequate control group. Furthermore, most studies examining AMS were not performed in a double blind design and therefore results may be considerably biased by a placebo effect. The only placebo controlled double blind study exposing subjects for 8 hours over 14 nights at an average altitude of 2600 m showed significantly reduced severity of AMS during a 20 hour exposure to FiO2 of 12% equivalent to an altitude of 4500 m. Today, exercise during intermittent hypoxic exposure is offered by commercial institutions to enhance exercise performance at altitude and to reduce the incidence of AMS. While it has been demonstrated that performance at high altitude can be improved by training in hypoxia, the effect on AMS has not been evaluated until now. In summary, repeated exposures to hypoxia in preparation to high altitude sojourns can reduce AMS and training in hypoxia improves performance at high altitude. However, to evaluate the underlying mechanisms and the adequate dose of hypoxia further randomized double blinded studies are required.
DOES INTERMITTENT HYPOXIA HAVE BENEFITS FOR PATIENTS WITH CORONARY ARTERY DISEASE?

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Intermittent hypoxia, such as induced by sleep apnea causes severe abnormalities of cardiovascular function, including prominent sympathetic activation, vasoconstriction, and sustained hypertension. These abnormalities lead to significant cardiovascular morbidity in patients who have spontaneous intermittent hypoxia at night, and raise caution regarding the use of intermittent protocols in patients, as well as healthy individuals like athletes. Moreover, although acute hypoxia generally causes systemic and coronary vasodilation to preserve oxygen delivery, recent evidence suggests that in patients with impaired endothelial function from atherosclerosis, paradoxical vasoconstriction may ensue. Conversely, in some models of intermittent hypoxia, activation of the hypoxia response pathways involving hypoxia inducible factor 1 may provide some protective effects against more profound hypoxia or ischemia, and small clinical studies suggest the possibility of improved myocardial perfusion and enhanced exercise performance. Overall, the available evidence suggests that intermittent hypoxia is more likely to harm than help patients with coronary heart disease, though careful study of mechanisms may reveal the opportunity for benefits under specific, carefully defined circumstances.

Invited symposia (IS)

IS-SH05 Gender and football

WOMEN’S FOOTBALL: A JOKE OR A SPORT TO BE TAKEN SERIOUSLY

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According to many Swedish football experts, journalists and others, women’s football players at elite level are not even close to male football players as regards ball technique and game perception. To all appearances, there are similar views in many other countries where women’s football has been established. The chief aim of the study is examine the accuracy of this opinion, that is, is it correct that Swedish women’s football players at elite level often fail to perform when ball technique and game perception are put to the test. The study analysed how often the Swedish national team players failed in their actions in the Women’s World Cups of 2003 and 2007. Actions refers to passes, ball re-ceptions, dribbles, final shots and fixed situations. The men’s national team’s performance was corre-spondingly analysed in the Men’s World Cups of 2002 and 2006. The matches were analysed by means of video. The analysis of nearly 10,000 actions shows that there are differences but that these are relatively small and do not explain the very heavy and categorical criticism that is usually levelled against women’s football. The criticism is essentially due to the masculine coding of football and to female intrusion being perceived as a feminist provocation that hence has to be counteracted.

EMPOWERMENT AND DISCRIMINATION WITHIN ELITE FOOTBALL

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The purpose of this paper is to discuss gender, empowerment and discrimination within elite football in Norway. I will try to answer the research question: ‘How and why do elite players of both genders experience both empowerment and discrimination within elite football in Norway?’ This is a part of the project ‘Elit Football a Field of Changes’, where I have done observations in international championships, observations of practices, meetings, and matches in three elite football clubs through a year, plus interviews with 22 players (11 of each sex) and eight coaches in women’s and men’s football. Both women’s and men’s football have developed significantly during the last 25 years, and Norway is one of the leading nations in terms of international successes in women’s football. One crucial part of this is the ‘Norwegian Model’ of development programme, where girls and boys follow the same model and practice together. In the study many similarities were found in the conditions of the men and the women: They experience the game itself as joyful and exiting because of the tough tackles, the team spirit and the joy of victory, and the social network and the friendships are also mentioned as crucial. However, much progress has been made, particular problems regarding the women’s game globally as well as locally concern the difficulties of attracting sponsors and media interest. I also found that women’s sexuality is questioned when they play football. At the same time it is easier to be a lesbian inside some football clubs, but more difficult for men to be gays inside elite football. A conclusion is that the heter-onormativity is weakened for lesbians, but not for gays. Bourdieu’s field theory with elite football as a sub-field was employed in this study. Another conclusion is that, it is ‘doxic’ and taken for granted both inside and outside the field of football that men’s football is better than women’s football, that gay men do not exist in side elite football, and some men still have ‘the symbolic power’ within the field of football, even if it is the largest organised sport for both women and men in Norway.

MARKETING WOMEN’S FOOTBALL IN GERMANY

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During the past years, European women’s football experienced a considerable upswing (Hong & Mangan, 2003). In Germany, football has become one of or even the most popular women’s team sports. This positive development certainly was supported by the recent sporting success of the women’s national team (World Champion in 2003 and 2007). Actually Germany will host the next Women’s World Cup in 2011. Now Women’s football is for the first covered by the big media and benefits from increased promotion by the German Football Association, Deutscher Fußball-Bund (DFB). But this lasting success story cannot belie the fact that esp. the base for a long-term establishment and sustainable sporting development of women’s league football in Germany is by no means secured. Thus, a number
of clubs of the first division league, the Bundesliga, are struggling with structural and financial problems and are still far away from a professional management and marketing.

Those briefly outlined development prospects and problems of women's football in Germany are studied in detail in an empirical research project. Based on a general economic market model of team sports (Hübl, Peters & Swieter, 2002), the key markets and demand groups, respectively, of the Bundesliga clubs are analysed. The media, sponsorship, attendance and merchandising, in addition, the external organisational network of the league (support by the DFB) as well as the clubs internal organisational and marketing structure is examined.

As to the data sources used in this research, association and club data, special periodicals on women's football, internet sites of the clubs, press releases etc. are analysed, quantitatively and qualitatively. In addition case studies of selected Bundesliga clubs enable a deeper look at marketing praxis. Structured interviews have been conducted with executives of 7 out of 12 premier league clubs and of the responsible association DFB. Furthermore, a questioning of totally 2.680 spectators of women's football games in 2007 gives information about the socio-demographic characteristics of the audiences, their motives and views of women's football.

Results of this study are: Marketing women's football in Germany, today, and in the running of the 2011 Women's World Cup, is going to be easier than in former times. But there remain handicaps in a male-dominated team sport market. Also, successful marketing is much more difficult for women's football clubs than it is for the German national team, for instance, because the league and individual clubs are simply not known well enough. A major problem is the huge differential both in sporting talent and economic base between the clubs.

References

Oral presentations (OP)

OP-HF05 Health and Fitness 5 - Children

THE INFLUENCE OF MATURATION ON DAILY PHYSICAL ACTIVITY OF OBESE AND NON OBESE LISBON CHILDREN AGED BETWEEN 6 AND 11 YEARS OLD

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INTRODUCTION

Obese and non obese children show different patterns of daily activities. Most of the studies related with overweight and obesity and time spent on domestic tasks, leisure activities, organized and non organized sports do not take into account the effect of maturation. The aim of this study was to analyze if obese and non obese Lisbon children have different patterns of physical activity and whether the time spent in different activities can be influenced by maturation variability.

METHODS

The sample was composed of 1843 children (976 girls and 867 boys) aged between 6 and 11 years. The anthropometric measures were obtained according to Fragoso and Vieira (2000), the maturation was estimated in accordance with Khamis-Roche (1994). The sample was divided into six groups according to BMI cut-off points proposed by Cole et al. (2000, 2007) and the physical activity was evaluated through a questionnaire. The physical activity variables were time spent on regular and non regular activities, sedentary activities (PC and TV) and domestic tasks, done in all week. The descriptive statistics and the multivariate ANOVA were generated by SPSS 15 for Windows. Gender, age and relative height were used as covariant variables. The level of significance was set at p ≤ 0.05.

RESULTS

The prevalence of overweight, between 6 to 11 years, was 13.7% for boys and 20.3% for girls. The correspondent obese prevalence was 8.4% and 6.9%. The studied groups showed some differences on time spent on total physical activity being the three thinness grades the more active ones. Additionally the most sedentary children are the thinnest and obese ones. When using relative height as covariant the time spent on sedentary and non sedentary activities decrease slightly on the obese group. The only variable influenced by relative height was watching TV during the weekend.

CONCLUSION

Apparently, as it is shown in this study, relative height (maturation) doesn't seem to interfere in time spent in physical activity. However, early mature development can have different origins and different morphological consequences meaning that some of the children who are early mature spent more time in activity but some others who are also early mature are fat and sedentary. This confound factor will be considered in a future study.

REFERENCES


IS THE BMI DURING THE FIRST TWO YEARS OF LIFE ASSOCIATED WITH THE BMI BETWEEN 6 AND 12 YEARS OLD?

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Introduction

In the last decades, many investigators have concluded that childhood overweight is associated to adult obesity. The association between a precocious metabolic program induced by nutritional stimulus or adaptations experienced in uterus that influences birth-weight (BW), physiological and morphologic characteristics in adult life and obesity is not consensual. Some studies point to a direct association
between BW and fat-free mass (Singhal et al., 2003), others recognize a direct association between BW and adult obesity (Labayen et al., 2005), and even others document an association between growth velocity in the first weeks of life and obesity in adolescence (Deckelbaum & Williams, 2001). The aim of our study is to identify the association between BMI measured in different moments in infancy in a sample of Portuguese children.

Methods
Our sample was composed by 612 Portuguese school children (323 boys and 289 girls) aged 6 to 12 years, who were divided into 6 groups, according to BMI cut off points proposed by Cole et al. (2000, 2007). Weight and stature during the first two years of life were obtained by questionnaire. Each child’s most recent measure was collected according to ISAK (2006) procedures. The BMI was calculated in five moments (birth, 1 and 6 months, 1 and 2 years and present age) and were transformed in Z scores. The descriptive analysis and the tests of Spearman and Friedman were calculated using SPSS 16.0 for Windows. The significance level was set at p<0.05.

Results
We have not found differences in Z scores between the five moments in both sexes (p=0.506 for girls and p=0.432 for boys). However, we found a significant correlation between Cole’s classification at two years and at present age in both sexes (p=0.001 in girls and p=0.009 in boys).

Conclusions
Our results reveal a tendency for the maintenance along the life time, at least until 12 years old, of the relationship between weight and stature (BMI). We concluded that there is an association between BMI in the first two years of life and BMI in later infancy.

References.


THE IMPORTANCE OF THE WAIST CIRCUMFERENCE IN THE METABOLIC SYNDROME AND PHYSICAL FITNESS IN 6 TO 15 YEAR-OLDS

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Research evidence has showed a connection between central adiposity and an increased risk of metabolic disorders, morbidity, and mortality. Waist circumference (WC) has been identified as the best predictor of Metabolic Syndrome (MetS) in children and adolescents. The purposes of this study were: 1) to determine if there were significant differences between the subjects who presented the WC risk factor (WCrf) and those without that risk factor (non-WCrf) for all the other MetS components and physical fitness parameters, in boys and girls across 3 agegroups (6-9, 10-11, and 12-14 year-olds); 2) to estimate the risk in WCrf subjects of having MetS and being considered unfit.

Methods
Participants in this study were 1128 children and adolescents ranging from 6 to 15 years of age attending the public school system in the island of Madeira. Subjects were measured for anthropometric indicators (weight, height and waist circumference), metabolic parameters (blood pressure, triglycerides, glucose and C-HDL), and fitnessgram tests (curl-ups, push-ups and pacer-20m). WCrf was defined according to the classifications by Katzmarzick et al. (2004) and Maffeis et al. (2001). MetS diagnosis was done according to the criteria established by Cook et al. (2003).

Results:
Multivariate ANOVA showed significant effects for factors agegroup and WCrf in all the metabolic parameters (p< .05) but not sex. Significant effects for found for all 3 factors in the fitness tests (p< .05). Significant 2-way interactions were found for blood pressure and triglycerides, and no 3-way interaction was found.

Risk estimate of being unfit in the pacer test when presented the WCrf was 3.453 (ICC 95% 2.559-4.661), comparing with the non-WCrf.

Conclusions:
For all agegroups and sex, subjects with the WCrf had significantly higher scores in the other MetS components (lower for C-HDL) and lower scores in the fitness tests.

References.


ANALYSIS OF THE INFLUENCE OF SEVERAL FACTORS RELATED TO THE BIO-Psycho-social HEALTH ON THE PHYSICAL ACTIVITY OF ADOLESCENTS IN MADRID

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An epidemiological study (1) for adolescent scholars between 13 and 17 years old from Madrid was made in order to know which variables are the most important determinants of the physical activity (PA). After obtaining written consent of the parents, anonymous forms were completed by a random sample of 266 boys and 288 girls. This sample was selected from 35 educative centres from 16 of the 21 districts on which the city of Madrid is divided.

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A first exploratory analysis showed that several variables turned out to be associated with PA, namely: gender, age, socioeconomic status (SES), PA of parents and friends, scholastic performance (SPI), money availability (MA), tobacco (TC) and alcohol (AC) consumption and being overweight (OW).

After a logistic regression, it was found that the variables that had the greatest influence on the PA were as follows, in order of importance: gender, PA of the father, PA friends and OW. With these four variables, a model was developed to predict the PA of the adolescents of Madrid.

As a result of our observations the following series of proposals for the future were made. Girls and adolescents with lower SES should receive high-priority attention concerning their health-related habits. Parents should be encouraged to practise PA, since the latter proves to have a positive influence on their children. Nutritional education for children, adolescents and parents is necessary to avoid being OW and to change sedentary habits. Although we did not observe any relationship between the screen time (ST) and PA, ST seems to be a relevant variable due to the current proliferation of multimedia entertainment and the average ST for our sample (225 min/day ±135 for boys and 174 min/day ±109 for girls).

References:

DETERMINANT FACTORS OF CARDIORESPIRATORY FITNESS IN CAUCASIAN AND AFRICAN PORTUGUESE ADOLESCENTS

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Cardiorespiratory fitness is an important health indicator in aged-school children. The aim of the current study was to understand the effects of some variables, such as body composition, age, race and gender in maximal oxygen consumption (VO2max) in a racially diverse sample of Portuguese adolescents (Caucasians C) and African Portuguese (AP). The sample consisted of 266 adolescents, 12-18 years of age (112 boys (80 C and 32 AP) and 154 girls (109 C and 45 AP)). Percent body fat (%BF) was estimated by a hand-to-hand bio-electrical impedance device (BF 300, OMROM). Cardiorespiratory fitness was assessed by the shuttle test from the fitnessgram battery. Multiple regression modelling methods were used. The prevalence of normal weight and overweight/obesity in this sample was 80.8% and 19.2% respectively. The mean values of VO2max were 45.0+/-6.2 ml/kg/min, 45.6+/-6.3 ml/kg/min, 36.2+/-4.9 ml/kg/min, and 38.8+/-4.9 ml/kg/min, respectively for C boys, AP boys, C girls, and AP girls. Girls showed a lower VO2max and higher %BF compared with boys (p<0.05). Overall, there were no significant differences between C and AP, though AP girls showed higher values in cardiorespiratory fitness compared to their counterparts. The model developed to explain VO2max showed that %BF (ß=-0.003, p<0.001), age (ß=0.011, p<0.001), and the interactions of age x Caucasian (ß=-0.001, p<0.01) and age x female (ß =0.004, p<0.001) were significant predictors, presenting a negative association with cardiorespiratory fitness. These results suggest that adolescents with higher adiposity, older Caucasians and older girls have lower cardiorespiratory fitness. The data seems to highlight the importance of interventions in promoting physical fitness in schools throughout the ages, taking into account the impact of determinant factors, such as race and gender.

PHYSICAL ACTIVITY IN PRESCHOOL CHILDREN - A PILOT STUDY

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Purpose: The aims of this study were (i) to determine Physical Activity (PA) patterns in preschool children with accelerometry in between gender and, (ii) to analyse discrepancy in the PA patterns using different epochs.

Methods: 45 Portuguese preschool children (25 girls, 20 boys) between the ages of 3 and 5 participated in the pilot study regarding PA patterns in preschool children. PA was assessed with accelerometers (MTI actigraph) during the school hours, for five consecutive days. Epochs were set at 5 seconds. PA was expressed as mean counts per minute during 5 days of MVPA, 95% CI: 23.11 - 30.33 for girls vs mean=29.69 counts per minute during 5 days of MVPA, 95% CI: 25.01-34.37 for boys albeit without statistical significance (p>0.05). The same tendency occurred with a 60 seconds epoch (mean=9.42 counts per minute during 5 days of MVPA, 95% CI: 6.33 - 12.50 for girls vs mean=12.33 counts per minute during 5 days of MVPA, 95% CI: 7.70 -16.96 for boys; p>0.05). In girls as well as in boys the average counts per minute of MVPA was much higher with a 5 seconds epoch than with a 60 seconds epoch (p<0.001).

Results: With a 5 seconds epoch, girls were, on average, less active than boys (mean=26.72 counts per minute during 5 days of MVPA, 95% CI: 23.11 - 30.33 for girls vs mean=29.69 counts per minute during 5 days of MVPA, 95% CI: 25.01-34.37 for boys) although without statistical significance (p>0.05). The same tendency occurred with a 60 seconds epoch (mean=9.42 counts per minute during 5 days of MVPA, 95% CI: 6.33 - 12.50 for girls vs mean=12.33 counts per minute during 5 days of MVPA, 95% CI: 7.70 -16.96 for boys; p>0.05). In girls as well as in boys the average counts per minute of MVPA was much higher with a 5 seconds epoch than with a 60 seconds epoch (p<0.001).

Conclusions: In Preschool Children gender differences in mean counts per minute during 5 days of MVPA were not significant. The use of an epoch of 60 seconds, compared to an epoch of 5 seconds, underestimated MVPA, in this children.
LIFETIME PARTICIPATION IN PHYSICAL ACTIVITY: DOES IT PREDICT EXERCISE ADHERENCE DURING BEHAVIORAL OBESITY TREATMENT IN WOMEN?

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Purpose: To analyze the association between history of participation in physical activity (PA) and adherence to PA/exercise recommendations during a 12-month behavioral weight management intervention in women. To our knowledge, this is the first study to investigate this topic.

Methods: At baseline, 255 women (137.5 ± 21.7 yr, 31.6 ± 4.2 kg/m²) were randomly assigned to intervention (IG) or control groups. The IG participated in a 12-month weight management program seeking to improve diet and nutrition and increase physical activity. Controls received a general health education curriculum. At baseline, participants completed a PA and exercise history questionnaire. Past activity was categorized by exercise intensity (light, moderate, vigorous) and life period (infancy, adolescence, adulthood), and quantified in min/yr per category. Exercise adherence at the end of the weight management program was assessed with the 7-day PAR interview. Associations between PA history and self-reported current activity were analyzed with correlation/regression analyses and comparing activity level categories (± 150 min/wk of moderate/vigorous PA).

Results: In general, higher levels of total lifetime (p=0.001), total adult (p=0.002) and total vigorous PA (p=0.001) were associated with moderate/intense PA after the obesity treatment program. Adult vigorous PA was also a predictor of higher PA adherence at 12 months, for the whole sample (p=0.026). In the IG, only participants with higher levels of adult PA showed greater adherence to PA at program’s end (p=0.02). For controls, moderate/intense PA levels were predicted by previous PA experiences, namely total PA (p=0.019), adult PA (p=0.018), and total and infant vigorous PA (p=0.012 and p=0.005). Comparing PA categories, significant differences were observed for the total sample and for both participation groups. The active group reported more total (ES=0.40; p=0.012) and adult (ES=0.40; p=0.017) PA in the IG, active participants after the program reported approximately more 662 min/yr of adult PA (p=0.044) than the insufficiently active. Active controls reported having engaged in about 1000 min/yr more of adult PA than their counterparts (p=0.018). After adjusting for the intervention group, regression analyses showed that adult PA predicted greater adherence to moderate/intense PA during the intervention (B=0.21; p=0.014).

Conclusions: Results suggest a history of participation in exercise and physical activities may positively predict exercise adherence during weight management, a critical target of most interventions. This is especially true for recent (adult) PA and more vigorous past exercise experiences. Lifetime participation in physical activities should be evaluated and considered by professionals in the field, prior to initiating weight loss treatment.

CAN DIFFERENCES IN MOTOR PHYSICAL FITNESS (EUROFIT) BETWEEN OBSESE AND NON-OBSESE CHILDREN BE USED TO DESIGN MORE EFFECTIVE INTERVENTIONS TO INCREASE PHYSICAL FITNESS IN EARLY SCHOOL AGE OBSESE CHILDREN

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Introduction

Obesity is an increasing health problem, starting already in primary school children. Promotion of physical activity programs at schools should take the motor performance of overweight children into account. Little is known about the variability in young children’s performance on tests of motor fitness. A study was designed to see whether the EUROFIT test battery (Adam et al., 1988) can be used to initiate health related physical fitness programs in obese children.

Objectives

To determine whether the EUROFIT Test Battery for children of 12-18 years old is reliable for testing children between 6 and 12 years of age and to determine differences in the motor physical fitness between obese and non obese children.

Material and Procedure

A randomised control group (N=42) was constructed for the obese children (patients) group (N=179). These controls were matched according to age and gender. The reliability of the EUROFIT test for children between 6 and 12 years old has been tested by a test retest with one week interval on the control group. Standard statistics (a.o. 1-tests) were used for determining reliability and differences between the experimental groups. The significance level for all tests was set on 5%.

Results and conclusions

The Eurofit test showed to be reasonable reliable. At retesting a learning effect could be noticed for plate-tapping, handgrip strength and sit-ups. The feasibility of the flamingo balance test and bent arm hang test was found to be very low in the experimental group. Respectively 62.1% and 80.5% of the children were unable to perform this tests.

The obese subjects scored significantly worse for all test components requiring propulsion or lifting of the body (standing broad jump, sit-up, bent-arm hang and the speed shuttle run). Obese children had significantly higher scores for the handgrip strength test and similar scores on the components of flexibility (sit & reach) and speed and coordination of the limbs (plate tapping). Results are in line with the study of Deforche et al. (2003).

As to bring obese children to more physical activity, it is suggested to avoid bodyweight bearing exercises in the beginning of physical activity interventions. Obese children will experience more success with exercises emphasizing their static strength and speed of limb movements. An adaptation of the flamingo balance test and bent arm hang tests are required for the use in the young age group, given their low feasibility scores.

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SHORT-TERM IMPACT OF A MODERATE INTEGRATED WEIGHT LOSS PROGRAM ON COMORBID OBESE SUBJECTS AND ITS EFFECT ON WEIGHT LOSS MAINTENANCE AND EXERCISE ADHERENCE

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Epidemiologic researches show an increasing percentage of overweight and obese subjects in the population. Obesity is often associated with many comorbidities. The American College of Sports Medicine recommends that the combination of reductions in energy intake and increases in energy expenditure, through structured exercise and other forms of physical activity, should be a component of weight loss intervention programs (WLP). There is also evidence that including behavioural principles within a WLP improves long-term outcomes. The aim of this study was to analyse the short-term results of an integrated WLP on body composition, physiological and health related parameters on a comorbid obese population, and to evaluate the results of the WLP on long-term weight loss maintenance and exercise adherence.

22 severely obese subjects (age, 40.3±6.48 yr; BMI, 43.37±6.03 kg/m²) followed a 3 weeks WLP composed by: an energy intake reduction, nutritional and psychological counselling and a tailored PA program (5 training sessions/week). PA program intensity ranged between 40 and 50% of VO2max for 40 minutes of cardiovascular exercises and between 40 and 60% of IRM for 1x10 strength exercises for different muscle groups. Before and after the intervention period a body composition analysis with bioimpedance methodology, a sub-maximal indirect test to estimate maximal oxygen consumption (VO2max) and a maximal indirect test to calculate maximal strength (IRM) were carried out. Framingham score was used to estimate health related parameters modification. The follow up included telephonic interview to collect information about physical activity ratio (PAR) and body weight after 6 months (FU6m).
Effect of a Weight Management Program on Body Composition, Physical Fitness, and Metabolic Parameters in Korean Obese Children


Introduction
Childhood obesity is progressing at an alarming rate. Since most overweight children become overweight adults, this chronic condition may increase the likelihood of cardiovascular diseases in adulthood as a result of early establishment of risk factors for cardiovascular diseases. To reduce this major health issue, effective childhood interventions are essential.

Purpose
The purpose of the present study was to examine the effects of weight management program on body composition, physical fitness, and metabolic parameters in Korean obese children.

Methods
Thirty-eight obese children (body mass index (BMI) > 95th percentile for age and sex) were recruited and randomly assigned to either a control (n = 19) or weight management group (n = 19). The control group received weight management counseling, and the weight management group received organized program, including exercise (~6-7 METs, 70 minutes, 2x/week), dietary education, and life style modification counseling for 3 months.

Results
The following variables were improved significantly with 3-month organized weight management program (mean ±95% confidence interval in weight management vs. control): weight [-2.3 kg (-4.2 to -0.4) vs. +2.5 kg (+0.9 to +4.1)], BMI [-1.7 kg/m² (-2.5 to -0.9) vs. +0.5 kg/m² (-0.2 to +1.2)], % body fat [-3.9% (-5.2 to -2.6) vs. +2.2% (+0.8 to +3.6)], VO2max [+3.7 ml/kg/min (+1.1 to +6.3) vs. -0.2 ml/kg/min (-1.2 to +0.8)], handgrip strength (+1.7 kg (+0.6 to +2.8) vs. +0.2 kg (-0.5 to +0.9)], sit-ups [+2.1 times/30 sec (+0.4 to +3.8) vs. +0.3 times/30 sec (-1.0 to +1.6)], TC [-15.4 mg/dl (-27.4 to -3.4) vs. +2.5 mg/dl (-9.3 to +13.4)], LDL-C [-11.0 mg/dl (-29.4 to +7.3) vs. +3.89 mg/dl (-5.8 to +13.6)], HOMA-IR [-1.0 (-1.5 to -0.5) vs. +0.2 (+0.8 to +1.6)], and hs-CRP [-0.4 mg/L (-1.2 to +0.3) vs. +0.9 mg/L (+0.3 to +0.8)].

Conclusion
Organized weight management program used for this study had beneficial effects on body composition, physical fitness, and risk factors for cardiovascular diseases in Korean obese children. In view of the global childhood obesity epidemic, multiple approaches, such as exercise, nutrition, lifestyle modification, and education, should be the focus of strategies aimed at overcoming childhood obesity.

Oral presentations (OP)

OP-NU02 Nutrition 2

The Effects of Caffeine on Endurance Cycling Performance and Exogenous Carbohydrate Oxidation: A Dose-Response Study

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This study investigated the effects of a low and moderate caffeine dose on exogenous CHO oxidation and endurance exercise performance. Nine trained and familiarised male athletes (age 29.4 ± 4.5 years, mass 81.3 ± 10.8 kg, ht 183.8 ± 8.2 cm, peak O2 uptake (VO2 peak) 61.7 ± 4.8 ml/kg-1·min-1, values are mean ±SD) undertook 3 trials, with training and high CHO diet being controlled. One hour prior to exercise subjects ingested capsules containing placebo, 3 or 6 mg.kg-1 BW of caffeine. Trials consisted of 120 min steady-state (56 ± 11%) cycling at ~70% VO2peak, immediately followed by a 7 kJ.kg-1 BW time trial (TT). During exercise subjects were provided with fluids containing 14C glucose every 20min to determine exogenous CHO oxidation. No significant TT performance improvements were observed during caffeine containing trials (Placebo 30.2 ± 5.3, 3 mg.kg-1 BW 30.4 ± 3.4, 6 mg.kg-1 BW 29.6 ± 3.8. TT Time ±SD min±s). Furthermore, caffeine failed to significantly alter maximal exogenous CHO oxidation (maximal oxidation rates Placebo 0.95 ± 0.2, 3 mg.kg-1 BW 0.92 ± 0.2, 6 mg.kg-1 BW 0.96 ± 0.2 g.min-1). Low and moderate doses of caffeine have failed to improve endurance performance in fed, trained subjects.
LOW GLYCAEMIC INDEX OR LOAD DIETS FOR WEIGHT LOSS

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Aim The aim of this review was to assess the effects of low glycaemic index (GI) or low glycaemic load (GL) diets for weight loss. Methods Studies were identified through searches of The Cochrane Library, MEDLINE, EMBASE and CINAHL for randomised controlled trials (RCTs) comparing a low GI or low GL diet with a higher GI, higher GL diet or other diet (CI diet for weight loss. Two authors identified studies, assessed their quality and extracted data, including information on adverse effects. Results Six eligible RCTs (N=202) were identified. Interventions ranged from five weeks to six months with up to six months further follow-up. Decrease in body mass (weighted mean difference [WMD] -1.1 kg, 95% confidence interval [CI] -2.0 to -0.2; P < 0.05; n = 163), total fat mass (WMD -1.1 kg, 95% CI -1.9 to -0.4; P < 0.05; n = 147) and body mass index (BMI) (WMD -1.3, 95% CI -2.0 to -0.5; P < 0.05; n = 48) was greater with low GI or GL diets compared to CI diets. Decrease in total cholesterol was greater with low GI or GL diets compared to CI diets (WMD -0.22 mmol/L, 95% CI -0.43 to -0.02; P < 0.05), as was decrease in LDL-cholesterol (WMD -0.24 mmol/L, 95% CI -0.44 to -0.05, P < 0.05). No study reported adverse effects, mortality or quality of life data. Conclusion A clinically significant decrease in body mass, total fat mass and BMI was seen with low GI or GL diets compared to CI diets. Lowering the dietary glycaemic load promotes weight loss and improves lipid profiles.

THE EFFECT OF FLUID INGESTION ON INTERMITTENT-SPRINT PERFORMANCE AND PACING STRATEGIES IN THE HEAT

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Fluid ingestion during exercise is commonly used due to the proposed reduction in cardiovascular and thermoregulatory loads and corresponding maintenance of exercise performance. However, minimal research has examined the influence of fluid ingestion on performance and pacing strategies during intermittent-sprint exercise in the heat. Nine male, club-standard rugby players completed a familiarisation session followed by two randomized testing sessions consisting of ingestion of fluid (F) or no fluid (NF). Participants were also advised of a third session to ensure they were blind to all sessions; however this third session was not completed. All participants were pre-hydrated with 500ml of water 1h prior to each testing session. Participants completed a 50min intermittent-sprint exercise protocol in warm conditions (31 ± 0.7°C) with a 3min break at 30 and 40min in which they consumed 250ml (water) or no fluid. The exercise protocol involved a 15 m maximal sprint each minute followed by sub-maximal, self-paced exercise in a shuttle run format at varying intensities (hard running, jogging, and walking) for the remainder of the minute. Performance was assessed with 15m sprint time, distance covered during sub-maximal bouts and pre- and post-exercise vertical jump and hand grip tests. Physiological measures of heart rate (HR), core temperature (Tcore), nude mass and blood parameters (La-, pH) plus perceptual ratings of perceived exertion (RPE), thermal stress and thirst were measured throughout the session. No significant differences (p>0.05) were present between conditions in 15 m sprint time or distance covered during the sub-maximal bouts. However, trends were evident with the difference between conditions for distance covered progressing to a 7% difference in the final period, which represents a 61m reduction in the NF trial. No significant differences were evident in the pre- and post-exercise vertical jump and hand grip tests. Physiological measures of HR, Tcore, blood parameters and nude mass showed no significant differences (p>0.05) between conditions at any stage of the protocol. RPE and thermal ratings were not different between conditions at any stage, however rating of thirst scale was significantly higher (p=0.02) post-exercise in the NF trial. These results indicate that fluid ingestion has minimal effect on intermittent-sprint performance in warm conditions less than 1h in duration. However, a progressive difference began to exist, suggesting larger differences between conditions may be evident with longer exercise durations. Further, the presence or knowledge of fluid availability may alter pacing strategies in intermittent-sprint exercise, as while minimal physiological differences were present between conditions, participants progressively reduced the amount of work performed in the NF trial.

THE EFFECT OF A CARBOHYDRATE MOUTH RINSE ON SIMULATED 40KM TIME-TRIAL PERFORMANCE IN ELITE MALE COMPETITIVE CYCLISTS

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Recently a novel study reported suggested a significant performance enhancing effect of a carbohydrate (CHO) mouth rinse during high intensity exercise of approximately 1-hour in duration (Carter et al., 2004). Subsequent CHO mouth rinse studies have produced conflicting results. The present study aimed to investigate the effect of a CHO mouth rinse (6.4% maltodextrin) on simulated self-paced 40km time-trial performance in elite cyclists. Endurance trained male racing cyclists (n=8; mean±SD: age 31±3yr, mass 77±8kg, BMI 24.7±2.2 kg.m-2, body fat 14±2%, VO2max 68±6mL.kg-1min-1 and load at TLac 275±30W) participated in this study and were required to make five visits to the laboratory. The first visit consisted of a medical examination, a graded incremental test to volitional exhaustion (initial load 120W, increment 40 W every 3 min) and a 10km familiarisation session on a standard racing bike mounted on a fluid filled turbo-trainer, cycling performance data were continuously monitored using the SRM system. During subsequent visits cyclists performed simulated self-paced 40km time-trial separated by 3 to 7 days using double-blind, randomised design incorporating two placebo and two CHO mouth rinse trials (10mL mouth rinse for 10s every 5 km), during time trials the distance completed was the only data visible to the cyclist. Time, power output, heart rate, blood glucose and lactate were recorded at 5 km intervals. Group data across treatment and distance were analysed using 2-way repeated measures ANOVA and P<0.05 inferred statistical significance. A small, non-significant decrease in 40 km time to completion was noted comparing CHO and placebo mouth rinse trials (74.6±4.1 vs. 76.0±3.3 min, P=0.104). However the calculated 95% limits of agreement (95%LOA) from repeated placebo and CHO mouth rinse trials were -5.5 to 5.2 and -3.7 to 7.0 min, respectively, and identified wide variability within each repeated test arm. These 95%LOA were large in comparison with the mean time difference detected between test arms (7±1.4 min). Overall no significant differences were recorded comparing power output (P=0.13), heart rate, metabolic data, blood lactate or glucose concentrations across treatment. For all assessed variables the variation within was greater than variation between trials. Due to high intra-trial variation, the findings of Carter et al. (2004) are not supported. In conclusion, CHO mouth rinse appears to have no beneficial or ergogenic effect on performance time or physiological variables during exercise of this nature. More research into CHO mouth-rinse investigating postulated ergogenic effects are warranted. Future studies should ensure that the most appropriate, reliable
EFFECT OF HIGH AND LOW GLYCEMIC INDEX RECOVERY DIETS ON SKELETAL MUSCLE SUBSTRATE STORAGE AND UTILISATION DURING SUBSEQUENT EXERCISE

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BACKGROUND AND AIM: The glycemic index (GI) of carbohydrates consumed during the post-exercise recovery period significantly alters substrate utilisation during subsequent exercise (Stevenson et al., 2005). We have recently reported that consumption of high GI carbohydrates during recovery reduces FFA availability and increases reliance on intra-myocellular triglyceride as a substrate source during moderate intensity exercise (Trenell et al., 2007). It is unclear whether muscle glycogen utilisation is altered as a result of this change in muscle lipid metabolism. The purpose of the present study was to investigate the effect of high and low GI recovery diets on muscle glycogen and lipid utilisation during subsequent exercise.

METHODS: Nine male endurance trained cyclists (age 33.0 ± 6.9 yrs, mass 76.3 ± 7.0 kg, VO2max 61.5 ± 5.0 ml/kg/min) participated in two trials in a randomised cross-over design. Subjects completed a 90 min cycle at 70% VO2max and were then provided with a high GI (GI = 73) or low GI (GI = 35) diet to be consumed over the following 12h. Carbohydrate was provided at 8 g/kg body mass with 11% protein and 17% fat content. The following day after a 10 hour fast, the 90 min cycle was repeated and metabolic parameters measured. 1H and 13C Magnetic resonance spectroscopy were used to evaluate intra-myocellular triglyceride and glycogen content of the vastus lateralis before and after exercise. Blood samples were collected at 15 min intervals throughout exercise. Substrate oxidation was calculated from expired air samples.

RESULTS: There were no differences in the metabolic responses to exercise on Day 1. The 90 min cycle on Day 2 resulted in a greater reduction in intra-myocellular triglyceride in the high GI trial than the low GI trial (P < 0.05). There were no differences in muscle glycogen utilisation between trials. FFA concentrations were higher throughout exercise following the low GI diet compared to the high GI diet (P < 0.05). There were no differences in glucose, lactate or insulin concentrations during exercise between trials.

CONCLUSION: The results of this study support previous findings that consumption of high GI carbohydrates in recovery from exercise reduce FFA availability during exercise and increase reliance on intra-myocellular triglyceride as a substrate source during moderate intensity exercise. The GI of carbohydrates consumed during a 24 h recovery period does not influence muscle glycogen utilisation during subsequent exercise.

Stevenson, E., C. Williams, and H. Bisce, The metabolic responses to high carbohydrate meals with different glycemic indices consumed during recovery from prolonged strenuous exercise.

References.

EFFECT OF SHORT TERM LIPID SUPPLEMENTATION ON A 1-HOUR TIME-TRIAL CYCLING PERFORMANCE

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PURPOSE: A short term lipid supplemented diet that increases intramyocellular lipids (IMCL) 55% while allowing normal muscle glycogen loading was previously validated (1). The effect of this diet on endurance performance is presently assessed.

METHODS: Twenty-two trained male cyclists performed two simulated time trials (TT) in an open randomized crossover design. Subject selection at entry included a performance test (VO2max, Wmax) and TT familiarization. Two weeks later, the subjects performed a 2h submaximal exercise to deplete energy stores. This was followed by feeding one of 2 glycogen replenishment diets for 2.5 resting days (7 meals): a Twenty-two trained male cyclists performed two simulated time trials (TT) in an open randomized crossover design. Subject selection at entry included a performance test (VO2max, Wmax) and TT familiarization. Two weeks later, the subjects performed a 2h submaximal exercise to deplete energy stores. This was followed by feeding one of 2 glycogen replenishment diets for 2.5 resting days (7 meals): a

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References.

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References.
OP-PE03 Physical Education 3 - Youth

MATRIX OF ANALYSIS FOR SPORTS TASKS; TAXONOMIC SURF MODEL

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Introduction
In an ecological approach, the ideal technique is difficult to define, being each time more accepted the necessity to characterize the environment, the performer and the task, to be able to identify the best performance.
Construct a sport activities matrix of analyzes from an established taxonomic framing of the activities aiming the improvement of techniques.

Methods
Sample was within Surf discipline in a competition flowing having 5 of the top 16 Portuguese surfers training together.
The study intended to develop a Matrix of Analysis for Sports Tasks (MAST), no matter the sports activity, based on the practise classification and the task analysis. Based on a qualitative method, studying the surf as the main activity, this was an interpretative study case.
The MAST was applied in four phases: taxonomy, tasks and context description, task analysis, teaching/performance strategies. Its application allows the activities’ characterization through the observation, surfer's opinions and bibliographical support. The data was crossed as an information data treatment.

Results
Surf is a discipline of surfing which is a sliding sports modality therefore a Nature sport.
Waves and surfboards are related to the context. The knowledge of the swell formation process allows the anticipation of the breaking waves (waves' components and waves' conditioners). As main surfboards' characteristics we have the format, the composition and the fins, being / associated to the quality of the surfboard.

With the tasks description, 9 groups, including several techniques, were found becoming possible the development of a diagram with the trajectories in the waves and the possible linkings between techniques.
Some characteristics aspects were found through the functional analysis that allowed a better understanding of the techniques.

Conclusions
The elements are classified by the challenges proposed to the practitioners and the taxonomy is constituted by the sport activities, group, modality and discipline. The structural analysis allowed to identify and to explain the inter task relationships linkings between groups of manoeuvres and intra task (relationships between manoeuvres of the same group). The understanding and learning of the manoeuvres must be from the terrestrial environmental to the aquatic one, from a stable context to an unstable one, from a plain surface to an inclined one. With the task analysis it is possible to perceive the relationship between manoeuvres and the sections of the wave; surfboards and the waves; manoeuvres and the technical level. The structural and the functional analysis allowed to find solutions for the learning of trampoline and skateboards because these last ones fit in sliding sports. MAST makes possible the development of strategies that benefit teaching/performance intervention.

PHYSICAL ACTIVITY, MOTOR COMPETENCE AND HEALTH STATUS OF CHILDREN IN DEPENDENCE OF SOCIAL STATUS

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Introduction
In the last years the health status of children in Germany declined and the number of psychologically conspicuous children also increased. According to the KIGGS study children from socially deprived areas are hit from this development the most (compare Opp et al., 2007). Holzweg (2006) and several other studies allocate a decline of the level of activity and the motor competence of young children in Germany (compare Woll, 2007 for an overview). In this study physical activity, motor competence and health status of children with different social backgrounds (privileged vs. deprived) are assessed.

Method
A sample of 172 3-5 year old children was included in this study. While 80 children lived in a deprived area 92 children lived in an affluent area. The children were testes with the KMS 3-6 and the MOT 4-6. Height, weight and Body Mass Index (BMI) were also assessed. In a questionnaire for the parents’ social status, activity level, television consumption, participation in sport clubs and sport activity of the family were assessed. The social status was collected by profession and income of both parents and according to the social structure atlas for Berlin. The analysis of the assessed data was carried out with SPSS 15 (ANOVA).

Results
Regarding coordination [SHI: F(3,9)=16.51, p<.05; eta²= .085], TBT: F(3,9)=14.28, p<.05; eta²=.075] and flexibility [F(3,9)=20.14, p<.05; eta²=.102] significant differences between the two groups could be shown. With the data of the questionnaire significant differences between the two groups relating to television consumption [F(3,9)=44.87, p<.05; eta²= .238], participation in sport clubs [F(3,9)=22.6, p<.05; eta²=.132], outdoor activities [F(3,9)=6.37, p<.05; eta²=.041], as well as sport activity of the family [F(3,9)=17.35, p<.05; eta²=.104] could be identified.

Discussion / Conclusions
The study showed that comparable to obesity and health status also motor competence is decisively influenced by the social status of the children. The results of this study additionally indicated differences of the level of activity in dependence of the social background. Therefore it seems to be necessary to offer affirmative intervention programmes especially in Kindergartens and Primary Schools in socially deprived areas.

References.
Participation in physical activity (PA) during childhood can help to reduce the onset of risk factors associated with ill health. Recommendations for healthy levels of PA for children have been established by the National Association for Sport and Physical Education (NASPE guidelines, 2004). Children should accumulate at least 60 min of moderate and vigorous PA on most if not all days of the week. Lack of information about Italian children has made it impossible to assess proportions of children meeting the recommendations. The aim of this study was to objectively measure PA behaviour in a sample of 8 to 12 year-old children in order to investigate if they fulfilled NASPE PA guidelines.

16 healthy children (age, 9.1±1.2 yr; BMI, 19.8±4.6 kg/m2; RMR, 4406.6±1758.6 kJoule/d; VO2max, 39.9±8.2 ml/kg/min) were monitored during a whole week in winter and in summer with a Actiheart (AH) monitor (Cambridge Neurotechnology, UK). The AH is directly attached to the chest with two standard ECG electrodes and it is able to measure acceleration, heart rate (HR), HR variability and ECG magnitude for objectively measuring PA and inferring time spent in sedentary or light (ISPA, <3 METS) to moderate (MPA, 3-6 METS) and vigorous (VPA, >6 METS) intensity. Data presented provide a minimum of four days of 10-h valid recording per week (the choice of 4 ensures that at least 1 weekend day is included).

Data analysed through the Branched model showed that children significantly exceeded NASPE guidelines of 60 min of moderate-to-vigorous PA (MVPA) both in winter (MVPA 143.4±67.9 min/day, p<0.001) and in summer (178.3±78.8 min/day, p<0.0001). However, a significant seasonal difference was detected especially for time spent in MPA (MPA: winter 132.2±62.8 min/day, summer 161.6±70.1 min/day, p<0.05). On the contrary, no significant differences appeared between weekly and weekend days (MVPA: weekly days 160.3±86 min/day, weekend days 161.4±86.7 min/day, p=ns). Besides, the between intensity comparison revealed a significant higher amount of time spent in moderate than in vigorous intensity (MPA 146.9±67.2 min/day, VPA 14.1±12.7 min/day, p<0.001).

The main finding of this study is that Actiheart data, taking intensity of activity into account, indicate that Italian young children significantly exceed the minimum activity standard of 60 min of accumulated MVPA per day. Although it is likely that all children should be encouraged to adopt an active lifestyle, it is unclear if 60 min of intermittent, accumulated PA are sufficient to gain health benefits or if it is favourable 60 min of sustained PA. Taking into account seasonal differences, a suggestion could be to increase physical education hours during school time.

Conclusions.

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References.


YOUTH SPORT PARTICIPATION AS BASIS FOR A PHYSICALLY ACTIVE LIFESTYLE AND HEALTH

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The aim of the study was to investigate the relationship of youth sport participation with adult physical activity and some selected health variables.

Methods. The data were obtained from the Cardiovascular Risk in Young Finns Study. The subjects of this study were 9-, 12-, 15- and 18-year-old girls and boys (N = 2200) who participated in base line measurements in 1980, and in follow-ups in 1983, 1986 and 2001. Participation in youth sport (sport club training sessions, sport competitions and persistent sport participation) was measured through a self-report questionnaire. To study the effect of persistent sport participation the subjects were divided into four groups on the basis of two subsequent measurements. Actives, who participated in both 1980 and 1983; Beginners who did not participate in 1980 but did in 1983; Drop Outs who participated in 1980 but not in 1983, Outsiders who participated neither in 1980 nor in 1983. Physical activity (PA) questions in adulthood concerned the frequency and intensity of PA, frequency and hours per week of intensive PA and participation in organised PA on the basis of which a Physical Activity Index (PAI) was formed. Measurement of health and lifestyle in adulthood included attention paid on health habits, BMI and sum of z-scores of following metabolic syndrome variables: insulin, triglycerides, HDL-C (inverted), glucose, systolic and diastolic BP and waist circumference.

Results. A regular and persistent participation in youth sport was significantly associated with high physical activity level in adulthood. The odds ratio (OR) for belonging to the most active tertile of PAI in adulthood was in females participating many times a week 6.0 (IC 2.4 - 15.1) and in males 5.1 (2.9 - 9.1) non participants being as reference. OR for Active sport participants was 4.2 (2.0 - 8.9) in females and 9.9 (5.0-19.3) in males Outsiders being as reference. Also participation in high level sport competitions increased the probability to be active in adulthood both in males, OR 3.3 (2.0 - 5.4) and in females, OR 3.5 (2.6 - 18.4) Outsiders being as reference. Those who participated more than once a week in sport club training sessions had higher probability to pay attention to their health habits in adulthood than non-participants, females’ OR 1.9 (1.1 - 3.3), and males’ OR 2.0 (1.3 - 3.0). The frequent participants also had higher probability for normal weight than non-participants among males, OR 1.9 (1.1 - 1.3) but not among females when adjusted for the youth BMI. Frequent sport participants had lower level in the sum of z-scores of metabolic variables than non participants among males (P>0.001) but not among females.

Conclusion. It is concluded that a frequent and persistent participation in youth sport is associated with a high physical activity level in adulthood and also with important health variables, especially among males.

PHYSICAL EDUCATION IN THE NATIONAL CURRICULUM STATEMENT OF SOUTH AFRICA: PERSPECTIVES OF TEACHERS

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Educational transformation in South Africa not only brought about Curriculum 2005 and Life Orientation as a new Learning Area / Subject, but also major challenges, especially for Physical Education. In the previous dispensation, Life Orientation's constituents were perceived as being of minor importance by many educationists due to its non-examinable status creating many preconceptions about the Learning Area / Subject. Against this background, it was necessary to investigate Life Orientation teachers’ perspectives regarding the implemen-
tation of the Learning Area / Subject in Grades R-11. Two hundred and forty-eight (N=248) schools which consisted of n=124 primary and n=124 secondary schools were randomly selected in the Western Cape region of South Africa. A response rate of 63%. (N=157) was obtained. Summary statistics using frequency tables and histograms were utilised. Comparisons of ordinal variables were done using one-way variance of analysis (ANOVA) and the Kruskal-Wallis non-parametric test. The data was analysed with Statsoft Statistica 8.0 (2007). The results indicate that the Learning Outcome related to the Physical Education focus of Life Orientation in the General Education and Training (GET) Band and Further Education and Training (FET) Band is presented in the majority of schools. However, the fact that 60% of the schools do not have qualified Physical Education teachers at their disposal, hold certain implications for the status of Life Orientation in general and more specifically for the growth and development of the learners. Life Orientation is a compulsory offering for all learners in Grades R-12 since the 1 January 2008 and therefore it is recommended that in-service and pre-service education and training of teachers receive a high priority from the Department of Education and that Higher Education Institutions become more involved in different forms of training initiatives than is currently the case. The state and status of Physical Education in South African schools and the implication that it has for sport development among the youth have been a major concern for more than a decade.

Key words: Curriculum 2005; Outcomes-based Education, National Curriculum Statement; General Education and Training Band; Further Education and Training Band; Life Orientation; Physical Education; Teacher training; Teacher perspectives.

DANCE AND THE PHYSICAL EDUCATION STUDENT: COMPARISON BETWEEN PORTUGUESE AND FINNISH UNIVERSITY STUDENTS

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Introduction
Many authors (Lynch, 1991, Taylor & Taylor, 1995, Macara, 1997, Mayer, 1998, Nakra, 2000) indicate dance as a form of physical activity fundamental for the development of young people. This is due not only to the potential for the rhythmic and motor development, but also for the artistic and aesthetic education. Considering that both in Portugal and in Finland, Physical Education Teachers are supposed to include dance in their teaching programs, we tried to better understand the relation of the future physical teachers in two universities with different curricula, in countries with different teaching traditions in what concerns dance.

Methods
The participants serving as sample for this study were 3rd year Physical Education Students from the University of Jyväskylä, Finland (n= 48) and from the 3rd year of Faculdade de Motricidade Humana in the Technical University of Lisbon, Portugal (n=63). Using specifically designed questionnaires, we looked for the types of dance, with which the students identified the most, and their previous dance practice, before and after the study in the University. Descriptive statistics was used to characterise both groups.

Results and discussion
As results we found similarities between the two groups: in both countries the involvement with dance previously to the University is significantly larger in the female sub-groups. Also, in both countries street dance, such as hip-hop were the most practiced. Contrarily ball-room dance was much more practiced by Finish students than in Portugal. In conclusion in both countries we find that most students have never practiced any dance forms. Though they may have some dance in the curriculum, the interest for this activity is relatively low, especially in the male subgroups. This indicates the necessity to develop the teaching of some dance forms in the curricula of PE teachers, knowing that street dance is presently the most attractive dance form for both genders and in both countries.

References.

Oral presentations (OP)
OP-PS04 Psychology 4 - General 1

TALENTED ATHLETES AND SCHOOL PERFORMANCE; A COMPARISON OVER 14 YEARS
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Talented athletes and school have been subject of continues debate. It was assumed, for years, that top level sport may be negatively linked with school performance. Recent research has indicated that talented athletes perform well in school (Dexter, 1999, Durand-Bush & Salmela, 2002). It is not yet clear whether this transition is related to school facilities, increasing importance of sport performance or changes in the type of student athlete. The purpose of this study is to gain insight in the school performance of talented athletes in 1993 and 2007 in the 14-16 age-band.

A questionnaire was used to measure the school performance of 253 talented athletes in 1993 and 260 in 2007. All talented athletes participated in a sport selection. All 2007 talented athletes were part of a school with special facilities. School performance was measured by school level [i.e. pre vocational or pre university]. Whether athletes had difficulties combining sport and school was assessed by a combination of an objective standard and perceived school performance.

Stability in the national averages of 1993 and 2007 was observed (p>05). It was also found that 2007 talented athletes were more often present in pre university education (p<05), whereas regular youth was more often present in pre vocational education. Results indicated the same tendency for 1993 talented athletes. In addition, 2007 talented athletes were more often present in pre university education than 1993 talented athletes (p<05). No significant difference was found between 1993 and 2007 on difficulties combining sport and school (i.e. 48,8% vs 41,2%).
When compared to the national average, talented athletes in 2007 attend pre university education more often. It is assumed that talented athletes might be more focused, motivated and self-regulative. A higher percentage of the 2007 talented population participated in pre university education in comparison with 1993, whereas the percentages of regular youth showed stability. Since no difference is found on difficulties in combining sport and school between 1993 and 2007 (i.e. without vs with facilities) it appears relevant to investigate self-regulation (e.g. metacognition, motivation and behavior) of today's talented athletes. Self-regulation of performance might be a promising venue as research indicates that expert performance in sport may not only be attributable to innate physical characteristics and physical training but also depends on levels of self-regulation. Experts in sport as well as in school have been indicated to be more self-regulative (Ertmer & Newby, 1996; Cleary & Zimmerman, 2001). It might well be possible that talented athletes are capable of learning skills in sport and use it in school and vice versa.

References.

AFFECTIVE RESPONSES DURING EXERCISE AND THEIR INFLUENCE ON FUTURE PARTICIPATION

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Purpose: Affective responses to exercise may be the first link in the chain between exercise and adherence. However, the progress of research in this area has been hampered by practical constraints (e.g. tracking individuals, controlling exercise intensity). This study extends the research by exploring the perceived impact of acute responses to either an imagined exercise experience at a prescribed high-intensity (HI) exercise session or a preferred self-selected (SS) intensity exercise session on future exercise participation.

Methods: Seventy volunteers (35 male, 35 female) took part in the study. Participants read (in a counter balanced order) 4 scripts that described two imaginary exercise sessions (one that was prescribed and one that was self-selected). The scripts either described the cues typically generated during exercise, or the cues generated following recovery. In the ‘during’ exercise scenarios, the cues are more extreme in the HI condition than the SS condition, where it is clear that the participant can alter their intensity to achieve a preferred level. After reading each script, participants completed measures of their rating of perceived exertion (RPE, Borg, 1998) and recorded their affect using the feeling scale (FS: Hardy and Rejeski, 1989). They then indicated to what extent the FS they had just recorded would influence their future participation and whether this would be in a positive or negative direction.

Results: As anticipated, and confirming the scenario manipulation, ANOVA indicated that the RPE responses were significantly higher for the ‘during’ HI script (M=16.4, SD=1.9) compared to the ‘during’ SS (M=12.8, SD=3.0) but that both decreased ‘post’ exercise (HI(M=11.9, SD=2.7, M=10.3, SD=2.7, respectively). FS was significantly lower in the ‘during’ HI (M=-0.29, SD=2.9) compared to the ‘during’ SS condition (M=-1.8, SD=-2.0) and became more positive in the recovery condition (M=1.36, SD=2.72, M=2.58, SD = 1.88, respectively). Preliminary analyses indicate that very positive or very negative FS responses were more likely to influence future participation (p<0.01). Further, the more negative the FS response the greater the negative influence, while positive FS responses were perceived to influence participation in a positive direction.

Conclusions: The results, although limited by the methodology selected, support the position that affect could be the first link in the chain to adherence. The data suggest that if the exercise experience leads to a large negative response then this will have a perceived negative effect on future exercise participation. However, a positive response, as experienced in the SS condition had the opposite effect.

References.

POWER LAW DISTRIBUTIONS IN PATTERN DYNAMICS OF ATTACKER-DEFENDER DYADS IN RUGBY UNION: PHENOMENA IN A REGION OF SELF-ORGANISED CRITICALITY?

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In the region of self-organised criticality (Bak, 1996) an interdependency of action between system components exists and slight changes in circumstances characterising near-neighbour interactions (i.e. attacker defender dyads in team games) can break the balance of equally poised options leading to sudden transitions in system order. In this region frequency of events (i.e. attackers attempting to pass defenders and defenders counterbalancing attackers’ actions) of differing magnitudes exhibits a power law distribution, in which smaller fluctuations arise more frequently than larger system changes such as phase transitions. The aim of this paper was to identify a power law distribution for the attacker-defender dyadic system in rugby union, suggesting that pattern forming dynamics observed in team sports is a phenomenon in a region of self-organizing criticality (SOC). In our analysis of typical (1 v 1) sub-phases of rugby union near the try line, videogrammetry captured players’ motion and TACTO 7.0 software digitized player positions (Passos et al., 2006). Power laws were calculated based on the rate of change of relative position between an attacker and defender. This power law displays a certain quantity N (i.e. frequency of changes in attacker-defender relative positioning) which can be expressed as a power of another quantity s (i.e. the magnitude of frequency of changes in attacker-defender relative positioning), in the following equation: log N=β-1·log s. Our analysis showed that three emergent patterns from dyadic system interactions (i.e. clean try, unsuccessful tackle, and effective tackle) revealed a power law distribution with exponents between 1.2 and 1.9. Adjustments in players’ relative positioning with higher magnitudes occurred less frequently than smaller adjustments. These findings suggested that pattern forming dynamics observed in attacker-defender dyads in rugby union exemplify the natural phenomenon of SOC. In this region the distribution of adjustments in players’ relative positioning approximated a straight line, exemplifying a power law in accordance with Bak’s (1996) underlying principle for system complexity. Players spontaneously adjusted their relative positions with information available in each specific performance setting, such as an opponent’s relative position. Required adjustments were scale free since there were no typical sizes of variations. We may conclude that attacker-defender dyads evolve in SOC regions signifying that players’ decisions and actions were governed by local emergent interactions rules rather than by outside agents or previously determined actions.

References.

AFFECTIVE RESPONSES DURING EXERCISE AND THEIR INFLUENCE ON FUTURE PARTICIPATION

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Purpose: Affective responses to exercise may be the first link in the chain between exercise and adherence. However, the progress of research in this area has been hampered by practical constraints (e.g. tracking individuals, controlling exercise intensity). This study extends the research by exploring the perceived impact of acute responses to either an imagined exercise experience at a prescribed high-intensity (HI) exercise session or a preferred self-selected (SS) intensity exercise session on future exercise participation.

Methods: Seventy volunteers (35 male, 35 female) took part in the study. Participants read (in a counter balanced order) 4 scripts that described two imaginary exercise sessions (one that was prescribed and one that was self-selected). The scripts either described the cues typically generated during exercise, or the cues generated following recovery. In the ‘during’ exercise scenarios, the cues are more extreme in the HI condition than the SS condition, where it is clear that the participant can alter their intensity to achieve a preferred level. After reading each script, participants completed measures of their rating of perceived exertion (RPE, Borg, 1998) and recorded their affect using the feeling scale (FS: Hardy and Rejeski, 1989). They then indicated to what extent the FS they had just recorded would influence their future participation and whether this would be in a positive or negative direction.

Results: As anticipated, and confirming the scenario manipulation, ANOVA indicated that the RPE responses were significantly higher for the ‘during’ HI script (M=16.4, SD=1.9) compared to the ‘during’ SS (M=12.8, SD=3.0) but that both decreased ‘post’ exercise (HI(M=11.9, SD=2.7, M=10.3, SD=2.7, respectively). FS was significantly lower in the ‘during’ HI (M=-0.29, SD=2.9) compared to the ‘during’ SS condition (M=-1.8, SD=-2.0) and became more positive in the recovery condition (M=1.36, SD=2.72, M=2.58, SD = 1.88, respectively). Preliminary analyses indicate that very positive or very negative FS responses were more likely to influence future participation (p<0.01). Further, the more negative the FS response the greater the negative influence, while positive FS responses were perceived to influence participation in a positive direction.

Conclusions: The results, although limited by the methodology selected, support the position that affect could be the first link in the chain to adherence. The data suggest that if the exercise experience leads to a large negative response then this will have a perceived negative effect on future exercise participation. However, a positive response, as experienced in the SS condition had the opposite effect.

References.
FORMATION OF PHYSIOLOGICAL PREPAREDNESS OF EXPERTS IN SPHERE OF PHYSICAL TRAINING AND SPORTS

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Introduction. The problem of social adaptation of children-orphans and children who have remained without care of parents, is especially painful now for our society. For today the very actual is the purposeful psychological preparation of experts which will promote the most effective formation of the personality of junior pupils in the conditions of a boarding school.

Our research aims to form the psychological preparedness of experts in sphere of physical training and sports for work in boarding school.

Methods and subjects. 131 students aged 19-23 took part in the experiment.

The empirical methods were used: 1) express-questioning which has allowed to reveal: a) subjective opinion of respondents concerning with the level of the importance of the personal-professional skills which are necessary for the expert in sphere of physical training and sports for effective activity with the orphans (on a mark scale from 0 to 10; 0 - not significant skill, 10 - the most important professional skill); b) the respondents' level possessing of the given professional skills (on a mark scale from 0 to 10 points: 0 - it is not formed, 10 - it is completely formed); 2) the testing of real formed level of professionally important skills, and also level of social disadaptation of children-orphans of junior pupils; 3) the quantitative and qualitative analysis of the received data; 4) the correlation analysis (or statistical processing of results of research).

Results. The research was carried out in the boarding school. During the research the essence of professionally important skills, the features and the factors providing their development and display were studied, and also the conditions promoting effective formation of psychological preparedness of the expert were investigated; the degree of influence of professionally important skills on decreasing of social disadaptation children-orphans of junior pupils was established.

Our findings show that the high formed level such personal-professional skills as the empathy, stress-stability, tolerance, reflexivity, communicativeness, self-organization, objectivity, working capacity, creativity, emotional flexibility, affiliation makes the base of psychological preparedness of the expert of physical training and sports and has direct influence on the process of decrease of social disadaptation of children of junior pupils.

Conclusion. The development of professionally important skills is initial, very important and responsible stage of formation of psychological preparedness of the expert in sphere of physical training and sports for work in boarding school. The purposeful professional training of experts will provide faster adaptation of children-orphans in the conditions of a favorable psychological climate, will promote decrease in level of anxiety, aggression and vulnerability, correction of negative emotional displays and development of skills of positive social behavior.

PERCEIVED MEDIA INFLUENCE ON BODY IMAGE CONCERNS OF TURKISH ATHLETES

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The purpose of this study was to investigate the influence of media on body image concerns (weight loss, weight gain and muscle size) of Turkish athletes. The study also aimed to examine the perceived pressure from media on body image concerns of athletes with regard to gender, sport experience and types of sport.

One hundred and six female (Mage = 18.5, SD= 3.8) and 197 male (Mage = 19.2, SD= 4.7) athletes from variety of sports voluntarily participated in this study. Perceived Socio-cultural Influences on Body Image and Body Change Questionnaire (McCabe, & Ricciardelli, 2001) was administered to all participants. In this study only the perceived pressure from media was evaluated. Athletes were grouped into two sport experience (less experienced: 5 & less years and more experienced: 6 & more years) and two sport type (team: handball, soccer, basketball, volleyball & individual: figure skating, weight lifting, swimming, wrestling, fencing, karate, track and fields) categories based on year of sport experience and types of sport that they were involved.

Multivariate Analysis of Variance for testing the gender differences revealed significant differences in perceived pressure from media on body image concerns of male and females athletes (Hotelling’s T2 = 0.08, F(3,299) = 7.79, p < .01). Follow-up univariate analysis demonstrated that female athletes perceived more pressure from media to lose weight than male athletes (F(1,302)= 5.83, p < .05) than female athletes. The sport experiences and sport type differences in the perceived influence of media on body image concerns was tested by Multivariate Analysis of Covariance by using gender as a covariate. MANCOVA results demonstrated significant multivariate main effect of sport types (Hotelling’s T2 = 0.09, F(3,297)=8.65, p < .01) and sport experience (Hotelling’s T2 = 0.03 F(3,295) =2.66, p < .05). The multivariate main effect of sport experience could be attributed to the pressure from media to lose weight (F(1,299)=7.61, p < .05). More experienced athletes perceived more pressure to lose weight as compared to less experienced athletes. Furthermore, follow-up univariate analysis indicated that team sport athletes reported more pressure from media to lose weight (F(1,302)=17.61, p < .01), gain weight (F(1,302)=15.54, p < .01) and improve muscle tone (F(1,302)=20.65, p < .01) than individual sport athletes.

As a conclusion, these findings suggest that the media are sending messages about the ideal body shape to Turkish athletes and particular media outlets give Turkish athletes the idea that they should be slimmer, eat less to lose weight, and eat less to be more muscular.

References.

CONFIRMATORY FACTOR ANALYSIS OF THE MALAY VERSION OF THE SPORT ANXIETY SCALE - 2

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Significant progress in competitive anxiety research has yielded a better understanding for practitioners to deal with anxiety (Martens, Burton, & Vealey, 1990). A clear distinction has been made between trait and state anxiety. The former refers to the general tendency to
perceive certain situations as threatening, while the latter refers to feelings of apprehension and tension that are associated with arousal. It has been suggested that the intensity and magnitude of state anxiety is proportional to the perceived threatening situation. Thus, an individual, who is high in trait anxiety, is likely to experience greater state anxiety than an individual who is low in trait anxiety (Halvari & Gjesme, 1995; Spielberger, 1966). Sport competition can be a major source of stress among young sport athletes. Given the debilitating effect of competitive anxiety to children overall sport participation, knowledge of children competitive trait anxiety may be beneficial in both of performance and developmental perspectives. However, its assessment has proven to be problematic because of measurement difficulties (Smith, Smoll, Cumming, & Grossbard, 2006). Smith et al. (2006) recently developed the Sport Anxiety Scale 2 (SAS-2) to assess competitive trait anxiety in children. Given its utility in both research and applied settings, SAS-2 has been translated into Malaysian language. However, without appropriate psychometric assessment, the translated version may be problematic in terms of functional equivalence. Thus, the present study sought to examine the validity and reliability of the Malays version of the SAS-2. The questionnaire was administered to 73 elite youth sport athletes. Using Confirmatory Factor Analysis (CFA), the results revealed a satisfactory goodness of fit of the model (chi-square = 121.439, df = 87, p < .05; RMR = .04; GFI = .84; CFI = .91; RMSEA = .07). Significant Unstandardized Regression Weights (< .05) for all of the path loadings were obtained. Furthermore, all of the Standardized Regression Weights were above .50. The results also revealed an acceptable reliability for the subscales (Alpha = .78 for Somatic, .83 for Worry, and .75 for Concentration disruption subscales). Overall, the findings support the construct validity and reliability of the Malay version of SAS-2. However, further studies with larger sample are needed to confirm if the findings were sample specific or more general.

References:


Oral presentations (OP)

OP-SM03 Sports Medicine 3 - Elite Athletes

ENDOCRINOLOGICAL STUDY ON THE EFFECTS OF TESTOSTERONE GEL APPLICATION IN MALE ATHLETES

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Introduction:

Testosterone gel is used for the treatment of testosterone deficiency in males. Testosterone is a hormone with strong anabolic effects and, therefore, belonging to the list of prohibited substances in sport. In the case of testosterone gel application results of preliminary studies indicate that the T/E ratio increases by a decrease of the epitestosterone concentration to stable, slightly elevated values with normal variations during the day. Under this misuse in sport, the steroid profiles appear like profiles of individuals with natural increased T/E ratios based on a decreased epitestosterone excretion. The misuse is, therefore, not detectable so far. One possibility to detect the misuse of testosterone gel might be an endocrine test on the integrity of the hypothalamo-pituitary-gonadal axis (HPGA).

Therefore, the aim of the study was to investigate the effects of testosterone gel applications in physically active young male subjects on the stimulatory pattern of LH, FSH and testosterone.

Methods:

The study was approved by the responsible ethical committee. All subjects gave their written informed consent. 9 healthy male subjects were included. Integality of the hypothalamo-pituitary-gonadal axis (HPGA) was tested by means of exogenous Gonadotropin-Releasing-Hormone (GnRH) injections (0.1 mg Relefact LRH) prior to, during every 7 days, and after a six week period of transdermal testosterone gel application (100 mg testosterone/d). Venous blood was collected prior to, 30, 75 and 120 min after GnRH injection.

Results:

Mean basal LH and FSH declined significantly during the application period. Values were (prior to and week 1 to week 6): LH (IU/l): 4.5, 2.6, 2.4, 2.4, 1.9, 1.8, 2.1; FSH (IU/l): 4.2, 2.5, 2.6, 2.5, 2.4, 2.2, 2.3. Maximal LH after GnRH increased in the first week and then declined, like FSH from the first week on, continuously during testosterone gel application. Values were: LH (IU/l): 37, 33, 24, 19, 16, 17, 13; FSH (IU/l): 7.2, 6.2, 5.4, 5.0, 4.3, 4.4, 3.5. Basal total testosterone as well as free testosterone increased from the first week of gel application and constantly remained elevated on nearly the double level. Values were: total testosterone (pg/ml): 19, 34, 40, 41, 43, 47, 41; free testosterone (pg/ml): 13, 24, 23, 26, 28, 40, 27. There was no significant effect of exogenous GnRH on either total or free testosterone.

Conclusion:

Daily transdermal testosterone gel application is capable to approximately double serum testosterone concentration in healthy young active male subjects from the first week of application, and to suppress pituitary LH and FSH secretion after the second week. This suppression of the endocrine axis might be detected by means of several exogenous GnRH injections over time.

The study was financially supported by the World Anti Doping Agency, Ontario, Canada.

THREE-PHASE BONE SCINTIGRAPHY FINDINGS AND EXERCISE EFFECTS IN CHRONIC EPICONDYLITIS

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Introduction:

Bone scintigraphy is a tool to image injuries and recovery in the musculoskeletal system. In this study bone scintigraphies were performed in different stages of rehabilitation in patients with chronic epicondylitis and the uptake intensities were compared to rehabilitation results.

Methods:

Three-phase bone scans were performed after an intravenous injection of 550 MBq of 99mTc hydroxymethylene diphosphonate in 42 patients (74% women, mean age 41 years) with chronic epicondylitis. The images were evaluated using X-Rite 331 B W Transmission Densitometer. The scans were performed once for each patients either prior to exercise rehabilitation (n=19), during rehabilitation (n=12) and after an 8 weeks’ exercise rehabilitation intervention (n=11). From the images the maximal 99mTc-HDP uptake of each epicondylus and the mean value of adjacent humerus were calculated as epicondylus to humerus ratio and the same was done for the...
corresponding healthy epicondyle and for the affected arm's opposite epicondyle and differences between these two reference points and the affected epicondyle were calculated. Besides clinical examination, grip strength and pain thresholds (PPT) of the cubital region were measured and a pain and disability questionnaire with VAS and a whole body pain drawing were inquired before and after the rehabilitation intervention. The bone scintigraphy results were compared to rehabilitation results at each measurement point.

Results. In general, high 99mTc-HDP uptakes were associated with better functional status of the arm. Before rehabilitation, low uptakes were associated with higher improvements in pain at rest (p=0.005) and in manual test results (p=0.04) and high difference of uptake with the corresponding epicondyle with improved PPTs of epicondyles (p=0.04). During rehabilitation low uptakes were associated with improved PPTs (p=0.022) and low difference between affected and the same hand's opposite epicondyle with improved PPTs, grip strength and palpatory finding. After exercise rehabilitation intervention high uptakes were associated with significant improvement in pain at rest (p=0.048), improved PPTs of the epicondyle (p=0.032) and low uptakes with improved PPTs of the arcade of Frohse. Small differences in uptakes between the affected and corresponding healthy epicondyle were associated with improved pain drawing (p=0.01), and high differences with improved manual test results (p=0.008).

Conclusions. Increased 99mTc-HDP uptake in bone scintigraphy in chronic epicondylitis reflects healing response of the disorder, which can be classified according to the uptake intensity. It seems that uptakes will get lowered as a response for exercises. Evaluation of 99mTc-HDP uptakes can help to distinguish different types of epicondylitis from each others to plan suitable rehabilitation.

MARATHON RUNNING ENHANCES THE MIGRATORY ACTIVITY AND PROLIFERATION OF PC-3 TUMOUR CELLS

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There is evidence from epidemiological studies that exercise can reduce the tumour incidence at least for some cancer types such as breast and colon cancer. Moreover, it has been shown that physical activity and exercise have beneficial effects on different physiological and psychological aspects of cancer patients. However, much less is known about the underlying mechanisms how exercise affects tumour progression. One important step of tumour progression is the development of tumour metastasis, which depends on migration and invasion of tumour cells into adjacent extracellular matrix, lymphatic systems or blood vessels.

The aim of this study was therefore to analyse the effect of exercise on the migratory behaviour and proliferation of tumour cells and to study the intracellular calcium homeostasis, which is an important second messenger.

Serum was taken from 10 male trained subjects before (pre) and 1 hour after (post) finishing a marathon run. The migratory behaviour of the androgen-independent prostate cancer cells PC-3 was analysed by performing a 3D-migration assay using collagen type I. Migration was recorded by time-lapse video-microscopy for 6 hours and was analysed by selecting 30 cells of each recording. The migration paths were digitized in 15 minute intervals by computer-assisted cell tracking. For the investigation of the proliferation rate, aliquots of the cells were cultured with either marathon serum, fetal bovine serum, or medium only until one group reached the confluent state. To analyse the possible underlying mechanisms intracellular calcium concentration ([Ca2+]i) was measured spectrophotometrically using the Ca2+ sensitive fluorescent dye Fura-2.

Treatment with post serum increased significantly the migratory activity and the mean migrated distance of PC-3 cells compared to treatment with pre serum. The velocity of the migrating cells remained unchanged. Proliferation of PC-3 cells was higher after incubation with post serum than with pre serum. In contrast, treatment of the PC-3 cells with pre serum lead to significantly higher [Ca2+]i levels than treatment with 1 hour post serum. This result could be confirmed also under calcium free conditions.

Our results suggest that long distance running enhances the migratory behaviour and proliferation of the prostate cancer cells PC-3. Marathon running seems to elevate serum factors which are able to increase both functions. In addition, it seems that these factors act predominantly through calcium-independent pathways. Further studies have to be done to get insights into the involved mechanisms and serum factors.

SORE THROATS IN ELITE ATHLETES: INFECTIONS OR INFLAMMATION?

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Background: Sore throats, oropharyngitis suspected to be upper respiratory infections (URTI) are a common health issue for elite athletes. They cause disruptions to training and can impact on optimal competitive performance (2). Despite extensive studies, a full understanding of the aetiology of sore throats in elite athletes is still uncertain.

Studies: Two prospective studies were undertaken to clinically assess elite athletes presenting to sports medicine clinics with URTI (3,4). An anti-viral agent and an anti-inflammatory agent (intervention studies) were assessed in prophylactic DBPC trials for efficacy to prevent the upper respiratory symptoms URS in elite runners (5,6).

Results:

Clinical 1 (3): In the first clinical study (n=41) physicians identified 22 athletes as having recurrent URTI (55%), however laboratory tests only identified evidence of infections or herpes virus reactivation in 27%. Other treatable medical conditions were identified in 50% of the athletes, including allergy (15%), asthma (16%), and airway dysfunction (5%).

Clinical 2 (4): In the second clinical study (n=70 physicians classified 89% as URTI), while pathology investigations only identified infections in 30%, with a further 27% of athletes with evidence suggestive of infections. There was no evidence of infection in 43% of athletes. Allergy was identified in 39% of the athletes.

Intervention 1 (5): An antiviral agent ValtrexTM reduced the viral load in elite runners (n=20) but did not reduce the incidence of URS.

Intervention 2 (6): The prophylactic use of a topical anti-inflammatory throat spray DifflamTM did not reduce the frequency of URS in elite runners (n=25) but did reduce the severity of the symptoms.

Conclusions. Symptoms of a sore throat in an elite athlete are not always associated with an infectious aetiology. Less than half the athletes associated with the two clinical studies had laboratory-based evidence of an infection. Other inflammatory causes of the URS should be considered, as treatable medical conditions were identified, with a high prevalence of allergy and asthma. The lack of a reduction in episodes of URS in response to an antiviral agent indicates that viral infections are not the major cause of the symptoms in runners. The reduced severity of symptoms in response to the topical anti-inflammatory throat spray supports an inflammatory cause for the symptoms that does not have an infectious aetiology. Mechanical damage to the airway epithelium is highly likely in these elite athletes undergoing intense training regimes.

References:
ARE FORMER FEMALE ELITE ATHLETES MORE LIKELY TO HAVE URINARY INCONTINENCE LATER IN LIFE THAN NON-ATHLETES?

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Background
Symptoms of pelvic floor dysfunction, e.g. stress (SUI) and urge incontinence, are prevalent in female athletes (1). There is scant knowledge about the long-term effect of strenuous physical activity on prevalence of urinary incontinence. The aim of the present study was to investigate whether former female elite athletes are more prone to urinary incontinence later in life than non-athletes.

Methods
Female senior or junior athletes from 39 different sports participating at the national team level in 1988-1990 were the target group for this study. 331 former elite athletes (response rate 81%) and 640 controls replied to a postal questionnaire on physical activity level and general health status including validated questions on urinary incontinence. The study was approved by the Regional Ethics Committee. Chi-Square and Fisher Exact Test were used to compare differences between groups. P-value was set to ≤ 0.05. Logistic regression analysis was used and results reported as adjusted odds ratios (aOR) with 95% confidence intervals (95% CI).

Results
Mean age was 37.5 (SD 4.0) and 39.3 (SD 5.4), BMI 23.2 (SD 3.3) and 25.2 (SD 4.7), parity 2.2 (SD 0.8) and 2.3 (SD 1.1) and percentage of postmenopausal women 15 and 11.5 % in the elite athletes and controls respectively. 10.9 % and 2.7% of the former elite athletes reported SUI and urge incontinence, respectively while competing in sports. Presently, 36.5% and 36.9% reported SUI in the former athlete and control group. 9.1% and 9.4% reported urge incontinence. 77.8% of the athletes reporting SUI during their athletic career reported SUI at present. Significantly more former athletes reported urinary leakage during physical activity than controls (20.4% versus 15.3%, p= 0.048), but not during coughing and sneezing. In the former elite athlete group women having 2 (aOR 2.66, 95% CI: 1.32-5.35) or 3 (aOR 2.69, 95% CI: 1.23-5.90) children and having urge incontinence while competing in sports (aOR 8.57, 95% CI: 3.55-20.71) were more likely to report urinary incontinence now. In the control group women with higher BMI (aOR 1.07, 95% CI: 1.03-1.12), 2 children (aOR 1.77, 95% CI: 1.04-2.98) and 3 children (aOR 2.03, 95% CI:1.13-3.66) were more likely to report urinary incontinence. Age, menopause and being regularly physically active now were not associated with urinary incontinence in either group.

Conclusion
The prevalence of urinary incontinence is not higher in former athletes than in controls, except during physical activity. However, this study indicates that urinary incontinence early in life as reported during elite sport is a strong predictor of urinary incontinence later in life. Hence, the effect of prevention and treatment strategies such as strength training of the pelvic floor muscles should be evaluated in elite athletes.

References.

OP-TT06 Training and Testing 6 - Failure

EXERCISE TRAINING EFFECTS ON VENTILATORY ANAEROBIC THRESHOLD IN PATIENTS WITH CHRONIC HEART FAILURE

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Introduction: Anaerobic threshold is an index of prognosis and submaximal exercise capacity in patients with chronic heart failure (CHF). On the other hand, it could be considered a reference point for prescribing intensity at exercise training rehabilitation programs. This study was aimed at investigating the effects of exercise training on the ventilatory anaerobic threshold (AnT) in CHF patients.

Method: Thirty stable CHF patients, 23 male and 7 female (mean±SD age: 53.4±10.4 years, VO2peak: 15±5.1 ml/kg/min) participated in an exercise training program for 12 weeks, 3 times/week. Participants were randomly assigned to either aerobic (AER, n=14) or combined (COM, n=16) exercise training. Aerobic exercise was performed in interval type (30 sec exercise at approximately 110% maximum power output – 90 sec rest) on cycle ergometers. Strength training involved exercises for various muscle groups of the legs (quadriceps, hamstrings), the shoulder zone and the arms. Both regimes were of the same duration. All participants performed a symptom-limited maximum cardiopulmonary exercise test at the beginning and the end of the program. Increments were adjusted according to Wasserman's norms. Criteria of assessing AnT included the V-slope method, VE/VO2 - VE/VCO2 and PetO2 - PetCO2 plots, while the corresponding VO2 (VO2AnT) and power output (WAnT) were calculated by the gas analysis system software.

Results: The whole cohort improved (p<0.05) VO2AnT (from 9.9±2.8 to 10.9±2.7 ml/kg/min) and WAnT (from 58.1±22.1 to 69.2±23.2 watt). AnT, expressed in % of VO2peak predicted, was also improved (p<0.05, 33.6±8.2 to 37.0±7.4, p<0.05). No differences were found (p>0.05) in VO2AnT and WAnT, expressed in % max VO2AnT: from 65.7±8.0 to 64.5±10.2 %, WAnT: from 58.2±7.0 to 59.4±8.2 %). No between-group differences were observed (p>0.05), except for WAnT, in which COM (from 55.5±26.1 to 70.3±29.7 watt) tended (p=0.07) to improve more than AER (from 60.7±17.8 to 68.0±15.0 watt). The whole group also increased (p<0.05) VO2peak (from 15.1±5.1 to 17.2±5.2 ml/kg/min) and Wmax (from 98.1±36.3 to 115.6±36.7 watt).
Conclusion. An exercise training rehabilitation program, either aerobic or combined, enhanced $\text{AnT}$ in CHF patients. These improvements were found to relate to enhancement of maximal oxygen uptake and maximal power output rather than qualitative improvement of $\text{AnT}$ per se.

**INTERACTION-DOMINANT DYNAMICS OF FATIGUE IN ISOMETRIC EXERCISE UNTIL FAILURE**

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**HAMSTRING/QUADRICEPS RATIO IN ATHLETES**

Muscle fatigue is defined as an exercise-induced reduction in maximal voluntary muscle force and it is said that has peripheral and central causes (Gandevia, 2001). The investigation of such causes and its individual components, as linearly loosely coupled and additively decomposable subsystems, centres most of the research in the classical approach to fatigue. Within this research paradigm the main aim is to find and locate the key or dominant factors of fatigue and failure for each task under investigation. In our opinion, the key question of explanation of fatigue and task failure phenomena is the following: Is the development of fatigue a component - dominant or interaction dominant self-organizing process? That is, is the internal dynamics of the components that bring about the task failure dominate over the interactions between them or vice versa? This is of a key importance because the two different kinds of processes would manifest different dynamics of the developing fatigue and task failure.

The objective of this research was to test the hypothesis of interaction-dominant dynamics in the fatigue development during a local isometric exercise until failure. Six subjects familiarised with the task performed during 5 alternative days an isometric arm curl exercise with 90° elbow flexion holding an Olympic bar weighting the 80% of their $1$-RM until failure. The subjects sat on an inclined forward bench with aim to isolate the prime movers in the elbow joint of both upper extremities. An electrogoniometer (Biometrics) and its software (Ebiom) were used to record the elbow angle in both extremities during the trials. The rate of perceived exertion was recorded during the exercise. It has been demonstrated that the developing fatigue is manifested by long-range correlations between the measured states of the investigated system. This fact points to an interaction dominant dynamics of the developing fatigue and task failure. The component processes have strong mutual vertical and horizontal interactions on each time scale of the fatigue development. This process leads the system through different highly correlated (i.e. history dependent) metastable configurations and forms the performance trajectory for each individual bout. The enhanced fluctuations immediately before the failure point are a result of these correlated processes and are another corroborated of the conjecture that task failure is an interaction - dominated self-organizing phenomenon.


**ASSOCIATION OF LEG VOLUME AND LEG MASS WITH ANAEROBIC PERFORMANCE, ISOKINETIC KNEE STRENGTH AND HAMSTRING/QUADRICEPS RATIO IN ATHLETES**

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The present study aimed to determine the relationship of leg volume and leg mass with anaerobic performance, isokinetic knee strength and hamstring/quadriceps (H/Q) ratio in athletes. Twenty male athletes from volleyball (n=6), basketball (n=6) and soccer (n=8) participated in this study voluntarily (Mage: 21.6±1.8 yrs; Mweight: 80.9±8.3 cm; Mweight: 75.3±6.1 kg). Leg volume of the athletes was determined by circumferential measurements and leg mass was determined by Hanavan method. Anaerobic performance was evaluated by Wingate anaerobic power test. Peak isokinetic concentric knee extension and flexion torques of both legs were tested at 60 and 300°/s and H/Q ratios were calculated for these movement velocities. Significant correlations were obtained between leg volume of the right leg and peak power (r=0.514; p=0.020), right knee flexion torque at 300°/s (r=0.620; p=0.004) and right H/Q ratio at 300°/s (r=-0.495; p=0.027). Results also indicated significant correlations between right leg mass and right knee extension torque at 60°/s (r=0.536; p=0.011), knee extension torque at 300°/s (r=0.463; p=0.040) and knee flexion torque at 300°/s (r=0.645; p=0.002). For the left leg volume significant correlation was obtained only between left knee flexion torque at 300°/s (r=0.509; p=0.022) and for the left leg mass significant correlations were found between peak power (r=0.575; p=0.008), average power (r=0.498; p=0.026) and left H/Q ratio at 300°/s (r=-0.473; p=0.035). As a conclusion the present results suggest that right and left leg volume and leg mass play different roles in anaerobic performance, isokinetic knee strength and H/Q ratio of male athletes.

**EFFECT OF CONCURRENT STRENGTH AND ENDURANCE TRAINING ON THE ENERGY COST OF RUNNING**

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Purpose: The purpose of this study was to compare the effect of two strength training programs designed to increase maximal power on the energy cost of running in endurance athletes. Methods: Thirty moderately trained endurance athletes were separated into two groups matched for maximal oxygen consumption. They entered a training protocol that involved 2 high intensity interval training sessions, 1 moderate intensity continuous training session and 1 strength training session per week, for 8 weeks. All training sessions were identical between groups, except strength training sessions. Group A used concentric training with the resistance leading to maximal power as determined by a force velocity test in half-squat. Group B used plyometric training with the height leading to maximal power as determined by a drop jump test. The number of sets and repetition was the same for both groups. A maximal graded exercise test (treadmill), determined by a force velocity test (half-squat) and a performance test (3000 m on an indoor track) were performed before and after the training protocol. Results: Three subjects in group A and 4 subjects in group B withdrew from the study because of injury (n = 5) or lack of motivation to complete the protocol (n = 2). Concurrent strength and endurance training did not alter maximal oxygen consumption (pre-post mean ± standard deviation = 57.4 ± 6.7 vs 56.1 ± 6.7 ml.min⁻¹.kg⁻¹ in group A, and 57.5 ± 6.5 vs 57.3 ± 5.5 ml.min⁻¹.kg⁻¹ in group B, respectively, p > 0.05), nor aerobic endurance, as measured by the percentage of peak treadmill velocity sustained during the performance test (87.1 ± 4.7 vs 87.1 ± 2.8% in group A, and 87.6 ± 3.8 vs 86.8 ± 3.9% in group B, respectively, p>0.05). Both groups increased maximal power (1147 ± 180 vs 1324 ± 181 Watts in group A, and 1174 ± 139 vs 1214 ± 190 Watts in group B, respectively, p < 0.01). We found a significant interaction between time and group for the energy cost of running, the improvement of group B being higher than that of group A (0.207 ± 0.015 vs 0.199 ± 0.012 ml.kg⁻¹.m⁻¹ in group A, and 0.218 ± 0.016 vs 0.203 ± 0.013 ml.kg⁻¹.m⁻¹ in group B, respectively, p<0.05). The improvement of performance was similar between groups (755 ± 87 vs 724 ± 77 seconds in group A, and 748 ± 81 vs 712 ± 76 in group B).
B, respectively, p<0.001). Conclusion: Concurrent strength and endurance training improved maximal power and did not alter negatively the components of aerobic fitness, including maximal oxygen consumption and aerobic endurance. Plyometric training was more efficient than concentric training to improve the energy cost of running. Several hypotheses can now be tested to understand this difference, the main being an improvement of the capacity to use elastic energy.

THE USE OF AN ONLINE TRAINING DIARY TO DISTINGUISH BETWEEN FUNCTIONAL AND NON FUNCTIONAL OVERREACHING: A PILOT STUDY

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Functional overreaching (FOR) is defined as short term performance decrement without severe psychological or negative symptoms. When the imbalance between training and recovery continues, non functional overreaching (NFOR) may occur. The distinction between NFOR and Overtraining syndrome (OTS) is very narrow, and occurs mostly on exclusion criteria (Meeusen et al. 2006). Although many markers have been proven to identify OTS, prevention remains the most important issue. Considering that it is difficult to standardize a method that can detect in advance some “early warning signals” of NFOR or OTS, the purpose of the present study was to evaluate the correlation between subjective and objective data of an online training diary before (PRE) and after (POST) 4 weeks of intensified training (IT) and 2 weeks of recovery (REC) and their relationship with performance and hormonal outcomes.

Methods
Four students (23±1.9 yrs) participated in the present study, trained for 6 weeks, with 2 weeks of IT and 2 weeks REC (Haslon et al 2002) and were tested PRE and POST by means of 2 exercise tests to exhaustion separated by 4 hours (Meeusen et al 2004) and with the finger precuing test (FPT). 4-weeks prior to the beginning of IT and during the whole training period, subjects filled in a daily online training diary (BLITS®?) and the POMS for objective and subjective evaluations of training. Hormonal and performance data were measured with a Friedman test while a Pearson correlation was performed between training diary parameters.

Results
No differences were observed in exercise performance between PRE and POST however, hormonal response was dampened after IT (ACTH: 269% and 135% increase PRE and 3,9% and 27,4% increase POST 1st and 2nd test respectively, PRL 113% and 115% increase PRE and 11% and 64% increase POST 1st and 2nd test respectively). The increase in negative mood was significantly correlated with physical (PWB) and mental well being (MWB) measured on a visual analogue scale. PWB and MWB were significantly correlated (r=0,877). Moreover, training attractiveness was significantly correlated with both PWB and MWB. Strain (load*monotony) increased by 132 and 157% while the Van Loon predicting value (Time*Intensity*attractiveness*soreness*MWB) increased by 322 and 614% in the 1st and 2nd week of IT respectively. The FPT shows that after IT, total reaction time was longer.

Discussion
The results demonstrate that prior to performance decrements due to incorrect training or excessive load, subjective data and training diary parameters are the most visible predictors of FOR, and strongly correlated with negative mood. Therefore, the use of the online training diary seems a valuable tool for training monitoring and prevention of OTS.

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Meeusen et al. EJSS 6:1-14, 2006

THE LEVEL OF METABOLIC ACIDOSIS EFFECTS THE LACTATE MINIMUM HEART RATE IN A HEART RATE BASED LACTATE MINIMUM TEST

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Background: The heart rate based lactate minimum test (LMT) was found to be a reliable tool to estimate maximal lactate steady state (MLSS) with one single exercise test (1, 2). The LMT consists of two parts: i) an incremental test to volitional exhaustion leading to extensive lactic acidosis and ii) a heart rate based incremental test to determine lactate minimum. However, it still remains unclear, whether the first part of the LMT needs to be performed until exhaustion. If not, the practical application of the LMT to provide accurate training prescriptions might be widened to fields, where maximal performance is not always of interest or even risky (e.g. cardiopulmonary rehabilitation). Thus, the aim of the present study was to investigate, whether or not the level of the metabolic acidosis in the first part of the LMT influences parameters measured at lactate minimum.

Methods: 15 well-trained men (age 31±6 years, height: 179±6 cm, weight: 75.6±7.6 kg and VO2peak: 51.0±9.5 ml/min/kg) each completed two LMTs. The first part of the LMT was composed either of an incremental test to exhaustion (maximal test) or an incremental test abandoned three stages earlier than the maximal test (submaximal test). The second part of the LMT was the same for both tests. Average values of heart rate, blood lactate concentration, oxygen uptake, minute ventilation, respiratory exchange ratio, breathing frequency, power and rating of perceived exertion were compared at the end of the incremental tests as well as at lactate minimum.

Results: At cessation of the first part of the maximal test compared to the submaximal test average maximal blood lactate concentration was significantly higher (9.7±2.7 vs. 6.0±2.0 mmol/l, P<0.001). The same finding was also true for all other parameters measured. At lactate minimum mean heart rate was significantly higher after the maximal compared to the submaximal test (160±12 vs. 144±13 bpm, P<0.001). Further, all other variables (except for respiratory exchange ratio) showed significantly higher values at lactate minimum in the maximal compared to the submaximal test.

Conclusion: Based on the findings of our study, we conclude that the first part of our heart rate based LMT needs to be performed to volitional exhaustion in order to reliably predict MLSS.

Any active or stretched passive sarcomere within a muscle fiber will shorten to its active or passive slack length respectively, unless opposed by an equal opposite force. Therefore at equilibrium, sarcomere length is determined by the loads working on it. Usually, only loads exerted by myotendinous structures are considered. However, in addition to those loads, evidence is accumulating that also loads exerted via epimysial myofascial connections. This name indicates that the load is imposed via the epimysium (i.e. the muscle fascia). Such load can originate from non-muscular structures (bone, periost, compartmental fasciae, neurovascular tract, intermuscular septa) or muscles. In the latter case, it seems likely that extramuscular structures usually play an important role, even though some direct transmission between the connective tissue strata of adjacent muscles is also reported (Maas et al., 2006). As a consequence, the length of sarcomeres exposed to such myofascial loads will differ from those exposed exclusively to myotendinous loads. Therefore serial distribution of lengths of sarcomeres within a muscle fiber is likely. The locations of epimysial myofascial loading on the muscle fiber determine such distributions.

If all fibers of a muscle would be exposed to similar myofascial loads little or no distribution of fiber mean sarcomere length would occur (Yucesoy et al., 2003), as seen at certain conditions (see Fig. below). However, finite element modeling usually indicates parallel distributions of sarcomere lengths. The net epimysial myofascial load may have a proximal or distal orientation. The corresponding force related to such myofascial force transmission will be integrated into the opposite side origin or insertion. Therefore, force exerted at both sides should not be expected to be equal. In the example shown force would be bigger at the distal tendon. Recently it has been shown that such additional myofascial force may well originate from antagonistic muscles (e.g. Huijing, 2007; Huijing and Baan, 2008). Experimental evidence and conditions for such force transmission will be discussed.

References.


**THE ROLE OF TENDON MECHANICAL PROPERTIES IN OPTIMISING MUSCLE OUTPUT IN SIMPLE AND COMPLEX LOCOMOTION ACTIVITIES**

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Muscle-tendon interaction in static and dynamic conditions has important implications for muscle function. One of the important questions, for example, is whether Achilles tendon compliance is optimised for maximum muscle efficiency during locomotion (e.g. Lichtward & Wilson, J Biomech, 40, 2007). The mechanical response of tendons is more complex than a linear spring and due mainly to the wavy pattern of the collagen fibres and the mix of collagen and elastin present, these tissues behave in a non-linear elastic manner. Furthermore, the high liquid content means that there are substantial viscoelastic effects in evidence. Stress at a given time depends not only on the elongation but also on the rate of elongation and other history effects.

In previous experiments of muscle-tendon interaction during locomotion it was shown, for example, that force was developed isometrically and this was interpreted as an energetically efficient mechanism. Increases in incline increased muscle fascicle length at which force was developed and it was suggested that the Achilles tendon allowed the muscle fascicles to act at speeds more favourable for power production. These findings also suggested that the function of the muscle fascicles at different slopes is relatively unchanged despite changes in the external work demands (Lichtward & Wilson, J Exp Biol, 209, 2006).

In human drop jump exercises the gastrocnemius medialis (GM) fascicles shortened throughout the ground contact (Ishikawa et al., J Appl Physiol, 99, 2005). In human walking experiments the GM fascicles contract isometrically (Fukunaga et al., Proc R Soc Lond, B268, 2001), or even lengthen (Ishikawa et al., J Appl Physiol, 99, 2005) during the single support phase when muscle tendon unit (MTU) and tendon are stretching. These findings show different/contradicting fascicle behaviour as fascicles did not follow the length change pattern of the MTU and perhaps movement specific fascicle behaviour (e.g. Ishikawa et al., Gait and Posture, 25, 2007).

In a series of experiments we examined gastrocnemius muscle fascicle behaviour during stair negotiation in humans (Spanjaard et al., J Appl Physiol, 102, 2007) and the influence of gait velocity (Spanjaard et al., J Electromyg Kinesiol, 2007) and step-height and body mass (Spanjaard et al., J Biomech, 2008). The main conclusions from dynamic stair negotiation activities are that the GM muscle was mainly active during the touch-down phase of stair descent where the MTU was lengthened; however, the GM muscle fascicles shortened by 7 mm. These findings show that the behaviour and function of GM muscle fascicles in stair negotiation is different from that expected on the basis of length changes of the MTU as derived from joint kinematics. This behaviour of muscle fascicles is not shown when walking down an incline by humans or other species and this difference is probably due to the toe landing in stair descent as opposed to heel landing during incline...
IN VIVO APONEUROSIS MECHANICS

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Introduction: Since the seminal work by AV Hill (1), muscle has been considered as a contractile element (CE), and a passive nearly elastic element arranged in series (SE) with the contractile element. However, neither Hill nor contemporaries identified the structures that were thought to be arranged in series with the CE. With increasing possibilities for theoretical representation of muscles, the series elastic element was rediscovered and needed identification and characterization. Obviously, tendons are in series with muscles. However, other passive structures, specifically the functional arrangement of aponeuroses is not nearly as obvious. Nevertheless, aponeuroses have been considered by most to be part of the in series elasticity of muscle.

By definition, series elastic elements transmit the same force (or force in constant proportion), and elongate in proportion to that force. Several years ago, while measuring aponeuroses strains in the cat medial gastrocnemius (MG), we observed that elongations of the aponeurosis were not in proportion to muscle force and certain parts of the aponeurosis were shortening with increasing force. The purpose of this work was to critically study the properties of aponeuroses experimentally and theoretically.

Methods: Measurements of aponeuroses lengths were performed in isolated aponeuroses, in situ aponeuroses and in vivo aponeuroses of cat MG using sonomicrometry. Simultaneous force measurements in cat MG were made using buckle type tendon transducer (2). Human tibialis anterior aponeuroses properties were also measured using ultrasound imaging for a variety of conditions. Theoretical analyses of aponeuroses force transmission and elongation were performed using models of uni-pennate muscle configurations (3).

Results: Aponeurosis segments in cat MG were found to shorten for in situ isometric contractions, and during normal locomotion. Also, theoretical modeling of aponeuroses function in uni-pennate muscle revealed that forces along aponeuroses were not constant and aponeuroses could shorten with increasing force.

Discussion: It has been shown previously that aponeuroses might shorten upon force production (4) and that aponeuroses strains in active muscle can be smaller than in passive muscle for the same force (5). These observations are not compatible with aponeuroses being arranged mechanically in series with the contractile element. Our observations on cat MG support these findings and add the result that these properties are preserved for in vivo contraction and everyday locomotor activities.

Conclusion: For the muscles tested here, aponeuroses are not arranged mechanically in series with the contractile elements. Should this result prove generally correct, biomechanical models of muscle would need to account for it.

Invited symposia (IS)

IS-PM09 Mechanisms leading to the metabolic syndrome

THE ROLE OF SLEEP AND SLEEP DISORDERED BREATHING IN THE METABOLIC SYNDROME

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The role of sleep duration and sleep disorders in the regulation of metabolism is increasingly recognised. Data from large population studies show that both long and short sleep duration are associated with obesity, the metabolic syndrome, diabetes, cardiovascular disease and mortality. These studies have been carried out across all age groups, and in several countries and ethnic groups. Human sleep laboratory studies have shown that both short sleep duration and sleep disruption are associated with metabolic derangements that are associated with the metabolic syndrome and diabetes. Additionally, sleep disordered breathing, which results in sleep disruption, hypoxia, and daytime sleepiness is associated with hypertension and glucose intolerance. Some studies suggest reversal of metabolic abnormalities with the treatment of sleep disordered breathing with continuous positive airway pressure (CPAP). As a result, it has been suggested that metabolic syndrome (also called syndrome X) should be called syndrome Z because of its potential association with sleep and sleep disordered breathing. The evidence for the association between sleep duration and sleep disordered breathing and metabolism will be critically discussed including potential mechanisms that could contribute to associated metabolic abnormalities. These mechanisms include sleep disruption, intermittent hypoxia, short sleep duration and daytime sleepiness (and concomitant reduction in physical activity) could be mediated through changes in metabolic hormone levels and autonomic nervous system activity.

ABNORMALITIES IN MITOCHONDRIAL FUNCTION: CAUSE OR CONSEQUENCE

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Mitochondrial function may be compromised in insulin resistance and type 2 diabetes. Studies in insulin resistant humans have indicated that the oxidative phosphorylation capacity is diminished in skeletal muscle in these individuals. However, these findings have been challenged by high resolution respirometry studies in which a 10-20% decrease in mitochondrial function is fully accounted for by a reduction in mitochondrial content, as measured by citrate synthase activity and mitochondrial DNA content.

A diminished mitochondrial function in insulin resistant skeletal muscle might partly explain both the common finding of increased intra-myocellular lipids and the hyperglycemia present in type 2 diabetes. However, the reverse situation may also be a possibility, i.e. that the intra cellular lipids are the cause of decreased mitochondrial function. As far hyperglycemia, studies in endothelial cells have shown that in these cells a decreased mitochondrial function may be a consequence of glycaemia induced increased production of reactive oxygen species, with subsequent impairment of mitochondrial function.

The presentation will cover this scenario, and further add to the knowledge of human mitochondrial physiology by reporting new data on intervention studies in healthy and insulin resistant humans.
ROLE OF INFLAMMATION, PROTEIN KINASE C (PKC) AND NADPH OXIDASE IN THE METABOLIC SYNDROME

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Insulin resistance in the metabolic syndrome occurs both at the level of skeletal muscle fibres and at the level of the endothelium of the microvasculature in skeletal muscle. A high release of fatty acids from the adipose tissue stores and high plasma triglyceride levels lead to high concentrations of fatty acid metabolites both in the muscle and in the vascular endothelium. This then activates PKC isomers that lead to serine phosphorylation of IRS-1. The latter has been proposed to prevent activation of IRS-1 by insulin induced tyrosine phosphorylation and downstream activation of the insulin-signaling cascade. This will lead to reduced GLUT-4 translocation and glucose uptake in the skeletal muscle fibres, and has been suggested to prevent activation of endothelial NO synthase (eNOS) in the terminal arterioles of the muscle microvascular bed. The latter has been proposed to lead to an impairment of the meal-induced increase in muscle capillary recruitment in obese subjects that is necessary to channel more glucose and insulin to the muscle fibres. The impairment in both of these mechanisms has been suggested to contribute to the reduction in glucose control in obese subjects with and without the metabolic syndrome. Both exposure to high fatty acids and inflammatory cytokines also leads to activation of NADPH oxidase in the vascular endothelium. NADPH oxidase produces oxygen superoxide anions (a damaging free radical), which will further reduce NO production by the (microvascular) endothelium via a reaction with NO under the formation of peroxynitrite. The further decrease in NO production will reduce the dilation of arteries and arterioles in response to meal-induced increases in insulin and exercise-induced increases in blood flow (shear-stress mediated). A low NO production has also been shown to prevent angiogenesis (leading to loss of muscle capillarities = rarefaction) and to lead to atherosclerosis in the metabolic syndrome. TNF-alpha and related members of the TNF-superfamily via activation of nuclear factor-kappaB have also been shown to induce the expression of cellular adhesion molecules (CAM) by the endothelial cells. This will lead to leucocyte adhesion and a local vascular inflammation that leads to further activation of NADPH oxidase, further reductions in NO production and that will enhance the rate of atherosclerosis. Inflammation of the microvasculature in the muscle also is causing insulin resistance in skeletal muscle via mechanisms that are not completely understood. All these pathogenic mechanisms are reversible by lifestyle interventions involving calorie restriction and regular exercise.

Reference

Invited symposia (IS)
IS-SH06 Decision-making in soccer

A PERCEPTION-ACTION APPROACH TO VISUAL SEARCH AND MOVEMENT BEHAVIOUR IN FOOTBALL

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With its emphasis on the nature of information for action, Gibson's (1979) ecological approach to perception stresses the circularity between perception and action. Gibson argues that information for perception and action is provided by the change or persistence of optical information in the environment. It is in this sense that perception and action are tightly coupled. In the presentation the role visual information will be illustrated and discussed by examples from the stopping of a penalty kick and the movement behaviour of football player in a four-to-four position game. The first part of the presentation will deal with the use of visual information by goalkeepers in stopping a penalty kick. The aim of the experiment was to improve the estimation of the direction of the ball during penalty kicks by changing the visual search behaviour. Inexperienced goalkeepers divided into three groups moved a joystick in response to penalty kick situations presented on a large screen in a pre-test, training and post-test. The perceptual learning group practised with film clips that were edited with a highlight over the relevant information in the sequence of the run-up of the shooter. The self-learning group practised with the same film clips without any highlights. The third group served as control. The findings in the post-test showed that the visual search behaviour of the directed training group changed significantly through direction of attention, changed its time of initiation of the joystick which coincidence with the most important visual information and stopped significantly more penalties than the other two groups. It is concluded that perceptual learning can improve the visual search and movement behaviour of the goalkeepers.

In the second part of the presentation, a study is reported that examined differences in locomotor and visual search behaviour among a group of skilled 11-12 year old football players. The participants watched film clips of a 4-to-4-position game, presented on a large screen. The task for participants was to take part in the game by choosing the best position for the reception of the ball passed by one of the players in the clip. Participants' locomotor and visual search behaviours were collected continuously throughout the presentation of the clip. A within-group comparison was made based upon the participants' interception score. The findings show that the high-score group, i.e. more at the correct position, looked more to the ball, while the players in the low-score group concentrated on the receiver and on the hips/upper body region of the passing player. In addition, the distance covered between the two groups differed significantly. It is concluded that the within-group comparison revealed differences in visual search and behaviour that can be used as indicators for talent.

The presentation will be ended with suggestions and implications for sport science research from a perception-action perspective.

UNDERSTANDING PERCEPTUAL MECHANISMS AND DECISION MAKING IN SOCCER

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Deciding when and how to move is very important when trying to stop a ball from entering the goal in soccer. Goal-keepers must attend to pertinent visual information (player and ball) that will allow them to judge where the ball is going to get their body in the right place at the right time. The aim of this presentation is to explore how this type of perceptual information influences decisions about action.

In soccer more and more teams are exploiting the free-kick scenario as an opportunity for scoring goals (Grant et al, 1999). This appears to be related to the free-kick specialists' ability to bend the ball around the defensive wall. Why do players try to put spin on the ball to...
make it curve? Does this deviation in the ball’s trajectory make it more difficult for the goalkeeper to anticipate where the ball is going and subsequently control their actions to actually get there? In other words, does spin give the attacker a competitive advantage? Experimental work will be presented that shows how a deviation in the ball’s trajectory affects players’ decisions about when and how to act. By immersing players in a virtual soccer stadium and allowing them to interact with realistic curved free kicks we were able to see the extent to which lateral deviations in a ball’s trajectory impact upon the decision making process (Craig et al., 2006). An in-depth behavioural analysis allowed us to examine the relationship between perceptual information picked up through the senses and the control of action. The implications of these findings will be discussed in light of how the dynamics of the environment (e.g., movement of other players and/or the ball) provide prospective information for the player and directly influence decisions players make about their future course of action.

References.

VISUAL EXPLORATION IN PREMIER LEAGUE FOOTBALLERS

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The extent to which skilled athletes use more appropriate and effective visual search strategies than less skilled athletes has been under some debate (e.g., Williams & Ward, 2007). Unfortunately, few studies have been conducted with expert athletes in real world competitive contexts. The purpose of this study was to learn more about the ways expert athletes use visual exploratory activity (Gibson, 1979) to prospectively control their actions under dynamic and complex performance conditions. In particular, we wanted to find out whether visual exploration frequency is related to performance with the ball in professional soccer games. Real-world close-up video images were obtained from Sky Sport’s split screen PlayerCam broadcasts in the 2003-2004 season, generating 442 game situations with 54 midfield players from the English Premier League. In addition, split screen video footage was obtained with 27 Dutch amateur level players (114 situations). Close-up video observation analyses made it possible to examine how players moved their bodies and heads, with their faces directed to players away from the ball (exploratory activity), prior to receiving the ball. Performance was indirectly assessed from level (Premier League or amateur) and player status (international awards), and directly assessed from the videos (e.g., pass completion percentage). The data was analyzed with ANOVAs and logistic regression analyses.

The results indicated a positive relationship between visual exploration frequency and performance. The Premier League players explored more than the amateur players (p < .01) and within the Premier League group, the players with international awards explored more than those without awards (p < .01). In addition, there was a positive relationship between exploration frequency and pass completion rate (p < .05). Specifically, in situations where players had the lowest exploration frequency (0-0.30 searches/s), they completed 57% of their passes, with medium frequency (0.31-0.50) this increased to 70% and with high frequency (0.50-1.25) to 75%.

In conclusion, the positive relationship between exploration frequency and performance is consistent with predictions from the ecological approach to perception (Gibson, 1979). It is possible that by exploring more extensively, actively moving one’s body and head, players detect more relevant and accurate information that can be used to control their prospective actions with the ball. Developing more ecologically valid research protocols for studying perceptual expertise in team ball sports are encouraged.

References.

Oral presentations (OP)

OP-BI02 Biochemistry 2

EFFECT OF ALLOPURINOL AND EXERCISE ON OXIDATIVE STRESS MARKERS IN GASTROCNEMIUS MUSCLE IN RATS

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Allopurinol is an inhibitor of xanthine oxidase. Xanthine oxidase is a major contributor of free radicals during exercise. Previous studies from other laboratories have shown that free radicals are vital for physiological adaptations in exercise. The purpose of this study was to examine the effects of allopurinol, exercise, and their combination on oxidative stress markers in gastrocnemius muscle in rats. Eighty adult male Wistar rats (8 weeks old, weighing 220±10 g; mean±SEM), were randomly and equally divided into eight groups as follows: a) DMSO-treated rats killed at 1.5 h after administration, b) DMSO-treated rats exercised at 1.5 h after administration and killed immediately after exercise, c) DMSO-treated rats exercised at 1.5 h after administration and killed 5 h after exercise, d) exercised allopurinol-treated rats immediately after exercise, e) exercised allopurinol-treated rats killed 5 h after exercise, f) allopurinol-treated rats killed at 1.5 h after administration, g) allopurinol-treated rats killed at 2.5 h after administration, and h) allopurinol-treated rats killed at 7.5 h after administration. Allopurinol was dissolved in dimethyl sulfoxide (DMSO) and administered intraperitoneally in a single dose of 50 mg/kg body weight at 1.5 h before the acute exercise protocol, as allopurinol peak plasma levels occur about 1.5 h after its administration. Exercise duration to exhaustion of DMSO-treated rats lasted approximately 1 h. Allowing 7 days of acclimatization in the animal facility, animals were then familiarized to swimming for a period of five days before the actual swimming protocol was implemented. Rats of the exercising groups individually swam until exhaustion in deep water tanks at a water temperature of 33/36 °C. Gastrocnemius muscle samples were collected before, immediately after and 5 h after exercise and in the respective time points after allopurinol administration. Tissue samples were homogenized using mortar and pestle followed by brief sonication treatment. Reduced (GSH) and oxidized (GSSG) glutathione, catalase activity, total antioxidant capacity (TAC), and thiobarbituric acid-reactive substances (TBARS) were determined. Allopurinol was found to increase GSH concentration, the GSH/GSSG ratio, catalase activity and TBARS concentration, whereas it decreased TAC. Similarly exercise increased GSH concentration, the GSH/GSSG ratio, catalase activity and TBARS concentration, whereas it decreased GSSG concentration. Allopurinol and exercise combined were found to increase GSH, the GSH/GSSG ratio and TBARS concentration. Allopurinol...
inhibits uric acid production to some extent via xanthine oxidase inhibition. This may be a possible explanation of the increased oxidative stress observed in gastrocnemius after allopurinol administration. The mechanism is discussed.

INVESTIGATION OF THE SP1-BINDING SITE POLYMORPHISM WITHIN THE COL1A1 GENE IN SUBJECTS WITH ACHILLES TENDON INJURIES AND CONTROLS

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Sequence variants within the type V collagen (COL5A1) and Tenasin C (TNC) genes have to date been shown to be associated with chronic Achilles tendinopathies and/or spontaneous Achilles tendon ruptures. Type V collagen and tenasin C are quantitatively minor components of tendon, while type I collagen is the major structural component. The expression of COL1A1 has been shown to increase in the painful Achilles tendon. The functional Sp1-binding site polymorphism SNP rs1800012 (IVS1+1023G>T) within the COL1A1 gene, which encodes for the α1 chain of type I collagen, has been shown to be associated with several connective tissue disorders. The aim of this study was to determine whether the Sp1-binding site polymorphism within the COL1A1 gene is associated with chronic Achilles tendinopathies and/or spontaneous Achilles tendon ruptures. Achilles tendinopathy (n=85), Achilles rupture (n=41) and asymptomatic control (n=125) subjects were genotyped for the COL1A1 Sp1-binding site polymorphism. There were no observed statistical differences in the genotype (P=0.602) or allele (P=0.694) distributions between the groups. In conclusion, this study has shown that there is no association between the Sp1-binding site polymorphism within the first intron of COL1A1 and Achilles tendinopathy or Achilles tendon rupture within the population studied.

TREADMILL EXERCISE ENHANCED LIVER NOT SKELETAL MUSCLE GLYCOGEN CONTENTS IN MALE RATS AT REST

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Introduction: glycogen as a polysaccharide is stored in the liver and muscle at high levels and with low levels in heart, brain, erythrocyte, and lymphocyte. Glycogen also has been recognized as an important source of energy provision, particularly during prolonged exercise training. The effect of endurance training on tissues glycogen content is well documented. On the other hand, it has been suggested that endurance-trained rats have higher glycogen contents than sedentary match groups. Most of previous studies have focused on the temporary effect of high intensity exercise on muscle glycogen content, but they did not much focused on the effect of exercise training program at different intensities on resting muscle and liver glycogen simultaneously. The purpose of this study was to investigate the effect of treadmill exercise at different intensities on liver and skeletal muscle glycogen contents in male rats at rest. Methods: forty male Wistar rats (4-6 weeks, 250-260g) were used and divided into four groups: control, low (18m/min), moderate (26m/min) and high (34m/min) intensities. Training groups were undertaken of a motor-driven treadmill running at each mentioned intensities 60min/day, 5 days/week, for 12 weeks. Animals were sacrificed 36 hr after the last session of exercise training. All rats were overnight fast. A portion of liver and skeletal muscle (gastrocnemius) were removed, cleaned and immediately frozen by liquid nitrogen. Tissues glycogen was obtained by a commercial kit. Data were analyzed by one way ANOVA method and all P values <0.05 were considered significant.

Results: a higher level glycogen has been observed in trained rat liver not muscle when compared with control group. A higher and significant (P<0.01) resting liver glycogen concentration was only found in moderate intensity group. A lower and significant muscle glycogen concentration was observed in high and moderate intensities groups (P<0.01, P<0.024, respectively) when compared with control group. Discussion: a high liver glycogen in moderate intensity group and low level muscle glycogen in moderate and high intensity groups were found. A lower resting muscle glycogen content after a high intensity exercise might be attributed to a higher negative energy balance, glycogen content of muscle, possible exercise-induced muscle damage, and an incomplete recovery time following exercise plus short period of fasting. Conclusion: it seems that treadmill exercise at moderate intensity resulted in liver not muscle glycogen supercompensation in our experimental condition. A tissue glycogen content might be considered as a factor for glycogen restoration status and liver glycogen supercompensation has no direct impact on muscle glycogen restoration. Data indicate that there is no tissue preference and order for glycogen restoration during recovery period.

OXIDATIVE STRESS RESPONSE IN YOUNG JUDOISTS DURING FOUR WEEKS PREPARATION PERIOD TRAINING PROGRAM

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BACKGROUND: Exercise can produce an imbalance between reactive oxygen species and antioxidant defense system, which is referred to as oxidative stress. Two major classes of endogenous protective mechanisms (enzymatic and non enzymatic antioxidants) work together to reduce the harmful effects of oxidants in the cell.

AIM: This investigation aimed to evaluate response of selected markers of oxidative stress in young judoists during four weeks preparatory period.

METHODS: Ten male judoists (mean±SD: age 20.1±1.3 years, body height 1.74±0.05 m, body weight 70.6±8.1 kg, body fat 7.3±2.9%) participated in the investigation. Blood samples, collected at rest before and after four weeks, were analyzed for the determination of selected markers of oxidative stress (malondialdehyde MDA, catalase CAT, carbonil and sulphhydryl group assay for determination of modified proteins and total antioxidant status TAS). The results were statistically evaluated by the Wilcoxon Signed Ranks Test.

RESULTS: There were no significant changes in erythrocyte MDA (median Me 13.84 µmol L-1 pre vs. 15.62 µmol L-1 post, p>0.05), plasma CAT (Me 7.21 IU L-1 pre vs. 9.44 IU L-1 past, p>0.05), catalase group (Me 0.71 µmol L-1 of proteins pre vs. 0.82 µmol g-1 of proteins post, p>0.05), sulphhydryl group (Me 191.06 µmol L-1 pre vs. 205.73 µmol L-1 post, p>0.05) and TAS (Me 49.91% pre vs. 52.67% post, p>0.05).

CONCLUSIONS: It can be concluded that this pattern of preparation period training program did not have any effects on oxidative stress levels in well-trained young judoists, and the body's natural antioxidant defenses respond adequately to increases in four weeks training program.

Key words: oxidative stress, judo, antioxidant defense, exercise.
Heat shock proteins (HSPs) act as molecular chaperones by refolding unfolded proteins. They control protein synthesis and trafficking, as well as regulating cellular adaptation and survival. Physical exercise provides a physiological stimulus for increased HSPs expression and up-regulate endogenous defences.

In the present study we investigated the effect of exercise and oxidant antioxidant intervention on the mRNA and protein expression of selected HSP and free radical concentration in the myocardium of rats. Methods: Thirty six, male Wistar rats were randomly assigned to one of six groups: non-exercised control injected with saline (NEC), non-exercised injected with oxidant H2O2 (NEH), non-exercise injected with antioxidant, N-tert-butyl-a-phenylnitrone (PBN) (INEP) and their respective exercised groups: exercise control injected with saline (EC), exercised injected with oxidant (EH) and exercised injected with antioxidant (EP). The experimental period lasted 10 weeks of inactivity or treadmill running. All animals were injected two weeks prior to sacrifice, every other day one hour before exercise. Results: Results revealed significant increase in HSP70 in all groups underwent exercise and significant increase in HSP25 and HSP90 only in EC group. No significant changes were found in HSP60 protein level. In addition, no differences were observed in any of the level of HSP mRNA among groups. The electron spin resonance (ESR) data for free radical concentration demonstrated significant decrease in free radicals in EC and NEP groups. Conclusions: HSP 70 induction seems to be sensitive to exercise training but not to oxidant or antioxidant interventions. On the other hand, HSP25 and HSP90 were induced by exercise alone while oxidant-antioxidant intervention attenuated their increase, emphasizing the redox regulation of cellular adaptations can be hampered by exogenous manipulations of oxidative stress. HSP60 showed no sensitivity to exercise or to oxidant-antioxidant stimuli. HSP mRNA level seems to be independent of protein level and it might be regulated by post-transcriptional modifications. Finally, exercise alone and antioxidant in sedentary animals have the capability of decreasing free radical concentration.

CONTRACTILE AND STRUCTURAL ALTERATIONS IN EDL MUSCLE FROM OB/OB MOUSE

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Animal models of obesity exhibit significantly higher body mass and lower skeletal muscle mass. This raises questions as to the contractile (and structural) status of skeletal muscle in the obese state, particularly in light of exercise being promoted as a therapeutic strategy. Here we combined whole muscle and single fibre methods to compare contractile properties (twitch and tetanic force, force-frequency relationship, fatigue resistance), myosin heavy chain isoform (MHCi) and fibre type composition and lactate dehydrogenase isoenzyme (LDHi) profile of the extensor digitorum longus (EDL) muscle from adult (18-22 wk) male C57 black (B6 V-Leip ob I/B) mice and its wildtype (lean) counterpart. For contractile measurements, the muscles were maximally stimulated at optimal length in carbogen (95% O2, 5% CO2)-bubbled Krebs solution with 10mM glucose and 10mM tubocurarine at 25±0.5 degrees Celsius. MHCi composition in both whole muscle homogenates and single muscle fibres and LDHi profile were determined electrophoretically. Mean body mass of obese and lean mice was 32.2±1.6 g (n=8) and 28.5±0.7 g (n=8), respectively. Mean muscle mass of EDL from obese mice (9.9±0.4 mg) was 27% smaller than from lean mice (13.5±0.7 mg). In comparison to EDL muscle from lean mice, EDL muscles from obese mice exhibited: (i) similar twitch and maximum tetanic forces per cross sectional area, (ii) shorter rate of force development of tetanus, (iii) longer half-relaxation time of twitch and tetanus, (iv) greater relative tension at suboptimal frequencies, (v) increased resistance to fatigue, and (vi) greater recovery of peak force post-fatigue. The predominant fibre type (~82%) in randomly dissected fibre populations from EDL muscles of both obese and lean mice was type IIb, however, the fibre population from obese mice compared with that from the lean controls, respectively.
contained a greater proportion of hybrid fibres (17.9% vs 4.5%), the majority co-expressing MHCIIdb and MHCIIdb (IIdb fibre). Consistent
with this result, EDL muscles from obese mice displayed a MHC IIIdb isoform ratio of 5.46 compared to that of 12.31 in muscles from
lean mice. The LDH profile of EDL muscles from obese mice displayed a M H subunit ratio of 33.13 compared to that of 78.99 in muscles
from lean mice. This was reflected by a lower proportion of LDH5 (M4; -6.8%, P<0.05) and a greater proportion of LDH4 (M1H3; +6.8%,
P<0.05) isoenzymes in EDL from obese mice. Taken together, these data suggest that the shift towards a more aerobic-oxidative muscle
observed in the present study of EDL from the obese mouse may be part of an adaptive response to the obese condition, whereby the
physiological role of the EDL muscle changes from a muscle enabling rapid movement to a muscle more suited to working under condi-
tions of increased body weight.

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Oral presentations (OP)

OP-BN03 Biomechanics 3 - Neuromuscular

COMPARISONS OF THE LOWER LIMB KINEMATICS AND INTER-JOINT COORDINATION BETWEEN THREE DIFFERENT
CLOSED KINETIC CHAIN EXERCISES

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Introduction - Resistance exercise prescription is used to improve sport performance, rehabilitate injury, and preserve functional inde-
pendence in older adults. Despite its branching applicability, all resistance exercise prescriptions require a fundamental analysis, termed
needs analysis. Thus, appropriate resistance exercise prescription requires an analysis of both the activity to be improved, restored, or
preserved, and the exercises that may be used to the scope.

Methods - Eight healthy, young resistance training athletes (aged range 21-39 years, body weight 54-81 kg, standing height 160-176 cm)
performed three different exercises: Forward lunge (FL), Forward step-up (FSU) and Deadlift (DL) with a load corresponding to the subject's
15 RM. The three-dimensional movements of six right-side body landmarks (fifth metatarsal heads, heel, lateral malleolus, head of fibula,
greater trochanter and anterior superior iliac spine) were detected by an optoelectronic instrument with a sampling rate of 60 Hz (SMART
System - B.T.S., Milan, Italy), during 3 repetitions of each exercise (2). The lower body was modeled as 4 rigid bodies (feet, leg, thigh, and
pelvis) connected by pin joints. Angle displacement of ankle, knee and hip were obtained from the cinemematic data. To assess the interjoint
coordination during each task, continuous relative-phase variables (CRF) were calculated between pairs of joints (1). The average values
obtained over the three trials of the ankle, knee, and hip sagittal plane range of motion (ROM) angles, and average RMS value of CRF
between ankle-knee, knee-hip and hip-ankle (1) were used for statistical analysis (two-way factorial analysis of variance with repeated
measures).

Results As expected, ROM differed among the three analyzed joints, while no significant differences were found between exercises. From
FL to DL, CRF of movement coordination between ankle and knee decreased of 13° (p<0.001); from FL to FSU, CRF between knee and hip
decreased of 15° (p<0.0001). In the other instances, the level of phase coordination was similar between the exercises.

Conclusions The joint ROM did not differ among the three motor tasks. The execution of FL was made with different inter-limb motor
programs, resulting in a significant difference in ankle/knee coordination relative to DL, and in knee/hip coordination relative to FSU.
These findings should be considered when prescribing exercises, matching closed kinetic chain biomechanical attributes with the re-
storative, maintenance or improvement requirements of patients and athletes.

References.

EFFECTS OF SUBMAXIMAL FATIGUING CONTRACTIONS ON THE COMPONENTS OF DYNAMIC STABILITY CONTROL
AFTER FORWARD FALLS

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Several studies reported that loss of muscle strength may alter the capacity of the human system to generate rapid force for balance
corrections after sudden perturbations (3,4). In agreement to these reports, we found that the muscle-tendon capacities of the lower
limbs contribute about 33% to the balance recovery after forward induced falls (2). However, postural corrections after a sudden per-
urbation involve sensorimotor adaptational responses which include mechanisms responsible for maintaining the dynamic stability and
thus muscle weakness may be partly compensated by proper planning and execution of the used locomotion strategy. The present study
aimed to experimentally investigate the effect of muscle strength decline, induced by submaximal fatiguing contractions, on the dynamic
stability control of young adults during forward falls.

Thirteen participants (body mass: 70.2 kg, body height: 175 cm) were instructed to regain balance with a single step after a sudden
induced fall from a forward-leaning position before and after the fatigue. The experiment (pre and post fatigue) has been performed at
12 Vicon cameras operating at 120 Hz.

The reaction time as well as the duration until touchdown did not show any differences (p>0.05) before and after the fatiguing contra-
tions. All components of the dynamic stability (1) at touchdown did not differ significantly (p<0.05) between the two conditions. As ob-
served at the instant of touchdown as well as at the end of the main stance phase the fatiguing contractions had no effect on the compo-
nents of dynamic stability. In the fatigued condition, the participants flexed their knees more during the main stance phase, leading to an
increment in time available to decelerate the horizontal CM motion.

The fatigue related decrease in muscle strength did not affect the margin of stability, the boundary of the base of support or the position
of the extrapolated centre of mass during the forward induced falls, indicating an appropriate adjustment of the motor commands to
compensate the deficit in muscle strength. We concluded that the decrease in muscle strength after the fatiguing contractions do not lead
To functional deficits while the forward falls demonstrating that this specific impairment of the musculoskeletal system cannot fully predict the postural performance.

References.

THE FORCE-RATE OF FORCE DEVELOPMENT RELATIONSHIP IN THREE TYPES OF ISOMETRIC CONTRACTIONS

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INTRODUCTION

When individuals are asked to produce rapid contractions to force levels along a submaximal continuum, there is a strong linear relationship between the peak force (PF) achieved and the corresponding peak rate of force development (RFD). However, a number of factors could confound the PF-RFD relationship, one of them being contraction history. The purpose of this study was to investigate the PF-RFD relationship in three different types of isometric contractions: 1) contraction from rest (REST), contraction from a 20% MVC baseline force level (BASE20), and 3) contraction preceded by a small effort in the opposite direction (PULL-PUSH).

METHODS

Twelve physically active adults (6 females) participated in the study. Subjects were seated on a custom bench for isometric testing. The left leg was affixed to a strain gauge force transducer proximal to the ankle joint. Subjects were asked to perform three MVC for the purpose of scaling all subsequent forces. Thereafter, subjects performed blocks of five contractions at each of three force levels in each of the three experimental conditions. In each condition, subjects were instructed to generate force above 40, 60, or 80% MVC, as fast as possible. Visual feedback was provided for each subject. For each force pulse, PF and RFD were recorded. In the BASE20 condition, the amplitude of individual pulses was calculated by subtracting the baseline force level from the peak force. Within each of the three conditions, five muscular contractions to each force level (40, 60, 80% MVC) provided 15 measurements. For each individual subject, as well as for the whole group, linear regression was used to describe the relationship between PF and RFD.

RESULTS

All participants had strong positive PF-RFD relationships (R2=0.66-0.99). R2 values were correlated such that consistent performance was associated with greater slopes (r=0.51, p<0.01) and lesser y-intercept (r=0.58, p<0.01). The covariance between the slope and y-intercept was very strong (r=0.94, p<0.01). When data from all subjects were consolidated within the three conditions there was remarkable similarity among the PF-RFD relationships. There were no significant differences between conditions for slope or y-intercept. Note also that our PF-RFD parameters for knee extension were strikingly similar to those reported by others for dorsiflexion.

CONCLUSION

Considering these results, and other reports in the literature, it seems that the PF-RFD relationship may represent a rule that describes the expression of the amplitude and rate characteristics in these feed-forward isometric force impulses. Our finding suggests that 1) exertion of high forces and the rapid exertion of forces represent the same ability of the neuromuscular system, and 2) separate evaluation of PF and RFD is not needed in routine testing batteries.

References.

DYNAMIC ANTERIOR Tibial DISPLACEMENT AND Hamstrings REFLEX ACTIVATION

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Introduction.

Anterior tibial displacement leads to increasing strain in hamstrings and ACL and thus induces hamstrings reflex activation. Requiring adequate dynamics of the stimulus, the hamstrings reflex activation comprises short (SLR) and medium latency responses (MLR) (Lee & Talbot, 1975). It is assumed that underlying group Ia and II signals are sensitive to different stimulus properties. Thus the aim of the study was to investigate whether variation of tibial displacement concerning the velocity and the amount of the stimulus was associated with modulation of reflex activation.

Methods.

Dynamic tibial displacement in anterior direction was applied, while the subject was standing upright with the knees slightly bent. The stimulus was induced by a falling weight and transferred to the shank of the subject. By varying the mass and the height of fall, the impulse could be varied concerning the amount of the resulting force and the rate of force development acting on the shank. The respective properties of the stimulus were measured with a force transducer and estimated by the size of the impulse (IMP), the maximal force (FMAX) and the rate of force development (RFD) acting on the shank. Tibial displacement (TD) was measured with an arthrometer. The amount of the SLR and MLR of m. biceps femoris (BF) and m. semitendinosus (ST) was calculated by integrating the EMG over time (iEMG) (Gruber et al., 2006). Correlation between the stimulus properties and the reflex activation was analyzed.

Results.

Significant correlation between the SLR of BF and the RFD acting on the shank could be detected, while IMP and FMAX did not affect SLR. MLR of BF correlated significantly with FMAX but not with IMP and RFD.

Discussion.

The results indicate, that the respective reflex components are sensitive to different stimulus properties. While the SLR is sensitive for RFD but not for FMAX and IMP, it is obvious that the underlying different contribution is of differential origin probably resulting from dynamic nuclear bag fibers. Therefore the la afferents are supposed to be responsible for the SLR not only due to the reflex latencies, but also due to their sensitivity concerning the specific quality of the stimulus. The MLR component is sensitive for FMAX and not for RFD. Thus this reflex component is supposed to be of proportional origin probably resulting from static nuclear chain fibers, which are mediated through group II fibers. Our study highlights the importance of the stimulus properties for the corresponding reflex activation of hamstrings muscles in anterior tibial displacement.

References.
HAMSTRING THICKNESS AND STRETCH IN ISOMETRIC RAMP CONTRACTIONS
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Hamstring muscle and tendon strains are frequent injuries in various sports. Therefore investigation of tendon and muscle properties of the hamstrings is important. Chleboun et al., (2001) found that the fascicle length and pennation angle of biceps femoris (BF) changed significantly as length changed. Due to the complexity of the hamstrings, its architecture and function are affected by the change of the knee joint angle and the level of muscle force. Information on muscle architecture related to joint positions is essential for the study of muscle function (Lieber, 1993) and treatment of hamstring injuries.

The purpose of the present study was to examine hamstring muscle thickness and aponeurosis stretch during ramp isometric contractions.

**Method**
Twelve males and females performed three maximum isometric contractions (MVCs) of the knee extensors and flexors at 0°, 45°, and 90° knee flexion angle. They then performed ramp isometric contractions of the knee flexors at 0%, 40%, 80% MVC. In each position, longitudinal ultrasonic images of the BF were obtained. The video images were digitized to measure aponeurosis strain and the muscle thickness during each position.

**Results**
The results indicated that for each knee flexion angle, as the MVC levels increased, the strain values increased. Particularly the strain values ranged from 3 to 10 cm, 6 to 13 cm and 5 to 14 cm at 0°, 45°, and 90° angles respectively. The muscle thickness decreased as the MVC level increased. The muscle thickness values ranged from 2 to 7 cm, 3 to 17 cm and 2 to 10 cm at 0°, 45°, and 90° angles respectively. The above results indicate that hamstring’s tendon elasticity increases as isometric force increases via a quasi-linear relationship. This relationship could be used to model hamstring function muscle-tendon unit.

**References.**

AGE-RELATED H-REFLEX EXCITABILITY AND JUMPING PERFORMANCE IN MAXIMAL DROP JUMPS
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**INTRODUCTION**
Neuromuscular activity and thus physical performance is strongly dependent on motoneuronal excitability. H-reflex, as a measure of this excitability, has been shown to be modulated during movement (1). In addition, H-reflex response in passive condition may be affected by ageing (2). It is, however, not clear whether the possible changes during movement are similar between different age groups. Therefore, the purpose of this study was to examine the possible effect of ageing in H-reflex activity and jumping performance in maximal drop jumps (DJ).

**METHODS**
10 young (Y: 21-31 years) and 20 elderly (E: 60-70 years) males participated in this study. H-reflex and M-wave were measured from the soleus muscle (Sol) during standing rest and during maximal drop jumps (DJ). In DJ the onset of the H-reflex stimulation was 20ms after ground impact. Hmax/Mmax -ratio was calculated for standing and H/M20% -ratio for DJ. In DJ, take-off velocity and pre-, breaking- and push-off phase EMG (RMS) activity was measured from Sol and medial gastrocnemius (MG) muscles. EMG values were normalized to maximal EMG which was measured during maximal isometric plantar flexion (MVC).

**RESULTS**
Take-off velocity was significantly higher in young (Y: 2.47 ± 0.09 m/s, E: 2.05 ± 0.16 m/s, p<.001). Pre-activity EMG was significantly higher in elderly only in MG (Y: 38.4 ± 32.5%, E: 82.9 ± 32.8%, p<.01). EMG in the breaking phase (Y: 79.1 ± 46.7%, E: 51.4 ± 17.3%) and in the push-off phase (Y: 165.8 ± 46.9%, E: 128.5 ± 32.7%) were significantly higher (p<.05) in young, but only in Sol. Hmax/Mmax -ratio in standing did not differ between the two groups (Y: 0.37 ± 0.25, E: 0.34 ± 0.18) and no statistically significant age-related changes were found in H/M20% -ratio during DJ (Y: 0.97 ± 0.91, E: 0.78 ± 0.50). MVC was almost similar in both groups (Y: 181 ± 15Nm, E: 178 ± 46Nm).

**DISCUSSION**
Decreased take-off velocity and breaking and push-off phase activity during DJ indicate decreased muscle performance of the elderly. Surprisingly, similarly to MVC, no significant differences in Hmax/Mmax ratio either in standing or in DJ condition could be observed between the age groups. Ageing has been shown to lead to degeneration of the fast twitch motor units (3). As soleus muscle consists mainly of slow type motor units, the effect of ageing for that particular muscle could be lower. This could probably explain why only small differences in H-reflex excitability between the age groups were observed.

**References.**
Multilevel Poisson Regression model was fitted to assess Rate Ratios and 95% CI, predicting the number of clustered risk behaviors.

The distribution of CRP was positively skewed. The median value was 0.42 mg/L in girls and 0.66 mg/L in boys. A total of 11.1% in girls and 10.3% in boys had levels above 3 mg/L (p=0.340), a threshold defining the adult high-risk category. CRP was strongly related to BMI (r=0.584, p<0.0005), waist circumference (r=0.603, p<0.0005) and sum of skinfolds (r=0.656, p<0.0005). CRP exhibited strong positive correlations with triglycerides (r=0.402, p<0.0005), total cholesterol/HDL-cholesterol ratio (r=0.371, p<0.0005) and Apo B (r=0.284, p<0.005). These relationships remained unchanged after adjustment for obesity. Other factors were either not related to CRP (blood pressure, total cholesterol, Apo A1, Iqpal, adiponectin, TNF-α) or their correlation was markedly attenuated to statistically non-significant levels after adjustment for obesity (glucose, LDL-cholesterol, HDL-cholesterol, LDL-cholesterol/HDL-cholesterol, Apo B/Apo A1).

Discussion/Conclusion.
CRP was positively correlated with most cardiovascular risk factors. However, with the exception of triglycerides, total cholesterol/HDL-cholesterol ratio and Apo B, the correlations were largely explained by the confounding effect of obesity, emphasizing the many effects of obesity on body metabolism. The independent relationships with triglycerides, total cholesterol/HDL-cholesterol ratio and Apo B suggest a role for inflammation throughout life in the development of cardiovascular and metabolic derangements. Our findings suggest that it may be important to control body weight to prevent an increase in serum CRP in Greek children.

Results
Correlations were used to test the interrelationships among CRP, obesity and cardiovascular risk factors.

Methods
The sample comprised 5723 women, aged 36.8 ± 9.1 who participated in the APAHS. Physical activity (PA) was assessed with the International Physical Activity Questionnaire short version (IPAQ). Total PA was expressed as minutes/week, by weighting the reported minutes of moderate PA and vigorous PA per day, by the number of days of each type of PA (Total PA = moderate-intensity activity minutes x moderate-days + vigorous-intensity activity minutes x vigorous-intensity days). Subjects were classified as inactive if total PA <= 150 minutes of moderate PA and vigorous PA per day, by the number of days of each type of PA.

Results: Results showed that the prevalence of physical inactive women was 55.6%, 52.3% had a BMI >= 25 kg/m2, 18.5% were current smokers and 72.4% had an inadequate sleeping time. The risk behavior combination with higher prevalence was "physical inactivity, inadequate sleeping time and BMI=> 15 Kg/m2" - 21%. Inactive women were more likely to have 1 risk factor (x2= 31.585, p<0.001) and 2 risk factors (x2= 36.197, p<0.001) but were less likely to have 3/4 risk factors (x2= 4.731, p<0.001) compared to active women. Regression analysis showed that physical inactivity was not a predictor of the number of clustered risk behaviors, after adjusting for age and education level (Rate Ratio=0.9782; 95%CI: 0.939-1.019, p=0.051).

Conclusions: Among Azorean women, physical inactivity was not a predictor of the number of clustered risk behaviors, although having 1 or 2 risk behaviors was associated with physical inactivity (in the bivariated analysis). Further studies are necessary to investigate and clarify this relationship between physical inactivity and risk behaviors, in this population.
FLEXIBILITY IS FITNESS RELATED TO ARTERIAL STIFFNESS

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PURPOSE: Fitness, especially cardiovascular endurance, has been identified as determinants of age-related arterial stiffening. Health-related components of fitness include cardiovascular endurance, muscular strength and endurance, and flexibility. Although the flexibility of different components of fitness, the relationship between flexibility and arterial stiffness remains unknown. Using the cross-sectional study design, we tested hypothesis that the flexibility associated with arterial stiffness independent of other components of fitness. METHODS: A total 314 adults, 20 to 39 years of age (young), 40 to 59 years of age (middle-aged) and 60 to 77 years of age (older), who were either poor-flexibility or high-flexibility, were studied. The flexibility was evaluated by sit-and-reach test. Cardiovascular endurance and muscular strength were measured by peak oxygen uptake and leg power, respectively. The arterial stiffness was assessed by brachial-ankle pulse wave velocity (baPWV). RESULTS: In young group, the sit-and-reach values of poor-flexibility and high-flexibility were 35.0 +/- 6.2 and 47.9 +/- 5.2 cm, respectively (P<0.001), those in middle-aged group were 32.1 +/- 5.3 and 45.9 +/- 4.9 cm, respectively (P<0.001), and those in older group were 27.1 +/- 6.5 and 42.2 +/- 5.0 cm, respectively (P<0.001). In each age group, age did not differ between poor-flexibility and high-flexibility groups. In older group, baPWV was higher in poor-flexibility than in high-flexibility peers (F=542 +/- 245 vs 1361 +/- 202 cm/s, P=0.01). However, in young and middle-aged groups, there was no significant difference between two flexibility groups. In the pooled analysis, a univariate regression analysis indicated that baPWV correlated with sit-and-reach (r=0.34, P<0.0001), peak oxygen uptake (r=0.42, P<0.0001) and leg power (r=0.19, P<0.001). A stepwise regression analysis revealed that among components of fitness, sit-and-reach and peak oxygen uptake were independent correlate of baPWV. Leg power did not enter as significant predictors of baPWV. CONCLUSION: We concluded that (1) poor-flexibility was associated with the higher arterial stiffness in older group, (2) age-related arterial stiffening was greater in poor-flexibility than in high-flexibility, and (3) flexibility independently associated with arterial stiffness. These findings are consistent with the idea that flexibility is identified as determinants or predictors of age-related arterial stiffening independent of other components of fitness.

CHARACTERIZATION OF A SEVEN MINUTES AQUATIC EXERCISE MAXIMUM EFFORT AND HEALTH RISK DETERMINATION

FADEUP, Portugal

Literature on hydrogymnastics is scarce and has been situated mainly on the estimation of aerobic performance indicators. According to the guidelines of the ACSM (Haskell et al., 2007) healthy adults need moderate-intensity aerobic physical activity. Anaerobic performance development as been neglected in fitness field without any sustained reason. Apparently, this kind of efforts still needs to be studied and possible health risks associated to it should be assessed. The aim of the present study was to characterize a long effort peak and detect possible health risk factors associated with it. Ten healthy women (38.3 +/- 9.39 years) experienced in hydrogymnastic participate in the study. Exercise protocol consisted on a 3 min warm up (level 11 in Borg’s 6 to 20 Rate of Perceived Exertion (RPE) Scale), followed by 5 min of aerobic exercise of moderate intensity (13 to 15 in Borg’s RPE scale), and a peak effort (18 to 20 in Borg’s RPE scale) of 7 min duration. Rest HR values (POLAR Vantage NV™) were obtained both on land and in water and during exercise. Blood pressure (BP) was evaluated at rest, and after exercise by experienced health professionals using a sphygmomanometer and a stethoscope. Mean BP was also calculated using systolic (SBP) and diastolic blood pressure (DBP) (MBP=1/3 SBP-DBP+DBP) and used as a health risk factor. Blood lactate concentration ([La-]) was determined at rest and after exercise (LactatePRO). Due to the lower number of subjects studied, both non-parametric Wilcoxon test and parametric Paired Samples T-Test were applied to data. The level of significance was established on 5%. Differences obtained trough both statistical procedures leaded to the same results. HR rest values were significantly lower on water (69.9 +/- 11.06 bpm) comparatively to land (75.7 +/- 11.63 bpm). Peak and mean HR values of the 7 min peak were 185.3 +/- 11.54 and 179.90 +/- 12.81 bpm, respectively. After exercise systolic blood pressure was significantly higher (mean difference of 26.40 +/- 15.02 mmHg) and diastolic blood pressure was significantly lower (mean difference of 5.00 +/- 4.9 mmHg) than at rest. The same MBP was observed in rest (88.8 +/- 12.22 mmHg) and after exercise (83.4 +/- 14.41 mmHg), showing a lower cardiovascular risk associated to an exercise performed at maximum intensity during a relatively long period of time. [La-] values were significantly higher after exercise (12.0 +/- 3.40 mmol/l) comparatively to rest (0.8 +/- 0.1 mmol/l) and showed the high level of participation of the anaerobic metabolic pathway during the 7 min peak. BP and [La-] values combined leads to the conclusion that anaerobic exercise could be safely used in hydrogymnastic classes with healthy subjects.

References:

PHYSICAL-ACTIVITY AND HEALTH IN A CROSS-SECTIONAL POPULATION STUDY AND THE EFFECT OF SUBSEQUENT WORKSITE INTERVENTIONS WITH CONTRASTING PHYSICAL-EXERCISE PROGRAMS ON SPECIFIC HEALTH OUTCOME MEASURES

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Background: Physical activity is known to have a positive effect on metabolic, cardiovascular, and musculoskeletal health as repeatedly documented in cross-sectional population studies. However, conflicting results have been reported in randomized controlled interventions in particular in regard to musculoskeletal health. Also, previous studies have been unsuccessful in discriminating the effectiveness of different types of exercise interventions in relation to various health outcomes. Aim and Methods: A cross-sectional population study was conducted at a public work place (N=2000 employees) followed by a one-year worksite randomized controlled physical-exercise intervention (N=600 employees) with three groups: specific resistance training (SRT), all-round physical exercise (APE), and reference (RE) without physical exercise programs. The aim was to analyse at baseline for possible relationships between physical activity and various health outcomes in terms of self-rated general health, frequency of musculoskeletal health including muscle strength, and measured variables on risk indicators for metabolic and cardiovascular health (i.e. blood pressure, body mass index, body fat percentage, and maximal oxygen uptake). The same measures were taken mid and post interven-
tion. A questionnaire was filled in with regard to general health, duration and intensity of musculoskeletal pain and physical activity. The risk indicators were measured by conventional methods.

Results and Discussion: At baseline there were significant correlations between participants physical activity and self-rated general health (R=0.09 for total physical activity and R=0.12 for vigorous activity). Further, significant correlations were found between vigorous activity versus neck pain (R=0.11), shoulder strength (R=0.10), body fat percentage (R=0.09), and maximal oxygen uptake (R=0.13). These data are in concert with previous studies. Worksite exercise interventions (APE+SRT) relative to REF intervention had positive effects on musculoskeletal pain in neck and low back (duration of pain during the last three month was reduced ~ 25%) as well as on shoulder strength (increased ~10%). But only SRT showed a preventive effect on neck pain. Likewise, exercise decreased body fat percentage (~5 percent point) and systolic blood pressure (~5mmHg), but only APE showed significant improvement in maximal oxygen uptake. No changes occurred in the REF group.

Conclusion: Physical activity correlated with several positive health outcomes regarding musculoskeletal as well as metabolic and cardiovascular health; vigorous activity showing the strongest correlations. Different types of physical-exercise at the worksite showed a number of similar health enhancing effects; however, results showed SRT to be superior regarding prevention of neck pain while AET was superior regarding an improved health risk indicator for metabolic and cardiovascular health. Thus, effectiveness of different types of exercise interventions was demonstrated to be specific in relation to promoting various health outcomes.

CARDIOVASCULAR RISK FACTORS IN RECREATIONAL FOOTBALLERS: A MATCHED CASE-CONTROL STUDY

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INTRODUCTION: Low levels of cardiorespiratory fitness, altered blood lipid profile and blood pressure are associated with high risk of cardiovascular diseases and all-cause of mortality. However, regular exercise and physical activity have favourable effects on cardiorespiratory fitness. Therefore, the increase of physical activity at all levels is considered a priority by all the national and international Health Organizations. Association football (soccer) is the most popular sport in the world. Several studies have examined various aspects of football but the majority of these have studied football in a competitive context. However, millions of people are involved in football at a recreational level and therefore this sport may be an effective exercise modality to enhance aerobic fitness and reduce cardiovascular risk factors. Surprisingly, very few studies or reports (Castagna et al, JSaMS, 2006; Krustrup et al., BASES congress, 2007) have examined football from this perspective. We designed this matched case-control study to examine differences in selected cardiovascular risk factors between recreational footballers, participants to structured aerobic training programs and untrained subjects. METHODS: After matching for age and activity level (IPAQ), 31 football players (FB: age 37±7 years, BMI 23.9±2.4 kg/m2) were compared to 31 participants to aerobic training programs (AE: 38±6 years, BMI 24.2±2.4 kg/m2) and 62 healthy untrained people (UN: 39±6 years, BMI 25.9±2.3 kg/m2).

Maximal oxygen uptake (VO2PEAK) and oxygen uptake efficiency slope were measured during maximal incremental cycling tests. Blood pressure and lipid levels (total cholesterol, HDL-C, LDL-C, triglycerides, and fasting glucose) were also measured. RESULTS: UN showed higher body mass (~7%), body fat (~27%) and BMI (~28%) than AE and FB (P<0.01). UN also showed lower maximal oxygen uptake (~16%) and oxygen uptake efficiency slope (~11%) than AE and FB (P<0.001). No differences between groups (P>0.32) were found in blood pressure or lipid profile, with the exception of triglycerides that were higher in UN (~20%) (P=0.02). The corresponding metabolic equivalents (3.5 ml/kg/min, MET) for the VO2PEAK in FB, AE and UN were 10.7, 11.0 and 9.1 MET, respectively. DISCUSSION: Cross-sectional and longitudinal studies have shown that every 1 MET increase during incremental tests is associated with a 8 to 14% reduction in mortality. In the present study the higher VO2PEAK in FB and AE corresponded to a difference of 1.6-1.8 MET. No substantial differences were found in blood pressure and lipids data (with normal ranges in all groups). However, even when other risk factors are taken into account, aerobic fitness remain a strong and independent predictor of mortality. In conclusion, the findings of this study suggest that recreational football has the potential to be an effective health-enhancing physical activity.

Oral presentations (OP)

OP-PH01 Philosophy

BODY AND MOVEMENT PHENOMENOLOGY

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This reflection wants to point out that there is a connection between performance adoration and objectivization of the body. What does it mean for movement, for the human existence? Existence is the most complex movement of all, we always head for a goal (telos), we proceed from the beginning of the mobility (archê). While doing so, we enter situations that we have not chosen. The pressure of such situations forces us to choose an option (dynamis) that tries to solve the situation. The transition from the option to reality is called energeia. This results in a deed (ergon).

A sports movement always involves telos, archê and dynamis. If performance becomes the only goal, options and sometimes even the beginning of mobility adapt themselves to this telos. This transformation is a dangerous one. The body adapts itself to the top performance, too; it becomes an object. What will happen when the body is transformed in a tool which is entirely controlled by the will to achieve top performance? Situations and their demands will be absolutely subordinated to the desire to achieve performance, i.e. all bans will be understood as something that must be circumvented.

Orexis intention and desire to move forward is controlled and determined by the will to such an extent that objectivized body becomes an impassable obstacle, after that, the orexis will burn out, too. The doctor will encounter anaesthesia, for instance. However, the root of the problem is the body as an object with which the owner may do what he/she wants. Nevertheless, the body as an exclusive object is the result of performance adoration. And this is typical of the sports world. What must be done so that the sports performance becomes a celebration of humanity? How to train teachers, trainers and coaches?

References:
A major objective of both sports scientists and elite coaches is the enhancement of sport performance. Despite this common goal, there is a general perception that research in sports science does not meet the needs of coaches (Williams and Kendall, 2007 b). In the literature on coaching, several authors refer that exist a “gap” between sports science research and coaching practice (Spinke, 1997; Goldsmith, 2000; Williams and Kendall, 2007 a, b and Midgley et al., 2007). Under the scope of contributing to minimise the “gap” between research and coaching practice, specially referring to physiologic factors that impair sport performance, this work aims to (1) identify some major problems that impair the use of physiologic factors in sport training and (2) propose solutions to the identified problems. The major problems identified were (i) the disciplinary research and the over specialization; (ii) lack of understanding the sport activity characteristics; (iii) the different conceptions of body and human movement and (iv) data overflow, from coach point of view. Solutions for each of the major problems identified are pointed out, in attempt to approach sport science researchers and coaches: (i) understand the complexity of “real world” problems of coaching practice; (ii) improve the knowledge about sport activities, to understand the different kind of solicitations that are imposed to the athlete; (iii) develop integrative frameworks to the training process, that comprehend the different factors that affect sport performance and (iv) develop operative methodologies that allow to select, evaluate and apply the most important data to improve the sport training process. In conclusion, operative researches, that comprehend the complexity of sport performance phenomena are missing, what may reflect an undervaluing of the benefits of scientific knowledge, by the coaches (Williams and Kendall, 2007 b).

References:

NEUROSCIENCE, REDUCTION, SPORT AND PHILOSOPHY OF MIND

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The rapid progress of biology and genetics at the molecular level, combined with the advance of better neuroimaging-techniques like fMRI, PET and EEG make great leaps toward understanding and explaining relationships between brain, behaviour and mind. Do we see the rising of a Grand Universal Theory? Finding not only correlation, but arrow-pointed causality? Are we about to find the mechanism underlying all kinds of memory necessary for learning? Will our understanding of skillacquisition change in light of how neural pathways develop during childhood and life? Training methods, pedagogy, psychology and bio-mechanical approaches to the understanding of sporting practices might have to change due to new neuroscientific discoveries. Or, at least, get a better platform to do empirical research and experiments. The talk takes a philosophical look at the reductions made by the neurosciences. I will claim there is an ex-planatory gap between reductions in the neurosciences and the subjective experiences of everyday life. This gap can in principle not be closed. There are several reasons for this. First, the neurosciences deal with third-person objective observations - subjective experiences are first-person experiences. First-person experiences cannot be reduced to third-person without losing a fundamental aspect, which the third-person reduction wants to explain; the subjective experiential aspect. Second, the personal mental language of persons cannot be reduced or substituted by the objective language of the neurosciences (molecular or cellular), because our common language is based on semantic content not provided by physical descriptions. Third, to have an objective look inside our own mind requires a view from nowhere. The view from nowhere cannot be established when it involves looking at ourselves; there is nowhere we can build the fundament of a pure, objective eye that can look without values or preferences and report back to us in the same objective way. The talk will clarify that the experiential aspect of mind is an important one in sport. Practising sport has a fundamental phenomenal feeling to it, and this is not reducible in neuroscientific terms (or in any other physical language for that matter). That is not to say that the discoveries of the neurosciences are not interesting. They may provide us with insights when it comes to, let's say, memory and learning. But a full-blown account of brain, body and mind relations is not arising. One must have all the experiences of the subject in question to do this. That is in principle, impossible.

To paraphrase Thomas Nagel (1): to have a complete understanding of what it is like to be a bat, one must be a bat. This is also true for sport, the experiential aspect of actually moving cannot be accounted for by the neurosciences. No matter what they promise.

References:

THE ROLE OF CONSCIOUSNESS IN ELITE SPORT

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Philosophy of mind has become the central discipline in modern philosophy. The development in cognitive science, neuropsychology and computer science has created a fertile cross-disciplinary ground where many of the old problems can be raised in a totally new setting. One of the central topics is the role and place of consciousness. Increasingly philosophers accept that the subjective experience of the conscious mind must be taken seriously and that the hard problem today is to explain how it is possible that experiential qualia, the feeling of what it is like to have some experience, can arise out of soggy grey matter. The soft problem is easier to address; how mind states are linked to and located in specific brain areas.

Phenomenology has also received new attention and has been combined with new findings from psychology and brain research. Dreyfus (2002) has developed a model with five stages that tries to describe how skills develop from novice to expert level. Dreyfus maintains that whereas consciousness plays a central role at beginner’s level it plays no role at expert level. The information-processing model in...
motor learning says similarly that beginners process information in a conscious manner and according to rules. At more advanced levels the rules and the processing are increasingly rendered unconscious. Searle (2004) who criticizes both the computer model and phenomenology also maintains that at high skill levels the athletes just act without following rules or conscious representations. There thus seems to be strong support for a view that has as a consequence that there is little or no room for conscious thinking in elite sport. My aim in this paper is to show that this view does not hold. Elite athletes do not act like zombies. They use conscious states whether they are perceiving, thinking, deciding or acting. I will use examples from elite sport to illustrate and argue for my views. Following Chalmers (2006) I make a distinction between psychological consciousness and phenomenal consciousness. Psychological consciousness is the psychological machinery, which makes us capable of perceiving, having beliefs and desires, handling information, making decisions, and so on. Phenomenal consciousness is our experience of what it feels like, the qualitative aspect of the various mental states. When we are active in sports we always have psychological consciousness and most of the time we also have phenomenal consciousness. Through examples from different types of sport I will argue for a view that gives conscious awareness, thinking and decision a more important role than many of the dominant theories today.

References.

THE VALUES AND ATTITUDES OF YOUNG ELITE ATHLETES TOWARD PERFORMANCE ENHANCING DRUGS

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There is evidence of a small but significant proportion of children and adolescents engaging in doping practices. Recent USA-based review articles suggest between 3 and 12 per cent of adolescent males have used anabolic-androgenic steroids at some point. (Yesalis and Bahrke 2000) while others present figures of between 4-11 per cent (Calfee and Fadale, 2006). There are few studies, however, that have explored young elite athletes’ attitudes toward performance enhancing substances in any great depth. A total of 24 young male and female athletes (16-22 years) attended 7 focus groups held over the UK. Athletes were assured of anonymity and confidentiality and that the research contractor (UK Sport) was unaware of their attendance. Discussions centred upon certain central themes: (i) the extent of a doping problem; (ii) distinguishing between banned substances and supplements and between therapy and enhancement; (iii) ‘Tipping points’ in the decision to dope, and (iv) willingness to take a banned but undetectable performance enhancing substance that would guarantee success. Participants also completed an implicit (ID-EAST, De Houwer and De Bruycker, 2007) and explicit measure of their attitude toward doping and supplements.

Athletes from 9 different sports participated in the focus groups. Knowledge of doping techniques was limited. Doping was often associated with appearance altering drugs such as anabolic-androgenic steroids. The economic implications of falling at an elite level were cited as a potential ‘tipping point’. A significant minority of athletes indicated their willingness to use a non-detectable, banned drug that would guarantee success. Interestingly, however, the added condition that the drug would reduce life span by 10 years resulted in the majority of those previously willing rejecting the hypothetical opportunity.

A number of key findings emerged from the experiment examining the implicitly and explicitly assessed attitudes. There was a general trend for a positive implicit attitude toward doping. There was a dissociation between implicitly and explicitly reported doping attitudes. Implicitly and explicitly assessed attitudes toward supplements were, however, significantly associated. Despite publicly expressing negative attitudes toward doping, this group of individuals, privately, viewed doping in a somewhat positive light. Such findings place a question mark over whether there should be a reliance on explicit measures to index attitudes toward doping.

References.

THE PHILOSOPHY OF SPORT GOES EUROPEAN

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The Philosophy of Sport (1, 2), is still a more or less neglected discipline, not only within the European College of Sport Science (ECSS) but also in the field of sport science in general. Thus it is surprising that besides the well established International Association for the Philosophy of Sport (IAPS) and its growing junior partner the ‘British Philosophy of Sport Association’ (BPSA) very recently the European Association for the Philosophy of Sport and Movement Culture came into being. While a number of sport scientists are mainly aware of sport philosophy in association with the doping debate, i.e. ethical reflections on enhancement a.s.o., the philosophical spectrum has a lot more to offer sport related analyses with a focus on e.g. aesthetics (3), ethics (4), metaphysics (5), existentialism (6) etc. Hence in this paper I would like to introduce the variety philosophical aspects within sport and sport science, as well as the possibility for its (practical) application in the sense of an applied philosophy of sports (e.g. philosophic/ethic counseling, etc.) and the future perspective and aims of the European Association for the Philosophy of Sport.

References.
anxiety before games than the Canadians, but both the Canadian and German participants perceived their anxiety as more facilitative.

MANOVA and independent samples t tests revealed that the German players had significantly lower levels of cognitive and somatic state anxiety than those in Japan. In addition, the Japanese players reported higher levels of pre-game guilt, shame, humiliation, placidity, and modesty, pleasant emotions, unpleasant emotions, and both the intensity and direction dimensions of cognitive and somatic state anxiety.

Stepwise linear regression indicated that the Country variable was related to players' stress and coping effort, and that the Type of passion was also a predictor of stress and coping effort. In line with expectations, paths linking a positive mastery climate, harmonious passion and obsessive passion to stress and coping effort were observed. Current findings illustrate the value of combining tenets of achievement goal theory (Nicholls, 1989) with the integrative sequence model of passion (Vallerand et al., 2006). However, the study findings also demonstrated the need for re-specification of the passion scales noticeably based on the positive relation found between obsessive passion and subjective vitality. Within the context of youth soccer, there is a need for further validation of the concepts of harmonious versus obsessive passion (Vallerand et al., 2006).

Types of passion were investigated in relationship to motivational climate and subjective vitality in youth soccer. Participants were 283 experienced young soccer players (aged 12-16 years) taking part in the Norway Cup soccer tournament 2004. Confirmatory factor analysis was conducted to examine the construct validity of the harmonious and obsessive passion constructs, and Structural Equation Modeling analyses were utilized to test hypothesized paths between predictor, mediator and outcome variables. Subjective vitality was positively predicted by a mastery climate, harmonious passion and obsessive passion. In line with expectations, paths linking a positive mastery climate, harmonious passion and subjective vitality were also observed. Current findings illustrate the value of combining tenets of achievement goal theory (Nicholls, 1989) with the integrative sequence model of passion (Vallerand et al., 2003). However, the study findings also demonstrated the need for re-specification of the passion scales noticeably based on the positive relation found between obsessive passion and subjective vitality. Within the context of youth soccer, there is a need for further validation of the concepts of harmonious versus obsessive passion (Vallerand et al., 2006).

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essy, while the Canadian players felt the highest level of pre-game excitement. The results set apart the players of each nation, and the status of university sport is offered as a means of accounting for the Canadian and German findings. The results also reinforce popular notions of a collectivistic Japanese mentality and that this mindset may extend to intercollegiate sports competitors. For practicing intercollegiate soccer coaches and/or coaches in multicultural settings, this information can help inform the development of team motivational climates that reflect the cognitions and motivational orientations of players. For applied sport psychologists, it should allow for more relevant counseling when helping coaches and culturally diverse athletes to meet their goals.

THE PSYCHIC REALITIES OF A COACH-ATHLETE DYAD AND THE DEPLOYMENT OF DEFENCE MECHANISMS

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Coach-athlete relationships are central to effective performance and psychological well-being in sport, yet their study has been methodologically limited. Within sport psychology, there is a recent expanding interest in coach-athlete relationships (Poczwardowski et al., 2006). Since Wylie et al.'s (2000, p.53) contention that such a focus of inquiry was ‘uncharted territory’, some researchers have begun to examine this relationship from a variety of theoretical positions. This study involves the application of a social psychoanalytic approach to the study of coach-athlete relationships and asks specifically what defence mechanisms, identities and subject positions are present when a coach and athlete describe their experiences of working in a close dyadic relationship.

A male triathlon coach (Brian) and one of his male athletes (Mack), were interviewed using a free association narrative interview (FANI) technique to elicit narratives of being in this dyadic relationship. A follow-up interview was conducted with each participant to elaborate on those areas raised by participants in the initial interview. Clarke (2002) suggests the FANI produces raw material from which one can then: identify patterns of experience and response, analyse the issues of main concern (here, facets of the coach-athlete relationship), and identify the unconscious mechanisms, expressed both within the responses to the researcher and the material described by the participant. The psychoanalytic position posits individuals may unconsciously adopt particular positions in their discourses in order to protect against anxieties emanating from vulnerable aspects of the self (Hollway & Jeffeson, 2000). Employing this approach, interview data along with associated field and reflexive notes were analysed to identify and illuminate the subject positions and defence mechanisms adopted by the participants.

Analyses of interviews revealed a number of themes: the reluctant sportsman, his pioneering spirit and relationships with his birth family (Brian) and Mack’s sporting heritage and his army discipline. Brian and Mack both displayed sporting identities, although the subject positions within their narratives were distinct, a variety of defence mechanisms (introjection, projection and objectification) were also evident and these are discussed and illustrated via appropriate quotations. The paper concludes with comment on the potential and limitations of this approach.

References.

THE STRUCTURAL AND PREDICTIVE VALIDITY OF A VISION, SUPPORT, CHALLENGE MODEL OF TRANSFORMATIONAL LEADERSHIP

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This paper presents 3 studies that test the structural and predictive validity of a three factor, vision, support, and challenge model of transformational leadership (Bass, 1985). Hardy, Arthur, Jones, Shariff, Munnoch, Isaacs, and Allsopp. In press) study used a vision, support, and challenge model of transformational leadership to underpin a successful intervention. The current study sought to examine the structural and predictive properties of the proposed model. The research was conducted with infantry recruits in a military training organization. Study 1 (n = 573) used confirmatory factor analyses in an exploratory manner to define the concepts of vision, support, and challenge. After minor modifications the conceptual model appeared tenable (S-B 2 (87) = 177.61, RMSEA = .04; CFI = .98). Using a second sample, Study 2 (n = 693) confirmed the factor structure obtained in study 1 (S-B 2 (87) = 300.87, RMSEA = .05; CFI = .98). A subset of the Study 2 sample was used in Study 3 (n = 248) to examine the predictive validity of the vision, support, and challenge model. The outcome variables selected were leader inspires extra effort, satisfaction with training, and self-confidence. Regression analyses revealed that vision, support, and challenge significantly predicted variance in leader inspired extra effort (R2 = .535, p < .001), inspection of the beta coefficients revealed that vision (beta = .317, p < .001), support (beta = .414, p < .001), and challenge (beta = .313, p = .005) all made significant contributions to the prediction. Vision, support, and challenge significantly predicted variance in satisfaction (R2 = .258, p < .001), however, inspection of the beta coefficients revealed that only vision (beta = .335, p < .001) and support (beta = .207, p = .013) significantly contributed to the prediction. Vision, support, and challenge significantly predicted variance in self-confidence (R2 = .414, p < .001), however, inspection of the beta coefficients revealed that vision (beta = .331, p < .001) was the only behaviour that significantly contributed to the prediction. The results of all three studies are discussed from a leadership and coaching perspective.

References.

AN EXPLORATION OF PSYCHOSOCIAL COMPETENCIES IN ELITE YOUTH TALENT DEVELOPMENT ENVIRONMENTS

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Contemporary research literature within the field of youth talent development has unequivocally supported the notion for interactional or multi-dimensional perspectives, incorporating a number of influences under the concept of psychosocial competencies. Holt and Dunn (2004) devised a grounded theory of the psychosocial competencies associated with success in elite adolescent level soccer.
The present study attempts to establish the transferability of Holt and Dunn’s grounded theory of psychosocial competencies across participants in a talent development environment (TDE) in a different sport, namely athletics. Participants were recruited through a structured TDE in the sport of athletics, numbering 6 athletes with an age range of 14-19 years. Leading on from this, selected parents (n=4) and coaches (n=2) were interviewed utilising a similar interview structure to enable triangulation of opinions on the effective requirements of TDEs, and how this corresponds with and validates Holt and Dunn’s grounded theory of psychosocial competencies across different sports. The sample of parents consisted of both mothers and fathers, to take into account findings by previous research indicating differences in type of social support provided by either parent (Bloom, 1985, Holt & Dunn, 2004). These data provided a triangulation as suggested by previous studies into social support processes.

The design of the semi-structured interviews conducted with athletes, parents, and coaches was directly modelled around the four identified psychosocial competencies of commitment, discipline, resilience, and social support. As conducted in Holt and Dunn’s (2004) study, each of the four competencies was further divided into sub-categories allowing further guidance as to the semi-structured interview questions. Collected and transcribed data were subjected to a process of thematic analysis and examined for emerging themes establishing the general dimensions of the four key identified psychosocial competencies. Constructing the methodology in such a manner, staying close to the original model of Holt and Dunn (2004), allow the findings to be a truly applicable representation of the original grounded theory and its generalizability across other sports and TDEs. This will therefore result in facilitating a coherent development of the original model, and progression of the body of knowledge.

The findings from participants are drawn together in relation to applied sport psychology implications, and the interactional nature of social support and athletes psychosocial competencies within TDEs. Directions for further research within the area are suggested.

References

Oral presentations (OP)

OP-RE02 Rehabilitation 2 - Lower Limb

OSGOOD-SCHLATTER’S DISEASE: AN ACTIVE APPROACH USING MASSAGE AND STRETCHING
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Introduction: Osgood-Schlatter’s disease (OSD) is a traction apophysitis of the tibial tubercle of the knee and tends to affect athletically active adolescents during their secondary growth spurts. It is a painful and extremely limiting condition and is the most common overuse injury in this age group. The current standard treatment is to allow the athlete to self-manage pain and activity levels, but the documented history of this condition records patients having to refrain from physical activity for an average of 21 months. The object of this pilot study was to investigate the dual influence of myofascial release massage (MRM) and stretching of the quadriceps group on the speed of recovery of patients with OSD.

Method: 25 patients were referred for physiotherapy treatment for OSD (6 female, aged 11.6 ±1.55 SD; 19 male, aged 13 ± 1.6). Onset of symptoms ranged from acute (1 week) to chronic (36 months) with an average of 8 months. Initial measurements of functional tendon loading using a standing wall slide test were taken for all subjects. This test was then repeated at regular intervals. MRM was performed daily for 2 minutes, either by the physiotherapist or parent who had been taught the technique. Once pain free knee flexion was achieved, active stretching was then performed daily by the patient instead of the MRM. Statistical analysis was performed to determine any significance between subsequent recordings using one-tailed t-tests.

Results: All patients achieved a full wall squat in an average of 20 days (±12) with a maximum of 50. The improvement in wall slide was significant to 98% (p<0.02) for each recording. Upon full wall slide patients were discharged and returned to their sporting activities as normal, with no reported further problems. At various follow-up dates (1-5 years) only 2 patients reported recurrence but they had not followed the recommended advice on stretching.

Discussion: In spite of the vagaries of adolescent and parent compliance, and the limitations of clinic appointments, these results indicate that MRM and stretching are likely to be an important intervention in the active treatment of this disabling condition. The patients in this study returned to their sport in a significantly shorter time than is usually anticipated with the traditional ‘let them grow out of it’ approach.

Keywords: Osgood-Schlatter, adolescent, knee injury, massage, stretching, apophysitis

References
1. Osgood RB (1903) Tibial tubercle occurring during Adolescence Boston Medical Science Journal 148 pg. 114-119

THE INFLUENCE OF KNEE PAIN ON GROUND REACTION FORCES DURING SSAIR ASCENDING AND DESCENDING
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Introduction: Patients with knee Osteoarthritis (OA) report knee pain during daily living activities and consider this to limit their ability to perform these tasks (1). Several activities such as going up or down stairs are important for subjects to maintain autonomy. It is known that, besides walking slower patients with severe OA need more time to go up and down a flight of stairs than normal subjects (2, 3). This study was conducted with bilateral knee OA patients, and aimed to seek different ground reaction forces according to pain (most painful knee-MPK and least painful knee-LPK) during stair ascending (STA) and descending (STD).

Methods: A cohort of 89 patients with knee OA was initially selected by family physicians, x-rayed, and observed clinically by a rheumatologist who selected 57 according to eligibility criteria (grade 2 or 3 knee OA (4)). Pain was assessed by the WOMAC VAS 3.1 pain dimension. Data was collected with the Novel Pedar-m® insole system when ascending and descending a flight of 12 steps (17cm height, 10:15 - 11:45
31cm deep), as fast as possible alternating legs in each step and without the use of handrail. Subjects were weighed with the system for posterior data normalization, and assessed with the same type of shoes to limit influence of different shock-absorbing properties. Results: Average pain level was 231.42 ± 103.28 (WOMAC pain sub-score), peak vertical ground reaction force (V-GRF) in Newton (N) was higher during STD than STA in both legs (MPK: 1030.5 ± 218.54, LPK: 1080.5 ± 245.55 vs MPK: 879.4 ± 205.97, LPK: 923.14 ± 197.19, p < 0.001). Maximum vertical impact in normalised units of body weight (IBW) was higher when STD than STA (MPK: 1.52 ± 0.26, LPK: 1.58 ± 0.32 vs MPK: 1.29 ± 0.26, LPK: 1.35 ± 0.22, p < 0.001). We also found differences between legs in the instant of peak vertical ground reaction force (% role over process (ROP)) during STD (MPK: 23.67 ± 16.26, LPK: 21.56 ± 9.86) and STA (MPK: 65.47 ± 14.25, LPK: 68.9 ± 13.98, p < 0.01).

Conclusion: Both in STA and STD maximum force (%I) and impact (IBW) were significantly higher in the least painful knee. We also found differences in-between legs in the instant of maximum force (%ROP). During stair descending %ROP was longer in the MPK once the LPK was used to slow down the transfer of weight. Contrarily in stair ascending subjects tend to transfer weight rapidly from the MPK to LPK. It seems that patients with knee OA, develop strategies during both stair ascending and descending to protect the most painful knee. In fact pain has been suggested to work as a protective mechanism that keeps patients from overloading the affected joint(s).

References.

**ISOKINETIC EVALUATION FOR THE ACL RECONSTRUCTED PATIENT: DID WE FORGET STRENGTHENING EXERCISES FOR THE QUADRICEPS?**

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Purpose.
Quadriiceps muscle weakness is common after ACL rupture and reconstruction. Quadriiceps strength and the hamstring/quadriceps (H/Q) ratio is often correlated to the anterior cruciate ligament (ACL) reconstructed patient’s functional status. Currently, one study has demonstrated that the H/Q ratio of 30° of knee flexion was strongly correlated to the functional score. We hypothesized that patients with ACL reconstruction would show a quadriceps strength deficit compared to the uninjured site and that strength measured at 30° degrees of knee extension and the first 1/3 work would be significantly lower than other strength measures.

Methods.
Using a cohort study design we reviewed the physical therapy strength records of 43 hamstring autograft reconstructed patients and 74 allograft reconstructed patients (patellar tendon, Achilles or tibialis anterior). The hamstring ACL reconstructions were applied by one orthopedic surgeon, and the allograft reconstructions were performed by another. The rehabilitation program was identical for both groups. Three, six, or twelve month isokinetic results (peak torque (PT), torque at 30º, torque at 0.18sec., total work, first 1/3 work, last 1/3 work) were reviewed for 117 consecutive patients who had received ACL reconstruction for unilateral primary ACL injuries at one institution between February 2006 to January 2007.

Results.
There are statistically significant differences between the hamstring and allograft groups at 6 months for time to operation, and at 3 months for age. Strength of quadriceps and side-to-side strength deficit was improved until 12 months, but strength of the hamstring didn’t improve after the 3rd month (p < 0.03). Side-to-side strength deficit for torque at 0.18 sec., torque at 30°, total work, first 1/3 work and last 1/3 work improved up to 12 months after reconstruction (p < 0.04).

Conclusion.
Side-to-side quadriceps deficit continues to improve until 12 months after reconstruction. These deficits not only occurred in the first 1/3 of knee flexion, but also through the full range of motion. It may be possible that if ACL reconstructed patients improve their quadriceps strength a little earlier in the rehabilitation program, they would have better functional status.

**EFFECT OF WHOLE BODY VIBRATION DURING DYNAMIC SQUATTING ON EMG ACTIVITY IN LOWER LIMB MUSCULATURE**

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Whole body vibration (WBV) is used in training and rehabilitation regimes and studies have reported increased muscle activity during WBV (Bosco et al., 1999; Roelants et al., 2006). This study quantified and compared WBV induced EMG activity with unloaded and conventional mass loading during dynamic squatting.

Male volunteers (n=14) performed continuous dynamic squats (10 by 6s squat) on a WBV platform (Power Plate Ltd.) in unloaded, 20% body mass loaded and vibration loaded (2-5g) trials, squat rate and depth were controlled using a visual metronome. EMG activity via telemetry (ME6000, Mega Ltd., Finland) was recorded from vastus lateralis (VL), rectus femoris (RF), tibialis anterior (TA) and gastrocnemius (GM) using surface electrodes. Squatting action was videoed at 50Hz and a synchronised audio trigger facilitated analysis of concentric and eccentric actions during repeated cycles. Rectified EMG data (rmsEMG) were analysed for concentric (CON) and eccentric (ECC) actions to assess mean activity. Data were analysed using repeated measures ANOVA, post-hoc Tukey tests quantified differences and P<0.05 inferred statistical significance.

Analysis revealed significant increases in EMG activity when body mass was increased by 20% for RF (P<0.01) and VL (P<0.001) and for vibration loads 1g and 5g for RF, VL and GM compared to unloaded, however, no significant increases were observed in TA. For VL and RF, mean CON activity was significantly greater at 4g (VL: 289±23 vs. 409±42mV, P<43% and RF: 125±12 vs. 170±23mV, P<34%, P<0.01) and 5g (VL: 289±23 vs. 439±54mV, P<50% and RF: 125±12 vs. 184±25mV, P<46%, P<0.001) compared to unloaded. Mean ECC activity was significantly greater at 4g (VL: 424±48 vs. 548±65µV, P<30% and RF: 154±16 vs. 195±23µV, P<28%, P<0.05) and 5g (RF: 154±16 vs. 202±25µV, P<35%, P<0.01) compared to unloaded, and significantly lower than mass loaded at 2 and 3g (P<0.05) for RF. No significant differences (P>0.05) were observed during CON or ECC actions comparing mass and vibration loading at either 4 or 5g. Relative to unloaded trials, the mean increased EMG activity during CON mass loaded and 5g trials were comparable for RF (42% vs. 46%) and...
SPATIAL DIFFERENCES IN VENTILATION EFFICIENCY OF BICYCLE HELMETS.

Katholieke Universiteit Leuven, Belgium

Prevention of head injuries is highly influenced by the impact protection of bicycle helmets. Thermal discomfort was identified as a key factor for neglecting helmet use in the late 90’s. Therefore, manufacturers have shifted towards the production of helmets with more open structures. While open structures require materials with higher stiffness and thus lower damping, it can be questioned if they provide enhanced ventilation effectiveness.

In this research ventilation efficiency (cm³/cm³.s) of five bicycle helmets was quantified using a tracer gas measurement technique. Ventilation efficiencies were calculated for 13 positions between scull and helmet. Local ventilation efficiency allows quantifying fresh air distribution between head and helmet. Average ventilation effectiveness did not explain fresh air distribution between head and helmet. Variations in ventilation efficiency were significantly lower than either 4 or 5 g (P<0.05). In conclusion, the significant increases observed in EMG activity in RF, VL and GM during increased gravitational loads (4 to 5g) induced by WBV were comparable to 20% body mass loading. These observations suggest WBV as a possible alternative or complement to traditional resistance training.

References:
of the scull, while poorly ventilated zones were monitored at the back of the scull for all five helmets. An analytical model was introduced to estimate flow rate between head and helmet. Using this model, estimated flow rate was linearly correlated ($r^2 = 0.83$) with well ventilated areas under the five helmets that were studied. However, no correlation was seen between the estimated flow rate and poor ventilated scull area ($r^2 = 0.01$). Bicycle helmet design could be optimized using these results. Nevertheless, comfort levels should be introduced that allow physiological judging of ventilation effectiveness.

EVALUATION OF MURINE MODELS FOR EXERCISE TRAINING OF STRENGTH, MOTOR-COORDINATION AND ENDURANCE

Mooren, F., Wieber, S., Wilke, G., Hesselsmann, G., Tunca, E., Krüger, K.
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Murine models are a suitable way in order to study molecular mechanisms of adaptations to exercise training. Most models focus on endurance training while other forms of training like resistance training and training of motor coordination are less well established. Purpose: To compare the specificity and interference of different approaches for training of strength, motor coordination and endurance in a mouse model.

Methods: Eight week old male C57BL/6 mice (n=8/group) were assigned to isometric strength training (STI), coordination training (CT), endurance training (ET) or control group (CO) for 10 weeks. Strength training was performed by hanging mice with their front and back paws on a vertical wire until falling down. For training of motor coordination a rotarod was used. The mice were placed on the rotating rod at increasing speed. Endurance training was performed by giving mice access to running wheels in their cages. Activity was monitored by a magnetic tachometer. All mice underwent exercise specific assessments of training status before, after 5 weeks and at the end of the training interventions.

Results: At the beginning the ST group was able to carry a weight of 40g for 2.57 ± 0.57min until falling down. This period increased significantly to 33.92 ± 7.17min after 10 weeks. Furthermore, strength training increased relative muscle weight of musculus biceps brachii, m. gastrocnemius/soleus and m. rectus femoris. CT group improved their coordinative skills from 34.37 ± 3.9 rpm significantly to 54.37 ± 6.34 rpm while ET group improved their maximum oxygen consumption (VO2max) from 59.0 ± 5.0 ml/min/kg to 72.9 ± 3.2 ml/min/kg. Adaptations of muscle weight were not observed in the ET and CT group. All mice improved their performance only in their specific types of exercise demonstrating no interference with the other components of physical fitness.

Conclusion: Ten weeks of different exercise training regimes resulted in specific functional and structural adaptations in mice. These approaches should be useful models to investigate the differential molecular and cellular effects of various training modes.

EXPERIMENTAL VALIDATION OF A TRAINING TO INCREASE THE SHOT SPEED IN WATER POLO

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The international rules in water polo have been widely changed in 2005 to make the water polo more attractive. One of key changes was that an allowed point for shot after an ordinary foul shortened from 7m to 5m away from the goal line. This change conducted not only an increase of goal-scoring opportunity but also a necessity of improving a shot speed further. For the shot speed in water polo, there were several references which analyzed relationships between the speed and kinematic/kinetic parameters during a shooting movement, however there were few studies which exercised a specific training for players, and validated an effect of the training. Therefore the purpose of this study was to exercise a specific training which can increase the shot speed and to evaluate effects of the training.

Eighteen Japanese male collegiate water polo players volunteered for the study. We divided the subjects into two groups that were a training group and a control group. Eleven players belong to the training group and they conducted special training programs which aimed to increase mainly muscle strength of upper limb and to improve an ability of eggbeater kick, for four months. We gave an individual weight training program aimed at strengthening of upper limb for each subject. In addition the training group conducted a special training with a tube which aimed for improving the strength and mobility of eggbeater kick during a shooting movement. Another seven players belong to the control group and they trained normally without any suggestions for the same period. Both groups have been training for two or three hours a day, six times a week constantly.

Before and after the training period we obtained data of anthropometric measurements, muscular strength measurement, kinematic parameters during shooting motion and an initial shot speed for both groups. By using upper and under water cameras, a whole body image during the shooting motion was videotaped and we obtained the kinematic parameters by three-dimensional analysis using the DLT method. The initial shot speed was measured by a radar gun (Bushnell SpeedStik) from a 8-meter mark away from the shooting point.

To evaluate the contribution of each parameter to a change of the shot speed, we obtained the Pearson’s correlation coefficient between variables. Moreover the multiple regression analysis was performed to determine the relationships between the morphological, muscular, kinematical factors and an improvement of shot speed.

As results, we found that both groups improved their shot speed. The training group significantly ($p=0.016$) increased by 3.3% while the control group did by 2.1% ($p=0.0008$). There were significant correlations between the shot speed and the following variables, muscular strength of wrist, a height of the right elbow and the right toe at the ball-release-moment in the training group. This result revealed that improvements of muscular strength of wrist and kinematic parameters altn

CONCURRENT VALIDITY OF A TRUNK TRI-AXIAL ACCELEROMETER SYSTEM FOR GAIT ANALYSIS IN OLDER ADULTS

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Institute of Human Movement Sciences and Sport, ETH Zurich, Switzerland

Background: For clinical and research settings, objective measurements of spatio-temporal parameters of gait under real life conditions, e.g. in challenging environments, might help in identifying gait impairments and in evaluating effects of therapeutic interventions. A tri-axial accelerometer system placed on the lower trunk (DynaPort MINI Mod) has previously been identified as a valid measure for spatio-temporal gait parameters in children [1] and healthy, young adults [2,3]. Based on a more conservative gait pattern that is often observed in older adults it is not known, however, whether the accelerometer system can be applied in older populations. The purpose of this study, therefore, was to determine the concurrent validity of the DynaPort MINI Mod for gait analysis in older adults.
Results: The concurrent measures of gait velocity (ICC2,1 = 0.99, RC = 2.2%), cadence (ICC2,1 = 0.99, RC = 0.8%), step duration (ICC2,1 = 0.99, RC = 0.8%) and step length (ICC2,1 = 0.99, RC = 2.1%) were excellent. ICCs for variability measures of step duration and step length were respectively 0.52 and 0.20. The corresponding RCs were 85.1% and 88.0%.

Discussions: Our data indicate that the DynaPortMiniMod is a highly valid system for the analysis of spatio-temporal gait parameters in older adults. Because of the rather large RCs gait variability measures need to be viewed with caution. Future studies should investigate the sensitivity to change in various sub-populations undergoing training interventions.

References:

COMPARISON OF HIDRODENSIOMETRY (HW), DUAL X-RAY ABSORPTIOMETRY AND AIR-DISPLACEMENT PLETHYSMOGRAPHY FOR ASSESSING BODY COMPOSITION OF OBESE ADOLESCENTS 15 TO 18 YEARS OF AGE: A PRELIMINARY STUDY

Colantonio, E., Dámaso, A., Salles, F., Inoue, D., Pinheiro, M., Szejnfeld, V., Mello, M., Tufik, S.
Federal University of São Paulo, Brazil

Comparison of Hidrosdensiometry (HW), Dual X-ray Absorptiometry (DXA) and Air-Displacement Plethysmography (ADP) for Assessing Body Composition of Obese Adolescents 15 to 18 Years of Age: a preliminary study

Emilson Colantonio; Ana R Dámaso; Fernando CA Salles; Daniela S Inoue; Marcelo M Pinheiro; Vera L Szejnfeld; Marco Túlio de Mello; Sergio Tufik.

Address: 1Center of the Studies in Psychology and Exercise, AFIP; 2Depart. of Psychobiology, Federal University of São Paulo; 3Depart. of Rheumatology, Federal University of São Paulo, São Paulo, SP, Brazil

Background: During the past decades, several new technologic developments have introduced alternative methods to determine percentage body fat (%BF). Allowing for a more accurate and precise assessment of body composition. Interest in assessing body composition in children and adolescent is rising, due in part to the increasing incidence of childhood and adolescence obesity. Purpose: to compare %BF determined by HW, DXA and ADP in a sample of obese adolescents. Methods: Thirty-six male and female subjects were recruited, including 15 males (16.00 ± 0.93 yrs, 105.05 ± 10.87 kg, 179.93 ± 7.18 cm, 34.91 ± 4.22 kg/m2) and 21 females (16.52 ± 1.50 yrs, 91.08 ± 10.48 kg, 163.57 ± 4.21 cm, 34.09 ± 3.64 kg/m2) who were tested using HW, DXA and ADP. The means of %BF observed by the three methods were compared by repeated measures ANOVA, and the intraclass correlation coefficient (ICC). Accuracy, precision, and bias were examined in DXA and ADP with HW serving as the gold standard method. Regression analysis was performed to determine the accuracy of DXA and ADP. Potential bias among DXA, ADP and HW were examined using Bland-Altman’s plots. Results: The means values and standard deviation of the three methods was: HW %BF total: 47.56 ± 7.79, boys: 46.22 ± 9.12, girls: 48.90 ± 6.47, DXA %BF total: 46.50 ± 4.61, boys: 42.34 ± 5.24, girls: 50.66 ± 3.98; ADP %BF total: 38.97 ± 6.22, boys: 35.60 ± 7.91, girls: 42.35 ± 5.33. Discussion/Conclusion: Comparison analysis among the %BF means of the three methods has shown that there was no significant difference.
between DXA and HW (p=0.300), whereas the mean of % BF by ADP was significantly lower than other two methods (p<0.001). The ICC for DXA versus HW and for ADP versus HW was 0.585 and 0.408, respectively. In fact, the ADP method tends to underestimate the % BF when compared to HW method. The DXA and HW methods seemed to be more closed than ADP, and to generate means values lower than another two methods. Considering the regressions using HW as accuracy criteria, the DXA was an accurate method and ADP wasn’t accurate method. Nevertheless, it is worth while to emphasize that the accuracy of DXA was not satisfactory, since the ICC value was low.

References

12:00 - 13:15

Plenary sessions (PS)

PS-3 Injury prevention & motivated intervention programmes

INJURY PREVENTION IN SPORTS

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Institute of Sports Medicine, Denmark

Overuse injuries represents a major problem in sports. Worldwide more than 100 million musculoskeletal (tendon/muscle/bone) injuries occur annually. It is well established that skeletal muscle can adapt to changes in functional requirements and to increases in loading e.g. with exercise through muscle hypertrophy. Despite the ability of the muscle tissue to hypertrophy overuse occurs within the skeletal muscles during sports. Overuse injuries in skeletal muscles may be caused by overly intensive training and inadequate recovery, which subsequently leads to a breakdown in tissue rather than stimulating hypertrophy. In addition several studies on e.g. hamstring muscles have shown that it is possible to reduce the risk of sustaining a hamstring sprains by applying specific designed strengthening programs aiming at reducing the relative load applied to the muscles during sports activities. Along the same line specific training programs with focus on the neuromuscular component have been use successfully in the prevention of ligament injuries e.g. in the knee.

The hypertrophy of the muscles of cause increases the muscle power and thus the maximal forces and stress on the connective tissue within the muscle as well as on the tendons in series with the muscles fibres during contraction. This may lead to a situation where the forces exceed the strength of the connective tissue with the risk of injuries. In order to maintain this relationship and withstand the increased load tendons need to adapt to the new situation by increasing tissue strength either by hypertrophy, increased cross-links or increased tissue density. Data from recent studies indicates such a close relationship between cross-sectional areas of muscles and their tendons. Although tendons have been found to possess the ability to adapt to changes in load approximately 40% of the overload injuries within the musculoskeletal system are related to tendons and ligaments. As for muscle overuse injuries in the connective tissue may be defined as an imbalance between tissue strength and the load applied to the tissue, and prevention of overuse injuries in tendons should thus be possible through applying the correct load to the tendons. Unfortunately only few studies have been conducted on the prevention of overuse injuries within tendons. During rehabilitation however eccentric training have been found to be effective in reducing the pain and strengthening the tissue. Thus eccentric training may be a potential way of preventing overuse in the future.

Although overuse injuries represents a major and very costly problem within sports not much is know about the prevention of sports injuries. In addition athletes are constantly pushing the human body to the limits making prevention even more difficult, but hopefully our increasing understanding of who the human muscular skeletal system adapt will in the future provide more insight to how injuries should be prevented.

INJURY PREVENTION: FROM THEORY TO PRACTICE

Verhagen, E.
EMGO-Institute/VU University medical center, Netherlands

Safety in sports and physical activity is an important prerequisite for continuing participation in sports, as well as for maintenance of a healthy physically active lifestyle. For this reason, prevention, reduction, and control of sports injuries are important goals for clinicians, researchers, as well as for society as a whole. A crucial part of injury prevention in sports and physical activity is the understanding of injury risks and injury aetiology. In the early 1990’s several theoretical models have been put forward that have aided clinicians and researcher towards a better understanding of injury aetiology, and ultimately injury prevention. There is no doubt that the approach they encapsulate has led to a wide array of proven preventive measures for a variety of injuries within different sports. However, recently debate as arisen about the true effect of proven preventive measures in a real-life sports setting. Only research outcomes that will be adopted by athletes, coaches and sporting bodies will actually prevent injuries. The content of this recent debate is an important step forward for sports injury prevention. It implicitly describes the important role of behaviour in injury risk, and consequently injury prevention. Nevertheless, although recent ideas in sports medicine lead the way to a more behavioural approach of sports injury prevention, they remain unclear as to the role of behaviour in sports injury prevention. For this reason, a better understanding of the determinants of behaviour and behavioural change, and the relationship with injury risk is needed to successfully translate current and future knowledge in sports medicine to real-life injury prevention.
CELL-FREE PLASMA DNA RESPONSES FOLLOWING AN ACUTE BOUT OF CARDIOVASCULAR EXERCISE TO EXHAUSTION: EFFECTS OF SAMPLING TIME

Fatouros, I., Jamurtas, A., Nikolaidis, M., Michailidis, I., Douroudos, I., Chatzinikolaou, A., Destouni, A., Vrettou, C., Kanavakis, E., Papassotiriou, I., Taxildaris, K., Kourelas, D.
Democritus University of Thrace, Greece

Introduction
Circulating free plasma DNA (pDNA) is implicated in conditions associated with tissue injury, including apoptosis, exercise-induced inflammation, and athletic overtraining (1,2). Exhaustive exercise may lead to performance deterioration, various physiological maladaptations, acute breakdown and repair of skeletal muscle that can be described in terms of an acute inflammatory response (3). pDNA is altered both quantitatively and qualitatively in a variety of inflammatory conditions (tissue injury, cancer, and trauma) (4) and its concentration has been correlated with the severity of injury in trauma and training volume (1). In the present study we aimed to thoroughly investigate the time-course changes of pDNA and other inflammatory markers commonly used as indices of exercise-induced muscle damage by performing serial measurements during a 24-h period after an acute bout of strenuous cardiovascular exercise.

Methods
Eleven untrained men performed two trials. In the experimental trial, the subjects exercised for 45 min at 70% VO2max and then at 90% VO2max to exhaustion on a treadmill; in the control trial, the subjects remained at rest. Blood samples were drawn before and after exercise immediately post-exercise and at 0.5, 1, 2, 3, 4, 5, 6, 8, 10, and 24 h. pDNA, CRP, creatine kinase (CK), and uric acid (UA) were determined. Data were analysed by ANOVA repeated measures (p < 0.05).

Results
pDNA demonstrated its highest (p < 0.05) concentration immediately post-exercise (6141.4±251.8 vs. 171.4±34.6), remaining elevated (p < 0.05) for 30 min post-exercise (2697.2±212.4 vs. 250.4±39.1) and it was normalized thereafter. pDNA levels in the control group remained unaltered throughout the sampling period. CK and UA demonstrated a rise (p < 0.05) 30 min post-exercise and never returned to baseline. CRP exhibited a rise (p < 0.05) during the recovery period, peaking (p < 0.05) several hours following exercise (5-10 hours).

Discussion
Results of the present investigation demonstrate that pDNA is increased (15-fold) following an acute bout of exhausting cardiovascular exercise. pDNA rise preceded the up-regulation of other inflammatory markers such as CRP, CK, and UA. While pDNA was normalized shortly within recovery, the other inflammatory markers remained elevated. The etiology of this exercise-induced pDNA response is still unclear and warrants further investigation. The most suitable time point for collecting blood samples for pDNA measurement is immediately post-exercise and until 30 min within recovery.

References

INFLAMMATORY AND PERFORMANCE RESPONSES DURING A WRESTLING TOURNAMENT

Fatouros, I., Barbos, I., Rossoglou, C., Parotsidis, C., Jamurtas, A., Michailidis, I., Douroudos, I., Chatzinikolaou, A., Nikolaidis, M., Taxildaris, K.
Democritus University of Thrace, Greece

Introduction
Wrestling takes place in tournament settings requiring athletes to participate in multiple matches within a single day resulting in the development of additional stresses beyond those already created by weight loss alone (1). Strength/power of the upper and lower body’s musculature may be further compromised over the course of multiple matches of a wrestling tournament (1,2). This study investigated the inflammatory and performance responses of elite athletes during a Greco-Roman wrestling tournament.

Methods
Twelve male wrestlers (21.8±0.8 yrs; training age: 11.5±1.9 yrs) lost 5.8% of total body weight during the week before a single-day Greco-Roman wrestling tournament consisting of five games/wrestler (scheduled according to the Olympic tournament regulations). Performance (hand-grip and hip-back dynamometry, vertical jumping), muscle soreness (DOMS), assessment, and blood sampling was performed prior to and after each match while heart rate was monitored throughout each match and recovery. Blood samples were analyzed for lactate, glucose, leukocyte counts, creatine kinase (CK), C-reactive protein, protein carbonyls (PC), TBARS, reduced (GSH) and oxidized glutathione(GSSG) and total antioxidant capacity (TAC). Data were analyzed with repeated measures ANOVA (P<0.05).

Results
Blood lactate reached 17.21 mM (P<0.05) following each match and returned to baseline prior to the next match except from the fourth match. DOMS increased (P<0.05) following each match and returned to baseline before the next match except prior to the fourth match. Leg power and hip-back strength decreased (P<0.05) progressively during the recovery between the first four matches but they were restored before the fifth game. However, hand-grip strength demonstrated a marked (P<0.05) decline throughout the tournament. Leukocytosis was seen throughout the tournament, peaking (P<0.05) in the last match. CK and CRP increased (P<0.05) after each match and within recovery periods, peaking (P<0.05) prior to and following the last match. TBARS, PC, GSH/GSSG, and TAC analyses revealed a marked oxidative stress elevation (P<0.05) after each match which, in most cases, was not normalized prior to the next match.

Discussion
The results of the present study demonstrate that a single-day wrestling tournament induces a substantial inflammatory response which was even more pronounced prior to and following the last matches. Performance was deteriorated before the third and fourth match and in one case (hand-grip strength) it was never restored suggesting that upper body performance is more susceptible to deterioration than lower body performance. These data indicate that these athletes may not perform at their peak during the last matches of the tournament suggesting a need for more suitable programming and anti-inflammatory strategies within recovery.

References.

IMMUNE SYSTEM IN ELITE COMBAT SPORTS ATHLETES
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Moderate exercise has been shown to improve immune defences whereas intense exercise seems to depress the immune system. The aim of this study was to evaluate the impact of an intense training season of combat sports (judo, karate and light) on the immune system of the athletes.

In this study participated 22 male athletes (AG) and 13 sedentary men (control group - CG) with ages between 18 and 31 years old. For the control group weight was 72.0±12.8 kg, height 1.78±0.06 m, body mass index (BMI) 22.6±3.37 kg.m-2, fat mass (FM) 14.1±6.30 kg and fat-free mass (FFM) 57.0±7.26 kg. For the athletes, the weight was 74.5±9.64 kg, height 1.74±0.05 m, BMI 24.4±2.54 kg.m-2, FM 8.76±2.78 kg and FFM 65.2±7.42 kg.

Blood and saliva were collected by standard procedures. Whole blood was used for lymphocyte subpopulations counting (CD4, CD8, CD3, CD19, CD16, total lymphocytes) by flow cytometry; serum for C reactive protein (CRP), high sensitivity C reactive protein (hsCRP), ceruloplasmin (Cp), haptoglobin (Hp), alfa1anti-tripsin (AAT), alfa1acid glicoprotein (AAG), properdin factor B (FPB), IgG, IgM and IgA by nephelometry; saliva for salivary cytokines (IL-2, IL-4, IL-6, IL-10, IFN-gamma, TNF-alfa) by Citometric Bead Array (CBA) and IgA (IgA saliva) by ELISA. Salivary IgA secretion rate was also calculated.

Athletes showed significantly lower Hp (CG: 92.8±39.1 mg.dL-1; AG: 50.7±44.5 mg.dL-1), higher serum IgA (CG: 178.1±55.5 mg.dL-1; AG: 240.0±88.9 mg.dL-1), and higher salivary TNF-alfa (CG: 9.32±2.90 mg.dL-1; AG: 12.4±5.45 mg.dL-1) than CG.

Athletes low Hp values are possibly associated with intravascular haemolysis due to physical injury, high serum IgA and salivary TNF-alfa levels can suggest the existence of chronic inflammation.

EFFECTS OF LOW AND HIGH GLYCEMIC INDEX CARBOHYDRATES ON PERFORMANCE AND BETA-ENDORPHIN LEVELS DURING EXERCISE
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Endorphin (946E) is an opioid peptide representing the C-terminal 31 amino acid residue fragment of pro-opiomelanocortin (POMC). 946917 is released by the brain and has been shown to be affected by carbohydrate intake (Fatouros et al. 1995) and exercise (Goldfarb and Jamurtas 1997; Jamurtas et al. 2000). Low or High glycemic index is a measure of blood glucose changes following food intake and have been used in sports in order to enhance performance. However, it is not known what the effects are from the intake of different glycemic index foods on 946917 levels during exercise. Therefore, the purpose of this study was to examine the effects of low and high glycemic index foods on &A9;46;E levels during exercise. Eight young men volunteered to participate in this study. They underwent, in a randomized counterbalanced design, three experimental conditions. In the first one they received carbohydrates (1.5 gr per kg of body weight) of low glycemic index, in the second one high glycemic index (1.5 gr per kg of body weight) and in the third one placebo. Food was administered 30 minutes prior to exercise. Subjects cycled for 60 minutes at an intensity corresponding to 65% of VO2max which was increased to 90% of VO2max, until the subject could not maintain 60 pedalling revolutions per minute and the exercise time to exhaustion was recorded. Blood samples were drawn through a catheter prior to food consumption, 15 minutes prior to exercise, 0, 40, and 60 minutes into exercise, and at exhaustion. Blood was analyzed for beta-endorphin, glucose, insulin, and lactate. Data was analyzed using MANOVA repeated measures and the significance levels was set at p<0.05. The results showed that the mean time to exhaustion did not differ between the three conditions. There was a significant interaction in the glucose and insulin response (p<0.05) with the HGI exhibiting higher values at 15 and 60 time points. There was a significant increase of 946917 (p<0.05) at the end of exercise without however a significant interaction between the three conditions. Lactate, respiratory quotient, heart rate, VO2 and ventilation did not differ between the three conditions. These results indicate that consumption of either low or high glycemic index foods 30 minutes prior to exercise does not result in enhanced performance or if differences in -E levels.

References.

IMMUNE CHANGES IN ELITE SWIMMERS OVER THE COURSE OF A TRAINING CYCLE
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The immune system (IS) reacts differentially to the chronic stress of exercise depending on several factors including intensity and duration of training, fitness level of the subjects and gender. Most of the findings about the influence of intensive prolonged exercise revealed an immunosuppression that can be associated, in some cases, to a overreaching state. Alternately, moderate exercise has been pinpointed as a potential enhancer of various parameters of the IS.

The impact of a 4 month training period of preparation for the swimming national championships on the systemic and mucosal immunity was assessed in a group of 13 elite Portuguese swimmers (7 female and 6 male) aged between 13 and 20 years old. The evaluation of the subjects was made in 3 different moments of the last macrocycle of the season (summer macrocycle): 1st preparatory, 2nd development and 3rd taper periods.
Blood and saliva restings were collected early in the morning at the 3 moments by standard procedures for posterior evaluation of leucocytes, total lymphocytes and CD3+, CD4+, CD8+, CD16+, CD19+ lymphocyte subpopulations by flow cytometry; serum immunoglobulin A (IgA) by Cytometric Bead Array (CBA) and salivary IgA (s-IgA) by ELISA. s-IgA (s-IgA) was calculated from s-IgA values. ANOVA for repeated measures with Bonferroni post-hoc test was used for the assessment of chronic exercise and gender effects. p < 0.05 was considered statistically significant in all cases. Mean values of the studied variables did not differ between genders and training effect was not gender dependent. Training induced a significant increase of total lymphocytes, CD3+ (Total T lymphocytes) and CD4+ (Th lymphocytes) and s-IgA from the 1st and the 2nd to the 3rd moments. CD8+ (Tc lymphocytes) rose from the 1st to the 3rd moment. CD16+ (natural killer NK) decreased from the 1st to the 2nd moment.

These findings show that the training process induced the stimulation of systemic and mucosal immunity restings values suggesting a chronic inflammation.

IS PREVENTIVE PHYSICAL EXERCISE IMPORTANT IN THE PROTECTION AGAINST CIGARETTE SMOKE-INDUCED PULMONARY OXIDATIVE RESPONSE?

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Reactive Oxygen Species (ROS) play an important role in the etiopathogenesis of pulmonary injury induced by exposure to cigarette smoke, and physical exercise may be useful with an impaired oxidative defense mechanism. However, the effect of preventive exercise on protection against cigarette smoke-induced pulmonary oxidative is partially known. Thus, the major aim of this study was to verify the preventive effects of physical exercise on cigarette smoke-induced pulmonary oxidative stress markers. Thirty six mice (C57 BL-6, 30-35g), were randomly divided in four groups (n = 9); control, cigarette, exercise, and cigarette plus exercise. The exercise groups were submitted to a program of physical training in water, five times a week, during eight weeks. The swimming sessions included two periods of 30 minutes each with a five-minute interval. The cigarette groups were submitted to passive exposure to cigarette smoke 15 times a day, four cigarettes per exposure, totaling 12 cigarettes per day, seven days a week for eight weeks. The animals were sacrificed by cervical traction 24 hours after the last exposure to cigarette smoke. Lung samples were isolated, processed, aliquoted and stored in 10% formalin at 40 °C. Initially, the lung sections were stained with hematoxylin-eosin, and hydroxyproline level was measured. Lipid peroxidation was determined by the quantity of thiobarbituric acid reactive species; protein carbonylation was obtained by determining carbonyl groups in a reaction with dinitrophenylhydrazine; catalase (CAT) activity was measured by the rate of decrease in hydrogen peroxide; and superoxide dismutase (SOD) activity was assayed by inhibition of adrenaline autoxidation. The differences among the groups were evaluated by one-way analyses of variance (one-way ANOVA); the results were expressed as means±SEM and the differences were considered different significantly with p<0.05. Pulmonary histological evaluation in mice treated with cigarette smoke demonstrated that physical exercise had a preventive effect on pulmonary parenchyma alterations and on hydroxyproline level. After exposure to cigarette smoke, a significant increase in superoxide was observed only in the cigarette group in relation to control. An increase in SOD activity was enough to reduce the oxidative damages observed in the same group. Moreover, no alterations in lipoperoxidation level and protein carbonylation were observed in the trained groups when compared to the control group, but results show a decrease of these markers in relation to the group exposed to cigarette smoke. These data suggest the preventive effect of physical exercise against the free radicals production in lung tissue. It is possible that the protecting response of exercise is related to the increased tissue resistance against oxidative damage and also to the improved antioxidant defense system.

INFLUENCE OF THE ADMINISTRATION OF ECSTASY AND OF THE ACUTE PHYSICAL EXERCISE IN THE HYDROGEN PEROXIDE PRODUCTION RATE ‘IN VIVO’ IN THE SKELETAL MUSCLE OF THE RAT

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This work aimed to analyse the influence of the administration of MDMA (10mg/kg ip) and of the practice of submaximum physical exercise (60 minutes, in a horizontal plan, 600m/h) in the hydrogen peroxide production rate in the mouse’s gastrocnemius muscle, and verify if the action of those two independent variables together increases the H2O2 muscle production rate. As indirect indicator of H2O2 production rate in vivo, the catalase residual activity (CRA) was quantified after previous administration of 3-amino-1,2,4-triazole (AT), an inhibitor of this enzyme in the presence of H2O2. Using this method, it was verified that the CRA time variations reflect, in an inverse way, the H2O2 tissue production rate. 30 mice, Charles River males, aged 12 to 14 weeks, with 42 ± 4.5g weigh, were used. The sample was aleatorily divided in 5 groups: AT control (CONT-AT, n=5), control (CONT, n=10), exercise (EX, n=5), administered with MDMA (MDMA, n=5) and administered with MDMA allied to physical exercise (MDMA+EX, n=5). The experimental protocol started (t0) with the AT administration ip (1g/kg) to the groups CONT, MDMA and MDMA+EX, and physiological saline to the group CONT-AT. 15 minutes later (t15), the animals were injected with MDMA (groups MDMA and MDMA+EX) or with physiological saline (groups CONT and EX). In the exercised animals, the physical exercise protocol happened immediately after the MDMA or the physiological saline administration. Every animal was sacrificed by cervical dislocation. The ones from the group CONT-AT were sacrificed 15 minutes after the physiological saline injection. All the other animals were sacrificed at 75 minutes (t75) after the AT administration. The group CONT, at 115 and 175, presented CRA values of 35.48 ± 2.73 and of 33.52 ± 4.14 U/mg protein respectively, significantly lower (p<0.05) compared to the group CONT-AT (44.13 ± 2.79 U/mg protein), which represents the base CRA value in t0. In the other groups, the CRA values at 175 were 21.76 ± 1.35 in group EX, 26.64 ± 2.30 in group MDMA and 21.30 ± 1.85 in group MDMA+EX. All of them revealed statistically more significant values (p<0.05) compared to intra-group CRA values in t15 and t0 (from group CONT-AT). The differences among the groups in t75 were significant (p<0.05) in the groups EX and MDMA+EX compared to group MDMA. These results prove the continuous H2O2 muscle production, even in base situations, and show that the practice of physical exercise or the MDMA administration, acting separately, increase the H2O2 production rate. The increase induced by physical exercise was more noticed. However, when the MDMA consumption was linked to the practice of physical exercise, the results were similar to the ones group EX achieved, which suggests that, on the contrary to what was expected, the association doesn't raise the H2O2 production rate in the skeletal muscle.
REDDENED ATROPHY GENE EXPRESSION IN MOUSE SKELETAL CELLS BY DEHYDROEPIANDROSTERONE SULPHATE

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Dehydroepiandrosterone sulphate (DHEAS) and its precursor dehydroepiandrosterone (DHEA) are multifunctional steroids produced by the adrenal gland. The production rate and levels of DHEA/DHEAS decrease gradually with advancing age suggesting an association between their decline and the general loss of skeletal muscle mass observed with aging. The most relevant factor, in muscle protein waste, is an enhanced protein breakdown associated with an increased expression of E3 ubiquitin ligases such as the muscle-specific ring finger protein (Murf1), which regulation is mediated by the transcription factor NF-κB (1). A DHEAS binding site has been identified in C2C12 myocytes and in human skeletal muscle (2) therefore we investigate if DHEAS may play a contrasting role in the process of muscle atrophy. Expression of Murf1, and myogenin, a muscle-specific transcription factor, were evaluated in response to DHEAS on mouse C2C12 differentiating muscle cells. We also studied the expression of thioredoxin (Trx), that represent one of the main endogenous redox-regulating molecules with thiol reducing activity. Trx has cytoprotective effects against oxidative stress and besides promotes DNA binding of NF-κB (3) whose activation is required for maximal atrophy. C2C12 myoblasts were grown in Dulbecco’s modified Eagle’s medium (DMEM) + 10% foetal bovine serum. At confluence of about 80% cells were shifted in 2% serum and at the same time treated with different concentrations of DHEAS. At the end of experiment total RNA were extracted, reverse transcribed and cDNA levels of Murf1, myogenin, thioredoxin and GAPDH were measured by semiquantitative PCR. A Western blot analysis were performed to determine myogenin levels.

Mylotubes treated with DHEAS concentrations from 1 M to 100 M showed that myogenin mRNA level was unaltered after DHEAS treatment. On the contrary myogenin protein was upregulated dose-dependently with the maximum at 100 M, suggesting that DHEAS may reduce the rates of muscle protein breakdown. In fact, a reduction of Murf1 and thioredoxin mRNA levels were observed with the maximal down-regulation, respect to control, also at 100 M DHEAS.

Our data suggest that DHEAS may act as an endogenous protective factor against muscle waste. DHEAS, through its inhibitory action on glucose -6-phosphate dehydrogenase (5), may reduce ROS generation from NADPH dependent pro-oxidant enzymes. The down-regulation of mRNA thioredoxin expression may lead to a reduction in NF-κB activation. Consequently DHEAS is able to stabilise myogenin, an important protein involved in muscle differentiation maintaining low levels of Murf1 expression.

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EIGHT WEEKS RESISTANCE TRAINING LEADS TO MUCH OXIDATIVE STRESS PRODUCTION IN SEDENTARY THAN IN REGULAR EXERCISE STUDENTS

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Purpose: The aim of this study was compare the effect of 8-weeks resistance training on oxidative stress and antioxidant capacity between sedentary and regular exercise students. Methods: Seventeen college-age men (20.2 +/- 0.4 yr) were volunteered to participate in 8 weeks resistance training program. They included sedentary group from non-physical education students and regular exercise students from department of physical education. All subjects performed resistance training at 80% of one repetition maximum (1RM) for 8 weeks. The blood samples were taken before training and immediately (0h), 7, 24, 48, 72 hours after training. Results: (1) Sedentary group: The lactate dehydrogenase (LDH) activity were increased after 48 and 72h nitric oxide (NO) level were increased after 0-24h malondiadehyde (MDA) concentration was increased after 72h creatine kinase (CK) and uric acid (UA) concentration were increased after 24h and 48h protein carbonyls (PC) concentration was increased after 24h superoxide dismutase (SOD) activity was increased after 48 and 72h. (2) Regular exercise group: Creatine kinase (CK) activity was increased after 7h UA concentration was decreased after 0hPC concentration was increased after 24h NO level was increased after 24h and 48h TAC and CAT activity were increased after 0-24h; creatine kinase (CK) activity was increased after 48 and 10W; NO level was increased after 8W; TAC and CAT activity were increased after 10W and 12W (p<.05). Plasma malondiadehyde (MDA), protein carbonyls (PC) and superoxide dismutase (SOD) have no significant change for both groups during 0W-12W. Besides, the muscle strength after 8 weeks training was increased for both groups. Regular exercise group gained more muscle strength (252.8% vs. 225.3%) and reduced oxidative stress for both groups. Sedentary group produced much oxidative stress than regular exercise group. Meanwhile, this long-term resistance training was also increased antioxidant capacity; it increases more for sedentary group. Therefore, regular exercise can’t only increase muscle strength but also induce less oxidative damage.

CHANGES IN OXIDATIVE STRESS AND ANTIOXIDANT CAPACITY DURING TAPERING TRAINING

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Purpose: The aim of this study is exploring the changes in oxidative stress and antioxidant capacity during tapering training before matches. Methods: Eighteen sedentary males (20.0 +/- 2.2 yr) were recruited to control group and tapering group. All subjects performed resistance training thrice a week at 80% of one repetition maximum (1RM). After completed training for 8 weeks, the control group stopped training and the tapering group keep training once a week for another four weeks. The blood samples were obtained before training (0W) and after training for 8, 10, 12 weeks. Results: (1) Control group: The lactate dehydrogenase (LDH) activity were increased after 8W and 10W, nitric oxide (NO) level was increased after 8W, urea (UA) concentration was decreased after 12W, total antioxidant capacity (TAC) were increased after 8W, 10W and 12W, catalase activity (CAT) was increased after 10W (p<.05). (2) Tapering group: creatine kinase (CK) activity was increased after 8W, LDH activity was increased after 8W, 10W and 12W, UA concentration was increased after 10W, NO level was increased after 8W, TAC and CAT activity were increased after 10W and 12W (p<.05). Plasma malondiadehyde (MDA), protein carbonyls (PC) and superoxide dismutase (SOD) have no significant change for both groups during 0W-12W. Besides, the muscle capacity (TAC) were increased after 8W, 10W and 12W; catalase activity (CAT) was increased after 10W (p<.05). (2) tapering group: creatine kinase (CK) activity was increased after 8W, LDH activity was increased after 8W, 10W and 12W, UA concentration was increased after 10W, NO level was increased after 8W, TAC and CAT activity were increased after 10W and 12W (p<.05). Plasma malondiadehyde (MDA), protein carbonyls (PC) and superoxide dismutase (SOD) have no significant change for both groups during 0W-12W. Besides, the muscle capacity (TAC) were increased after 8W, 10W and 12W; catalase activity (CAT) was increased after 10W (p<.05). (2) tapering group: creatine kinase (CK) activity was increased after 8W, LDH activity was increased after 8W, 10W and 12W, UA concentration was increased after 10W, NO level was increased after 8W, TAC and CAT activity were increased after 10W and 12W (p<.05). Plasma malondiadehyde (MDA), protein carbonyls (PC) and superoxide dismutase (SOD) have no significant change for both groups during 0W-12W. Besides, the muscle
strength after 10W and 12W training were significantly increased for both groups. Conclusion: Tapering training after 8 weeks increased much oxidative stress and muscle damage than stop training. Antioxidant capacities were increased for both groups. Because stop training increases muscle strength but not oxidative damage, it is better training model than tapering training before matches for athletes.

**MUSCLE DAMAGE INDUCED BY UPPER VS. LOWER BODY MUSCLE STRENGTH TRAINING EXERCISES**

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**Methods**  
Thirty subjects (average age = 20.9 ± 2.6 years) participated in this study. All subjects were previously evaluated in what concerns to maximal strength (1 maximal repetition) of upper body muscles (triceps, supine and lat pulldown) and lower body muscles (leg press, leg extension and leg curl). After one week, half of the subjects performed submaximal repetitions until exhaustion for upper body muscles and the other half performed submaximal repetitions until exhaustion for lower body muscles. One week later, the groups inverted the aim of the muscle strength training session. Capillary blood samples were collected before the each training session, 24 hours and 48 hours later for creatine kinase (CK) analyse in Refflotron Analyzer Plus. A comparison between blood CK values induced by upper body muscle training and by lower body muscle training was made through general linear model with repeated measures. Significance level was established at 5%.

**Results / Discussion**  
Our results revealed that blood CK values vary with the moment of evaluation, increasing significantly 24 hours later and remaining significantly high 48 hours later compared to the values obtained before each training session. Regarding the influence of upper or lower body muscle training on blood CK values, our results revealed that although higher values were obtained 24 and 48 hours later after lower body muscle training session, there was no significant difference compared to blood CK values after upper body muscle training session.

**Conclusion**  
Our results suggest that the recovery period between exercise training sessions for the upper or lower body muscle could be the same.

**AGE-RELATED LYMPHOCYTE MITOCHONDRIA RESPIRATION AND HYDROGEN PEROXIDE PRODUCTION IN TRAINED PEOPLE**

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**Introduction**  
Mitochondria seem to be the most important subcellular site of hydrogen peroxide production in mammalian organs either by dismutation of peroxide ion on the electron-transfer chain of mitochondria or by the oxidative deamination of biogenic amines by monoamine oxidases on the outer mitochondrial membrane. It has been stated that generation of oxidants by mitochondria, and damage of mitochondrial components and functions by oxidants, are important aspects of the aging process. The aim of this study was to analyze the influence of exercise training on lymphocyte mitochondria function and hydrogen peroxide production with aging, in trained people.

**Methods**  
Ten men, aged between 27 and 52 years old (average age = 37.2 ± 8.8 years), engaged in regular physical activity participated in this study. Maximal aerobic capacity (VO2max. ml/kg/min) was assessed by spirometry until exhaustion, according to Bruce protocol. Human lymphocyte mitochondria oxidative activity with a Clark electrode (Hansatech Instruments) according to Miró et al. (1999) and mitochondria hydrogen peroxide production was assessed by fluorescence as described by Valletta and Berton (1987). A Spearman correlation was performed in order to test variables (age, mitochondria oxidative rate of Complex I and II and mitochondria hydrogen peroxide production) associations. Significance level was established at 5%.

**Results / Discussion**  
VO2max were 54.23 (± 4.68) ml/kg/min, mitochondrial oxidative rate was 12.7 ± 4.8 and 17.9 ± 7.9 nmol oxygen/min/mg lymphocyte protein for Complex I and Complex II, respectively, and mitochondria hydrogen peroxide production was 17.8 ± 2.2 µmol/ mg lymphocyte protein. Our results couldn’t find any significant correlation between mitochondria oxidative rates and age but mitochondria hydrogen peroxide production decreased significantly as age increased (r=-.709, p<.032).

**Conclusion**  
Our results suggest that regular exercise must be a stimulus for physiological mitochondrial biogenesis preventing and retarding the effects of aging process in mitochondria functionality decline. However, it’s possible that in larger samples and in older persons (close to 80 years old), where morphological changes in mitochondria cristae are more pronounced, age related mitochondria functionality decline should be visible, even between trained samples.

**References**  
Blood and saliva samples were collected early in the morning by standard procedures before and after the performance of a 7 x 200 m crawl progressive test (protocol based on Pyne et al., 2001) for posterior evaluation of leukocytes, total lymphocytes and CD3+, CD4+, CD8+, CD16+, CD19+ lymphocyte subpopulations by flow cytometry; serum immunoglobulin A (IgA) by Citometric Bead Array (CBA) and salivary IgA s-IgA by ELISA. s-IgA secretory rate (sr-IgA) was calculated from s-IgA values. Blood post exercise values were corrected for plasma volume variation. ANOVA for repeated measures was used for the assessment of exercise and gender effects. Paired samples t-test was also used for comparisons between pre and post exercise values of each variable when exercise effect was gender dependent. p < 0.05 was considered statistically significant in all cases. The acute maximal exercise induced a significant increase of leukocytes, total lymphocytes, CD3+ (Total T lymphocytes), CD4+ (Th lymphocytes), CD16+ (Natural killer NK) and CD19+ (B cells), for the male group. Leukocytosis and an increased number of B cells after exercise were also observed for the female group. The concentrations of serum IgA, salivary IgA (s-IgA) and s-IgA secretory rate (sr-IgA) did not suffer any significant changes, in both genders. These findings show that the effect of a single bout of maximal exercise on immunity is gender dependent. We observed the stimulation of systemic immunity, which was more pronounced in males then in females, and the maintenance of the assessed mucosal immunity.

**SERUM CYTOKINES AND TOTAL ANTIOXIDANT CAPACITY IN MALE AND FEMALE ROWERS AFTER ACUTE EXERCISE**

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**Introduction**

The cytokine IL-6 (traditionally a pro-inflammatory cytokine but recently described as having anti-inflammatory effects) is proposed to mediate the beneficial effects of regular exercise in terms of systemic, low-grade inflammation (Petersen & Pedersen, 2005). An intensity-dependent increase in IL-1ra (anti-inflammatory) was observed in moderate exercise in women (Gough et al., 2007) suggesting that this cytokine may have more impact than IL-6 in these circumstances. Gough (2007) further suggested that total antioxidant capacity (TAC) may mediate IL-1ra release. The present study looked at the effects of repeated bouts of rowing on male and female rowers. Diet, lactates, total antioxidant capacity and three serum cytokines were compared on a gender basis.

**Methods**

Eight male (age 29yrs ±8.4; wt 81.3kg ±10.5; ht 1.85m ±0.08), 5 female (age 20yrs ±0.7; wt 62.2kg ±6.8; ht 1.70m ±0.05) healthy rowers participated in this ethically approved study. The exercise protocol consisted of a Concept II Rowing Ergometer step test. The serum cytokine concentration was measured with a monoclonal antibody sandwich ELISA kit (IL-1ra, R&D) and Immulite chemiluminescent assay (IL-6, IL-10). Serum TAC was quantified against an anti-oxidant standard in a chemiluminescent assay with peroxynitrite and the photoprotein Pholasin® (Knight Scientific). Statistical analysis used repeat measures ANOVA and paired t-test.

**Results**

IL-1ra was the only cytokine that increased significantly during the trial [P<0.01] and was significantly higher 1hr after exercise in women than men [P<0.05]. IL-10 was not detected. TAC also changed significantly with time [P<0.001]. There was no significant difference between TAC of men and women, although males tended to have slightly higher resting TAC scores, and females higher post-exercise scores.

**Discussion**

IL-6 did not increase in response to short duration exercise but IL-1ra did. These data lend support to the proposal by Gough et al. (2007) that IL-1ra may have more of an impact than IL-6 as an anti-inflammatory cytokine after this type of exercise. It is further proposed that there may be a significant difference between the inflammatory response of men and women to exercise which should be further investigated. The role of sex hormones and amenorrhoea would be relevant to such a study.

**References**


**Poster presentations (PP)**

**PP-BN02 Biomechanics 2**

**AERODYNAMIC DRAG FORCE AND POWER WHEN CYCLING IN DIFFERENT METEOROLOGICAL CONDITIONS**

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**Introduction**

In the International Standard Atmosphere (ISA), at sea level with a normobaric pressure of 1,013.25 mb and 15°C temperature, dry air has a density of 1.225 kg/m3 (Massey, 1991). However, local fluctuations in barometric pressure, ambient temperature and relative humidity associated with prevailing weather conditions incur changes in the density of the air (Bertin, 2002), which determines the air resistance acting on the cyclist and the aerodynamic power required to overcome drag (Martin et al., 1998). This study aimed to model aerodynamic forces and powers in different meteorological conditions. The findings may be used by cyclists to sketch pacing strategies according to forecast weather.

**Methods**

This study used a hypothetical well-trained cyclist with a mass of 80 kg and a wind tunnel drag area of 0.261 m2 (Martin et al., 1998). The rider was assumed to be performing a 40-km time trial, unaccompanied, on an asphalted road and using an aerodynamic position on the bike. Wind direction was assumed tangential to the direction of cycling. Meteorological variations encompassed head and tail wind velocities of up to 5 m/s-1, sea level barometric pressures from 973.25 to 1033.25 mb, ambient temperatures of 0 to 40°C, and relative humidity levels of 10, 50 and 90%. Air density was computed as a function of weather parameters, and drag force was calculated using FD = 1/2rhCDAv2 (Massey, 1991). Bertin (2002) assuming a constant cycling velocity of 11 m/s-1. Aerodynamic power (absolute and as a percentage of total power) was predicted using the mathematical model of Martin et al. (1998), assuming a constant total power output of 255 W.

**Results**

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Drag force was less in high ambient temperatures; however, headwinds substantially increased absolute and relative aerodynamic power. Drag force and aerodynamic power were lowest (17.1 N and 191 W, respectively) in simulated weather systems that bring about low pressure (973.25 mb) and warm air (40°C), and highest (20.8 N and 233 W, respectively) when there was a combination of high pressure (1033.25 mb) and cold air (0°C). Dry (10%) and cold (0°C) air elicted more drag (20.4 N) and aerodynamic power (228 W) than humid (90%) and warm (40°C) conditions (17.4 N and 194 W, respectively).

Discussion/Conclusion

The mathematical model of Martin et al. (1998) allowed the prediction of air density and aerodynamic parameters (Massey, 1991; Bertin, 2002) associated with simulated weather conditions. Headwinds remain the worst enemy of the cyclist, particularly in combination with cold air. Weather systems characterized by low pressure, warm air and high humidity reduce drag force and aerodynamic power. Cyclist may consider a detailed assessment of forecast weather as an integral part of race strategy planning.

References


AERODYNAMIC EFFECTS OF ROAD TOPOGRAPHY AT THREE DIFFERENT LEVELS OF CYCLING PERFORMANCE

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Introduction

Aerodynamic drag acting on the cyclist is proportional to air density and the square of air velocity, which are respectively influenced by altitude and road gradient (Massey, 1991). Previous studies have modelled cycling performance as a function of individual environmental parameters (e.g., Martin et al., 1998; Atkinson et al., 2007). However, the aerodynamic effects associated with the interaction of topographical features have not been elucidated. Thus, this study aimed to model the individual and interactive aerodynamic effects of race course altitude and road gradient at three levels of cycling performance: recreational, well-trained and elite. The findings may be used by cyclists to select pacing strategies.

Methods

This study used a hypothetical cyclist with a wind tunnel drag area of 0.261 m² (Martin et al., 1998). The rider performed a 40-km time-trial unaccompanied, using an aerodynamic position on the bike. Cycling velocity and power output of the cyclist were adjusted to simulate three performance levels: recreational (9.33 m/s⁻¹, 164 W), well-trained (11.00 m/s⁻¹, 255 W) and elite (12.86 m/s⁻¹, 394 W) (Atkinson et al., 2007). Geometric altitude was modelled from sea level to 2500 m above sea level. Road gradient was simulated using alternating 2.5-km uphill (+2% gradient) and downhill (-2%) sections. Aerodynamic drag force and power (absolute and as a percentage of total power) were computed as a function of the individual terrain parameters. Finishing time was calculated based on the interactive effect of topographical features.

Results

Drag force and aerodynamic power dropped by 2.3 N and 30 W, respectively, per every 1000 m increase in altitude in the elite, by 1.7 N and 19 W in the well-trained and by 1.2 N and 12 W in the recreational cyclist. In uphill sections, air resistance accounted for 40, 48 and 55% of total power output in the recreational, well-trained and elite riders, respectively. The interaction of alternating ±2% road gradient and high altitude (2500 m) increased finishing time by 4 min and 15 s in the recreational cyclist, but saved 27 s in the well-trained rider and 2 min and 22 s in the elite cyclist.

Discussion/Conclusion

Cyclists should expect aerodynamic drag and power to decrease with altitude and relative aerodynamic power to decrease with both altitude and road gradient (Massey, 1991; Martin et al., 1998). As with individual environmental parameters (Atkinson et al., 2007), the interactive effects of road topography on cycling performance were closely related to the performance level of the cyclist. However, cycling performance may be predicted more accurately by modelling the interactive effect of topographical features.

References


STUDY REGARDING TORQUE MEASUREMENTS

Yamamoto, T., Mochizuki, K., Naguchi, K., Akita, K., Miura, K., Miura, M., Aoyama, H., Yoshihara, S., Katoh, Z., Tamura, M., Kita, T., Kyungok, Y.
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Introduction

This research aims to evaluate two kinds of torques of the hip joint muscular power and the elbow joint muscular power measuring, and to do the comparative study between the two based on the measurements.

Methods

The factors were (1) distinction between hip-joint muscle strength and elbow-joint muscle strength, (2) distinction between inward and outward rotations, and (3) difference in gender. A total of 60 students, 30 male and female, were tested in the experiment. After comparing the data of test subjects, certain findings were obtained.

Discussion/Conclusion

A variance analysis of the measurement data gave the following results:

1. The torque value of men exceeded that of women. The difference was statistically significant at the 1% level. This is believed to reflect gender differences that we are commonly familiar with.
2. The torque value of hip-joint muscle strength showed a statistically significant excess over the torque value of elbow-joint muscle strength at the 5% level. It is generally known that legs have greater strength than arms, and the difference seen here between hip and elbow joints appears to follow a similar trend.
3. For both men and women, the torque value of hip-joint muscle strength during inward rotation showed a statistically significant excess over that during outward rotation.

References
MEASUREMENT OF THREE DIMENSIONAL ACCELERATIONS DURING THE PERFORMANCE OF THE SKI-JUMPING

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Introduction: In ski jumping, the performance is divided in some phases that are the start, griding on inn-run, take off, flight and landing. In the flight phase, a jumper stays in the air for a couple of seconds after the take-off. If the whole of jump performance could be recorded exactly, each part of the performance can be analyzed more easily. It is interesting to know mechanical behavior in the series of the performance from take off to touching down phase. Especially, it is important to know how aerodynamic force affects the jumper and skis during the flight phase. The longer a jumper stays in the air, the longer flight length will be. So, a jumper cannot ignore the aerodynamic force at any occasion. Especially in the flight phase the gravity and the aerodynamic force affect a jumper. It is important to know the behavior of the accelerations for a jumper. We tried to prove our hypothesis about the influence of accelerations during jump performance by using a compact accelerometer with a gyroscope.

Methodology: This study was made possible with the collaboration of three voluntary jumpers during their training camp from 2006 Summer to 2008 winter. Jumpers jumped with a small accelerometer with a gyroscope. The accelerometer was set on the jumper’s back. The data was taken digitally with 200 Hz sampling frequency. The data were converted into global coordinate system by the rotational matrix known as Euler angles. The angle is obtained by the integrating the angular velocity from a gyroscope.

Results: Flight length was confirmed by one of their trainers. The mean of flight length was 93.5 m at the Hakuba. After the take-off, an aerodynamic force is calculated by subtracting the total force from the gravity. An aerodynamic force is divided into the drag force and the lift force on the body coordinate system. The range of fluctuation in the AC a is from the 0.15 to 0.5 m in all the three jumpers. In the period of the early flight phase, the total force vector is directed obliquely backward and downward on the trajectory. In the the middle of flight phase, the total force vector is directed obliquely downward and slightly forward that the lift forces are increasing. The drag force strongly affects a jumper than lift force during the early flight phase. Whereas the lift force become gradually larger than the drag force from the middle of the whole phase to the touching down phase.

Conclusions: The coordinate conversion technique in this study can obtain precise data in the flight phase. The data of flight phase is reliable to analyze the aerodynamic factors. During the early flight phase, the drag force strongly affects a jumper than lift force. The lift force become gradually larger than the drag force from the middle of the whole flight phase.

OPTIMIZED DESIGN OF A MOVEMENT ANALYSIS LABORATORY FOR RESEARCH IN SPORTS AND SPORTS EQUIPMENT

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Introduction

Movement analysis plays an important role for both, enhancing athletes’ performance and clinical applications. In addition movement analysis is integrated in many fundamental and applied research and development processes, e.g. prosthetics, sport equipment or to improve the safety of car occupants.

Because of the high costs of a full equipped movement analysis laboratory, the efficiency in lab design and usage rate is important. This could be solved by a synergistic and interdisciplinary concept of a movement analysis laboratory. An optimized lab should provide most realistic conditions for a variety of sports, including individual and team sports as well as for clinical gait analysis and interdisciplinary motor control studies. In addition the lab should enable the testing of various sport equipment. The purpose of this paper is to present the technical requirements for an optimized movement analysis laboratory.

Methods:

A recently completed movement analysis laboratory will be used as an example to illustrate a model facility. Its concept and design is based on a requirement analysis. Current and future needs for research in sport science, physical education, medicine and for demands of sport associations and industrial partners have been considered. Special emphasis is given to the spatial design and to the technical construction requirements to integrate accurate measurement devices such as various force plates, marker based and markerless motion capture and wireless EMG. In addition important information for the planning process including a general timeline are presented. From these date, recommendations how to plan and build a movement analysis laboratory are derived.

Results:

The planning of the movement analysis lab has to combine the scientific purposes of use and all technical aspects of structural engineering, like building construction, electrical engineering, heating and air-conditioning. General aspects are room size, movement pathways, positioning options of force plates and camera systems in combination with the positioning of safety harness suspensions or housing technology installations. To provide most accurate measurements, the type of concrete used under the force plates and their separation during the flight phase. The longer a jumper stays in the air, the longer flight length will be. So, a jumper cannot ignore the aerodynamic force at any occasion. Especially in the flight phase the gravity and the aerodynamic force affect a jumper. It is important to know the behavior of the accelerations for a jumper. We tried to prove our hypothesis about the influence of accelerations during jump performance by using a compact accelerometer with a gyroscope.

Conclusions: The coordinate conversion technique in this study can obtain precise data in the flight phase. The data of flight phase is reliable to analyze the aerodynamic factors. During the early flight phase, the drag force strongly affects a jumper than lift force. The lift force become gradually larger than the drag force from the middle of the whole flight phase.

THE USE OF BIARTICULAR MUSCLES AFFECTS THE FORCE DEVELOPMENT

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Biological systems can show a great variability with regard to the movement of its segments and for muscle control, which is based on a high number in degrees of freedom in joints and muscles. However, certain movement and activation patterns are still reliable (Bobbert and van Ingen Schenau, 1988). One example referring to the human jumping is the acceleration of the segments from proximal to distal. A similar behaviour can be observed for the description of the leg behavior. Here it appears that for certain frequencies one can see a
linear-elastic force-length relationship, which can be described by a simple spring-mass model (Blickhan, 1989, Farley et al., 1991). This applies for all people likewise. But it does not apply for hopping frequencies much lower than the preferred frequency anymore. The formerly observed force-length behavior is anything but linear-elastic, which is why the presumption suggests that this is caused by the longer contact times and greater joint movements during slow hopping.

To detect these changes in low frequencies, jumps were carried out on a sliding sledge (developed in Jenă). To carry out this specific experiment, the subjects were sitting below an inclined plane (inclination 20°). The subjects had the task to push a sledge (different weights) with different frequencies for 20 seconds. Beside the dynamographic data, also the kinematics and the activities of different leg muscles were registered.

The results show that the change of leg behaviour cannot be generalized. In spite of long contact times, great joint movements and high loads, some test persons were able to maintain the linear leg behaviour observed in high or preferred hopping frequency. This difference can be explained with an altered activation - and coordination pattern within sportspeople with jumping experience, which becomes visible due to their training. The other test persons show a multimode force pattern with plateau characteristics. This reason for the failure to maintain the linear elasticity can be seen in the different muscle activation. Particularly in biarticular muscle activation. Here the M. biceps femoris seems to have a key function. Jumpers use the force ability of the muscle to change the whole muscle coordination (Ertelt, 2008). This leads to an adequate movement, which supports a greater force generation. Through this, other structures (muscles, ligaments, tendons, bones etc.) can be preserved/disburdened or can make use of a higher muscle force on the same or a shorter way.

References


DIFFERENCES IN MAXIMAL SPRINTING SPEED KINEMATICS ON SLOPING SURFACES

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Sprinting up and down inclined surfaces are two of the most popular sprint training methods (Paradisis and Cook, 2006). One of the most important considerations of such training is the magnitude of changes in the kinematics of running. The aim of the study was to determine the differences in maximal sprinting speed kinematics on uphill and downhill slopes. Nine sprinters (20 ±3.5 y a., 74 ±2.7 kg, 179 ±6.8 cm) participated in this study. In order to assess differences in maximal sprinting speed kinematics, the 20 meter maximal sprint test was used. After a standardized warm up sprinters perform randomly 2 maximal sprints without inclination, 2 maximal sprints uphill and downhill, using a flying start. The slope inclination was 3.7°. Ten minutes recovery time was used between repetitions. Kinematic parameters were measured with Opto-track system (Microgate, Italy). Velocity, contact time, flight time, stride length and frequency of each stride were measured over running distance. Stride length and frequency were also normalised to body height. ANOVA for repeated measures was used to test the significance of differences in obtained parameters due to changes in inclination of running surface. In the event of significant main effect PostHoc Bonferroni was used to locate the differences. A repeated measures ANOVA showed significant main effect for maximum velocity (F(2,16)=26.6, p<0.001), absolute and relative stride length (F(2,16)=31.5, p<0.001), contact time (F(2,16)=10.7, p<0.01) and flight time (F(2,16)=5.8, p<0.05). Uphill running decreased maximum velocity compared to downhill (p<0.01) and horizontal running (p<0.01). Uphill running also decreased relative stride length compared to downhill (p<0.001) and horizontal running (p<0.001). Downhill and uphill running increased stride contact time compared to horizontal running (p<0.05). Results of our study showed that extra propulsive force during downhill running increased stride contact time although running velocity stayed the same. Thus could be due to greater distance between the centre of mass and the contact point compared to horizontal running (Paradisis and Cook, 2001). Uphill running decreased maximal velocity due to shorter stride length and increased contact time. Posture alteration during uphill running was probably not the main reason for contact time prolongation. An extra resistance load on the musculoskeletal and neural system during uphill running could be counteract only with great impulse (force x time) during contact phase, which could be seen during contact time prolongation. The results of our study implied that running on the different slope surface generate acute changes in the kinematic parameters due to different demands on the musculoskeletal and neural system.

References


ANALYSIS OF CRAWL FORCE AND FLOW FIELD USING A ROBOT ARM

Ozaki, T., Matsuuchi, K., Takagi, H., Nakashima, M.,
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Important factor which should be taken into account in swimming are the propulsive force. There were many studies about propulsive force in crawl, but in their studies it has been supposed that flow field around a swimmer is steady or quasi-steady. Schleihauf evaluated a force exerted on a hand in swimming using a quasi-steady analysis. However, swimmer’s motion cannot be evaluated quantitatively by the quasi-steady analysis, because of extremely unsteady characteristics. In general unsteady flow force is greater than the steady one. According to Toussaint et al., the quasi-steady analysis may give an underestimation of force. It is hence necessary to analyze the generating mechanism of propulsive force based on the unsteady flow. Top swimmers are expected to swim using effectively unsteady flow force. Our aim is to clarify the relation between the force exerted on an arm and flow fields around it. To detect these changes in low frequencies, jumps were carried out on a sliding sledge (developed in Jenă). To carry out this specific experiment, the subjects were sitting below an inclined plane (inclination 20°). The subjects had the task to push a sledge (different weights) with different frequencies for 20 seconds. Beside the dynamographic data, also the kinematics and the activities of different leg muscles were registered.

The results show that the change of leg behaviour cannot be generalized. In spite of long contact times, great joint movements and high loads, some test persons were able to maintain the linear leg behaviour observed in high or preferred hopping frequency. This difference can be explained with an altered activation - and coordination pattern within sportspeople with jumping experience, which becomes visible due to their training. The other test persons show a multimode force pattern with plateau characteristics. This reason for the failure to maintain the linear elasticity can be seen in the different muscle activation. Particularly in biarticular muscle activation. Here the M. biceps femoris seems to have a key function. Jumpers use the force ability of the muscle to change the whole muscle coordination (Ertelt, 2008). This leads to an adequate movement, which supports a greater force generation. Through this, other structures (muscles, ligaments, tendons, bones etc.) can be preserved/disburdened or can make use of a higher muscle force on the same or a shorter way.

References


STORIL / PORTUGAL, 09-12 JULY 2008

Friday, July 11th, 2008 14:15 - 15:15

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References

cycle and the flow speed. We called three types stroke S, whose trace is like a figure S, stroke I, which is comparatively straight and stroke SI, which is the middle of stroke S and stroke I. We could evaluate the relation between the force exerted on a robot arm and the flow field around it. Since the forces and flow fields were measured simultaneously, we were able to investigate the mechanism of propulsive force.

The results show that the averaged thrust has almost same magnitude for all types of strokes from entry to exit. The maximum thrust was measured at the time when the arm changes the direction from in-sweep to out-sweep in the stroke S. At that time a vortex was observed to be released. It was found that the propulsive force was closely related to the generation and the release of vortices.

**RESULTS:** Ball velocity significantly decreased (P<0.05) after the implementation of the cutting maneuver task (Straight approach = 19.62 ± 1.89 m•sec-1 and Kick after cutting = 16.93 ± 1.41 m•sec-1). Similarly, the ball/foot speed ratio was significantly (P<0.05) higher during straight approach (1.59 ± 0.44) compared with the kick after cutting maneuver (1.52 ± 0.16). Kicking after cutting maneuver displayed lower velocity of the thigh (774.35 ± 79.31 vs 707.26 ± 81.69 deg/s), the shank (1625.62 ± 160.81 vs 1539.49 ± 194.38 deg/s) and the foot (1765.83 ± 162.38 vs 1571.02 ± 177.56 deg/s) compared with kicks after straight approach. Similarly, thigh, shank and foot angular velocity values at ball impact were significantly lower after cutting maneuver tasks (P<0.05).

**DISCUSSION:** The results of the present study indicated lower soccer kick kinematics when players performed kicks after cutting maneuver. This agrees with previous studies which reported decreased performance in running after cutting maneuvers (3). A powerful kick depends on proximal-to-distal sequence of segmental angular velocities (4) and transfer of energy between segments (5). This sequence agrees with previous studies which reported decreased performance in running after cutting maneuvers (3). A powerful kick is sustained by a higher velocity of the thigh, shank and foot. Therefore, a powerful kick after cutting maneuver tasks is less powerful compared with kicks after straight approach.

**REFERENCES:**

**STRATEGIES OF POSTURAL CONTROL IN STATIC AND IN DYNAMIC TESTING SITUATIONS**

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**Introduction**

In order to gain a better understanding of postural control and to detect the individual risk of failing, one can evaluate subject's performance in specific balance tasks. Most often posturography is used to examine postural stability. At this subjects stand on a stable platform in static condition and motions of centre of pressure are analysed. Moreover, one can assess postural stability in balance tasks on an instable surface in dynamic condition. The aim of this study was to evaluate the relationship and differences between performances in postural control in static and in dynamic testing situations.

**Methods**

Twenty-three healthy male physical education students participated in this study (age: 24 +/-2.8 years, height: 182.0 +/-5.7 cm, weight: 78.7 +/-7.7 kg). Subjects were tested on their ability to maintain postural stability in a standardised one-leg stance (II) on a force platform (posturography, static condition) and (III) on a movable and instable platform attached to four springs (dynamic condition). We measured motions of centre of pressure (static condition) and displacements of support surface (dynamic condition). Furthermore, we recorded motions of the hip by an acceleration sensor attached to a belt. EMG-activity was recorded of the following muscles: m. tibialis anterior, m. gastrocnemius lateralis, m. vastus lateralis, m. biceps femoris, and m. erector spinae. Each measurement of postural control consisted of three tests on each leg (II and III) lasting 32 seconds. Trials were carried out in random order to prevent order effects.

**Comparison of postural control in static and in dynamic testing situations**

The correlation between postural control in static and dynamic testing situations led to poor correlations between performances in these two test situations (r=-0.11 L, r=-0.27 R). The motions of the hip increased significantly in dynamic testing situations (p<0.000 L; p=0.000 R). Moreover, EMG-activity (EMG) increased in all muscles in dynamic testing condition but reached the level of significance only in m. tibialis anterior, m. biceps femoris, and in m. vastus lateralis.

**Discussion**

This study reveals a surprisingly poor relationship between postural control in static and in dynamic testing condition. Regarding motions of the hip and analyses of EMG-activity we hypothesised different postural control strategies depending on testing situation (e.g. primarily hip-strategy versus primarily ankle-strategy). In conclusion our results suggest that measurement of postural stability in static conditions cannot predict performance in dynamic situations, e.g. to detect the individual risk of falling in elderly people and the risk of injuries in athletes.
RESEARCH ON TORQUE MEASUREMENT

Aoyama, H., Yamamoto, T., Mochizuki, K., Noguchi, K., Akita, K., Miura, K., Miura, M., Yoshihara, S., Katoh, Z., Tamura, M., Kita, T., Kinyungo, Y.

1Toyo University, 2 Musashino Art University, 3 St Marianna Medical College, 4 Mizuho University, 5 Meiji University, 6 Tokai University, 7 Ewha Womans University, Japan

Objective
The objective of the Study was to investigate how torque values of hip abductor and adductor strengths change over the course of a year, to compare MRI cross sections of the psoas major and erector spinae muscles, and to investigate their relationship to hip joint muscle strength.

Method
Evaluations of the psoas major and erector spinae muscles were based on cross sections obtained by Magnetic Resonance Imaging (MRI). Evaluations of hip abductor and adductor strengths were based on measurements taken with an exclusively developed hip-joint muscle strength measuring instrument.

Results
Part 1 Subject A: There was a positive correlation of 0.76 (significance level: 5%) between the abducence muscle (closed) and the right psoas major muscle. A positive correlation of 0.88 (significance level: 1%) was found between the adducence muscle (open) and the left erector spinae muscle. A positive correlation of 0.99 (significance level: 1%) was found between the left and right erector spinae muscles.

Part 2 Subject B: No statistically significant correlation was found between hip-joint muscle strength and the psoas major muscles. There was a positive correlation of 0.84 (significance level: 5%) between the right hip-joint muscle strength and the left erector spinae.

Part 3 Subject C: No statistically significant correlation was found between hip-joint muscle strength and the psoas major muscles. There was a positive correlation of 0.89 (significance level: 1%) between the left and right psoas major muscles.

Discussion /Conclusion
Only one of the three subjects showed a statistically significant correlation between hip-joint muscle strength and the psoas major muscles. No conclusion can be made concerning the existence or non-existence of any relationship between the two. Further studies are necessary to ascertain whether the small number of trials, lack of accuracy in attaining the central position for measurements, or individual differences had any bearing on the results.

Subject A: 40 years of baseball (underhand pitcher) Subject B: 45 years of golf

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Yamamoto Tadashiro et al (2005)?Research about the measurement of the torque ??The10th Annual Congress of the EUROPEAN COLLEGE OF SPORT SCIENCE, Belgrade.

LOCALIZED MUSCLE FATIGUE EFFECTS ON LOWER LIMB KINEMATICS AND MUSCLE ACTIVITY DURING LEVEL RUNNING

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Aristotle University of Thessaloniki, Greece

The purpose of this study was to compare the changes in lower limb kinematics in running after a knee fatigue protocol with those observed after an ankle fatigue protocol. Sagittal kinematic data were collected from 15 female runners running at 3.61 m/s on a treadmill prior to and following an isokinetic knee extension / flexion (session 1) and an ankle plantarflexion / dorsiflexion (session 2) fatigue test at 120 degrees/s. Ankle muscle fatigue caused decreased dorsiflexion at initial contact while knee fatigue caused increased knee flexion at the same period (p < 0.05). Both protocols increased knee flexion angle at toe off while the hip was more extended after knee fatigue and the ankle more plantarflexed after ankle muscle fatigue. Ankle muscle fatigue caused a significant increase in hip extension and ankle plantarflexion angular velocity (p < 0.05). Knee muscle fatigue decreased hip and knee flexion velocity (p < 0.05). These results indicated that localized muscle fatigued effects on running kinematics differed between the two protocols. However, the strategy used to compensate for fatigue effects was similar for both protocols: to protect the joints at initial impact and to prevent impairments in performance during toe off and swing phase.

ALTERATIONS OF RUNNING PATTERNS DUE TO FATIGUE, COGNITIVE LOAD AND MAP OPERATING IN HIGH- AND LOW-LEVEL ORIENTEERS

Millet, G., Divert, C., Banizette, M., Morin, J.

Jean Monnet University, Saint-Etienne, France

Introduction. Orienteering is a good model to examine the interaction between cognitive tasks, biomechanical responses and fatigue. It can be hypothesized that elite orienteers have developed specific aptitudes to run at high velocity over prolonged periods of time while processing visual information on a map without injury. However, this hypothesis has never been tested. In this study, we examined the influence of fatigue on running biomechanics in normal running, normal running with a cognitive task and running while map operating, in orienteers of different levels of ability.

Methods. Nineteen international level and less experienced orienteers performed an exhaustive running exercise (~ 1 h at 70% VO2max) followed by a time to exhaustion (TTE) test at 85% VO2max and another 8 min at 70% VO2max on an instrumented treadmill to assess stride kinematics, kinetics and spring-mass model characteristics. At 8 min intervals during the 1h at 70% VO2max and at post-TTE, orienteering simulation (OS) (i.e. respond to as many orienteering questions as possible over 90-s sequences with a map in hands) or control running (CONTR) were requested. In order to differentiate the influence of the cognitive load from the influence of running while map operating, running patterns were also recorded during a cognitive task that did not modify the ‘natural’ run (mental arithmetic, MA).

Results. Kinematic and kinetic parameters were significantly different (P < 0.001) between both MA and CONTR compared with OS. However, no difference was observed between MA and CONTR. During CONTR, fatigue was associated with a lower (P < 0.01) maximal downward displacement of the center of mass during contact (delta-z) and an increased (P < 0.001) vertical stiffness (Kvert), while peak vertical ground reaction force (Fmax) did not change. A significant effect of the level of ability was observed for OS running (normalized by CONTR): a higher step frequency (+3.1%, P < 0.01), a lower Fmax (-3.9%, P < 0.05), a higher Kvert (+3.9%, P < 0.05) and a lower delta-z (-3.1%, P < 0.01).

STORIL / PORTUGAL, 09-12 JULY 2008
Twelve males and females performed three maximum isometric contractions (MVCs) of the knee extensors and flexors at 0°, 45°, and 90° knee joint angle and the level of muscle force. Information on muscle architecture related to joint positions is essential for the study of tendon and muscle properties of the hamstrings is important. Chleboun et al., (2001) found that the fascicle length and pennation angle of biceps femoris (BF) changed significantly as length changed. Due to the complexity of the hamstrings, its architecture and function are affected by the change of the knee joint angle and the level of muscle force. Information on muscle architecture related to joint positions is essential for the study of muscle function (Lieber,1993) and treatment of hamstring injuries. The purpose of the present study was to examine hamstring muscle thickness and aponeurosis stretch during ramp isometric contractions.

Method

Twelve males and females performed three maximum isometric contractions (MVCs) of the knee extensors and flexors at 0°, 45°, and 90° knee flexion angle. They then performed ramp isometric contractions of the knee flexors at 0%, 40%, 80% MVC. In each position, longitudinal ultrasonic images of the BF were obtained. The video images were digitized to measure aponeurosis strain and the muscle thickness during each position.

Results

The results indicated that for each knee flexion angle, as the MVC levels increased, the strain values increased. Particularly the strain values ranged from 3 to 10 cm, 6 to 13 cm and 5 to 14 cm at 0°, 45°, and 90° angles respectively. The muscle thickness decreased as the MVC level increased. The muscle thickness values ranged from 2 to 7 cm, 3 to 17 cm and 2 to 10 cm at 0°, 45°, and 90° angles respectively. The above results indicate that hamstring’s tendon elasticity increases as isometric force increases via a quasi-linear relationship.

This relationship could be used to model hamstring function muscle-tendon unit.

References.


Hamstring thickness and stretch in isometric ramp contractions

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Hamstring muscle and tendon strains are frequent injuries in various sports. Therefore investigation of tendon and muscle properties of the hamstrings is important. Chleboun et al., [2001] found that the fascicle length and pennation angle of biceps femoris (BF) changed significantly as length changed. Due to the complexity of the hamstrings, its architecture and function are affected by the change of the knee joint angle and the level of muscle force. Information on muscle architecture related to joint positions is essential for the study of muscle function (Lieber,1993) and treatment of hamstring injuries. The purpose of the present study was to examine hamstring muscle thickness and aponeurosis stretch during ramp isometric contractions.

Method

Twelve males and females performed three maximum isometric contractions (MVCs) of the knee extensors and flexors at 0°, 45°, and 90° knee flexion angle. They then performed ramp isometric contractions of the knee flexors at 0%, 40%, 80% MVC. In each position, longitudinal ultrasonic images of the BF were obtained. The video images were digitized to measure aponeurosis strain and the muscle thickness during each position.

Results

The results indicated that for each knee flexion angle, as the MVC levels increased, the strain values increased. Particularly the strain values ranged from 3 to 10 cm, 6 to 13 cm and 5 to 14 cm at 0°, 45°, and 90° angles respectively. The muscle thickness decreased as the MVC level increased. The muscle thickness values ranged from 2 to 7 cm, 3 to 17 cm and 2 to 10 cm at 0°, 45°, and 90° angles respectively. The above results indicate that hamstring’s tendon elasticity increases as isometric force increases via a quasi-linear relationship.

This relationship could be used to model hamstring function muscle-tendon unit.

References.


TRACKING AND ANALYSIS OF WHEELCHAIR RUGBY PLAYERS

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Wheelchair Rugby was introduced as a demonstration sport at the Atlanta 1996 Paralympic Games and became a full medal sport at the Sydney 2000 Paralympics. As with all elite sports the athlete and coach are seeking to better understand the sport-specific requirements of their sport and develop the framework for training and coaching. No previous study has provided kinematical data of wheelchair rugby players. The purpose of this study was to examine the kinematical data (distance traveled, velocity) of competitive wheelchair rugby players.

Method. The data were obtained with a tracking method based on computer vision techniques recently applied to characterize soccer player performance (Barros, et al., 2007; Figueroa, et al., 2006). The data acquisition used two Basler cameras fixed overhead on the ceiling, each one covering approximately a half court. The final match of the 2008 Demolition Derby in Birmingham, Alabama was analyzed. The positions of all eight players (n=8), four on each team, were determined simultaneously at 10 Hz for all four periods of the game. Prior to analyze the data were filtered with a Butterworth low-pass zero-phase digital filter with a cutoff frequency of 0.4 Hz, determined by spectral analysis. Results. The results were first examined using field diagrams showing the players’ motion during the match. From the curves of position in function of time, the total distance covered was calculated. In order to evaluate the possible effect of fatigue during the game, the distribution of distances covered in the first and second half for all players were compared. The data were tested for normality using a 2-sided goodness-of-fit Lilliefors test (p<0.05). After that, a one-sided paired t-test was performed to verify if the mean distances covered in the first half of the game were greater than in the second half. The total distance covered by the players ranged from 3522.3 to 5690.2 m (4563.3 ±822.8 m). Because the duration of first (31.6 min) and second (35.7 min) halves were not the same, the mean velocity value was compared. The mean velocity of player movement in the first half was 1.21 ± 0.20 m/s. The mean velocity of player movement in the second half was 1.06 ± 0.20 m/s. The results of the Lilliefors test (p<0.05) revealed that the data were normally distributed. The mean velocity in the 1st half of the game was significantly greater (p<0.001) than in the 2nd half, with a decrease of 13%. Conclusion. These results show the feasibility of this methodology to analyze wheelchair rugby. In addition, the results provide important information regarding player movement patterns during the game that can be used by coaches to plan adequate training strategies.

References.


KNEE JOINT MOVEMENT DURING A SPORTS-RELATED TASK DESCRIBED BY THE QUATERNIONS METHOD

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Introduction: Knee joint movement analysis during the single-leg drop landing task has been used in the study of sports-related anterior cruciate ligament (ACL) injury mechanism. Mathematical approaches have been utilized to describe joint rotational components during athletic movements, such as rotational matrices, Euler angles and quaternions. Among these methods, the least utilized in Biomechanics is the quaternions approach. Objective: The aim of the present study was to use the quaternions rotational representation to describe...
knee joint movement during the single-leg drop landing. Methods: Three collegiate female subjects without prior lower limb injuries participated in the study. They performed five single-leg drop landings from a 31cm platform, and the task was recorded with three 120 Hz digital video cameras. Six passive markers (three on the thigh and three on the shank) were utilized. Markers tridimensional raw data were obtained with the software Dvideow. Data Analysis: The software Matlab was used to smooth the raw data with the Loess function and to create segment coordinate systems of the thigh and shank to extract the unit quaternions from the knee joint observed in the task. Because it is an unit quaternion, its vectorial portion was converted from Cartesian coordinates to Spherical coordinates, and its scalar portion from radians to degrees. Results: The results obtained demonstrated that small alterations exist in the knee rotational axis (components of the unit quaternion during the airborne phase, with values of 3.9º±3.6º, 2.4º±1.8º and 1.2º±1º of longitude, latitude and rotation, respectively. After the initial foot contact with the floor an abrupt change was observed in the orientation of the knee rotational axis, characterized by the alteration in the three components of the quaternion, with 60.2º±23.1º, 44.5º±16.3º and 22.2º±4.6º of longitude, latitude and rotation, respectively. This sudden rotational axis alteration is considered one of the sports-related ACL injury mechanisms. However, there are no references about specific limits within the rotational axis that represent a risk factor for injury. Conclusion: The representation of rotational movements observed in human joints by means of the quaternions is an interesting alternative because it is possible to represent the joint rotational axis with fairly simple mathematical calculations when compared to other forms of representation. This is a relevant topic once movements are product of internal and external forces that result in rotations through axis (quaternions), which naturally occurs repeatedly in human joints. Therefore, it is suggested that the other forms of rotational representation should also be transformed to quaternions to allow comparison among studies, once the transformations are simple and provide a more adequate representation system to operate rotations without restrictions.

MUSCLE POWER OF LOWER EXTREMITIES IN RELATION TO BODY COMPOSITION OF TOP FEMALE RHYTHMIC GYMNASTS

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It’s known that novice rhythmic gymnasts have a specific anthropometric profile that could be correlated with performance (2). Also other aspects like lean body mass and composite measures of flexibility, leg power and visuo-motor proficiency were also significant correlates of attainment (r = 0.69) (1). Due to the importance of anthropometric profile we evaluated Spanish senior national rhythmic gymnastics team during the preparation period before 2007 World Championship. The purpose of this study was to compare the anthropometric measurements and jump tests results during the season.

11 gymnasts from the Senior Spanish National Team participated for the study. The measurements were carried out at three different moments during the season. Muscle power of lower extremities was measured with a force plate (Kistler Quattro Jump) at 500 Hz. Gymnasts execute Squat Jump (SJ) and Counter Movement Jump (CMJ) tests. We selected the height (h), Peak Force (IN), Peak velocity (IN•s⁻¹) and Peak Power (W/Kg) of the highest jump execute at each test.

Anthropometric and jump capacity evaluation were made at the same week. Seventeen anthropometric dimensions were taken to calculate the anthropometric somatotype: stretch stature, body mass, nine skin folds, three bone breadths, and five limb girths. Statistical analysis was made with SPSS 15.0 software.

Significant correlation was showed between the thigh skin fold and SJ Peak Power (r = -0.41, p<0.05) and CMU Peak Power (r = -0.41, p<0.05). It was showed a significant correlation between thigh skin fold and SJ (r = -0.47, p<0.01) and CMU (r = -0.48, p<0.01) height. Low thigh skin fold data was revealed as indicator of better jump capacity.

We also found significant correlation between Endomorphic component with SJ (r = -0.44, p<0.05) and CMU height (r = -0.45, p<0.05). Endomorphic component also showed significant correlation with SJ Peak Power (r = -0.39, p<0.05) and CMU Peak Power (r = -0.43, p<0.05). Significant correlation was found between Percent body fat (Yuhasz) and SJ height (r = -0.41, p<0.05) and CMU height (r = -0.38, p<0.05).

An adequate decrease of endomorphic component, decrease of percent body fat, with a correlated increase of jump performance was showed during the preparation period of the world championship. These results revealed the importance of control the evolution of these variables during the training season of elite rhythmic gymnasts. It's necessary to check that the decrease of the endomorphic component is synchronized with the increase of the jump capacity.

References.

SUB-MAXIMAL VELOCITY, TRAINING AND THE BEHAVIOUR OF BIOMECHANICAL PARAMETERS ASSOCIATED WITH RUNNING ECONOMY

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The running economy has been associated to a variety of biomechanical variables (Saunders & col., 2004). The main goal of our study was to determine the differences between trained and untrained individuals, in relation to some of those biomechanical variables, during the support phase, in 3 different sub-maximal race speeds.

For the accomplishment of this study, 2 different groups were constituted with 8 adult males each, one of trained and another of untrained runners, to determine the behaviour differences of the variables (length and rate step, angles of ankle, knee and shank at the instants of initial contact, intermediate support and too-off, ground reaction forces in the antero-posterior and vertical components) with an increase of race speed (3, 4 and 5 m/s). For the cinematic data, 1 camera of high temporary resolution with a capture speed of 250 Hz was used along with the Sequen computer program (Gabriel & col., 1998) for the analysis of images. For the dynamic data, a Kistler 9281 B platform of forces was used and the results were analysed by the computer program Acknowledge 3.2.6 of BIOPAC Systems. To determine the behaviour differences, a t-test was used for matched samples (in non parametric sample distribution it was used the test of Wilcoxon). Then, the differences between the groups were tested using a t-test of 2 independent samples (Mann-Whitney test, in non parametric sample distribution), to determine the differences of behaviour accordingly the training level (p<0.05).

In the analysis between groups, a significant difference was verified in plantar flexion of ankle at to-off: t = -3.39 ±0.6º to untrained versus -20.3 ±15.2º to trained runners at 5 m/s speed race, p=0.04. In the kinetics data, just at 3 m/s, we verified a significant difference in
propulsive impulse (0.021 ± 0.005 BW.s to untrained versus 0.016 ± 0.007 BW.s to trained runners, p=0.02). With the increase of running velocity, the untrained increase the plantar flexion to obtain the same step length, while the trained runners probably increased the stiffness of the joints for a better use of the elastic properties of muscles, which seems better for running economy. In the reception, the trained runners have smaller impact impulse (0.036 ± 0.008 BW.s to untrained versus 0.030 ± 0.006 BW.s to trained runners, p=0.03 at 3 m/s and 0.038 ± 0.006 BW.s to untrained versus 0.032 ± 0.006 BW.s to trained runners, p=0.05 at 5 m/s), showing a better technical capacity to attenuate the impact impulse, with a smaller percentage of the impact duration in the total support time (13.3 ± 1.2% to untrained versus 11.9 ± 2.7% to trained runners, p=0.02 at 4 m/s). These characteristics seem an adaptation by training.

References.

EFFECT OF THE CAFFEINE INGESTION ON THE NEUROMUSCULAR FATIGUE OF VASTUS LATERALIS MUSCLE DURING SUPRAMAXIMAL CYCLING EXERCISE
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Research suggests that caffeine ingestion delays the development of muscular fatigue (Kalmar and Cafarelli, 2004). Thus, the purpose of the present study was to investigate the effect of the caffeine ingestion on the neuromuscular fatigue of Vastus Lateralis (VL) muscle during supramaximal cycling exercise. Eight male volunteers, amateur athletes of cycling (25.2 ± 3.1 yr, 70.7 ± 10.3 kg and 173.2 ± 6.0 cm) completed an incremental test (20W min^-1) until exhaustion to measure maximal power output (Wmax). Caffeine (CAF - 6 mg kg^-1) or maltodextrin (placebo, PLA) were administered in a randomized and double-blind procedure. One hour after ingestion, the subjects performed an exercise of constant intensity at 110% Wmax until volitional exhaustion. All tests were conducted in cycle ergometer (Computer-Trainer DYNAPL, RacerMate, Seattle, WA, USA) and separated by 72 h intervals. Cadence was allowed to range of 90 rpm. The test was terminated by the experimenter when the cadence dropped below 85 rpm. Before the start of testing, each subject had bipolar EMG electrodes (TSD 150, BIOPAC Systems Inc, USA) placed over the VL muscle of the right leg. The electrode was positioned following the standardization proposed by SENIAM (Hermens et al., 2000). Electromyographic (EMG) data were recorded during each cycling test (W50, BIOPAC Systems Inc, USA) in agreement with the ISEK (MERLETTI, 1999). EMG analysis was performed by calculating the root mean square (RMS-V) value every 10 s. During the supramaximal test, the time when fatigue started was obtained for the VL muscle - TVLFT. This was identified as the non-linear increase of the RMS values (breaking point). The participants were instructed to avoid all drinks containing caffeine during the experiment and a pilot study was used to familiarize the individuals with the equipment and procedures used. Normality of the data distribution was confirmed using the Shapiro-Wilk test, and this was followed by Student t-tests with level of significance set at p<.05. The results of the study showed that the TVLFT was significantly higher on condition CAF compared to PL (83.3 ± 14.6 vs. 75.0 ± 15.9 s, p<.05, respectively). According to these results, it can be concluded that the ingestion of 6 mg kg^-1 of caffeine increases time to neuromuscular fatigue of VL muscle during supramaximal cycling exercise.

References.

EMG ACTIVATION OF ABDOMINAL MUSCLES IN THE EXERCISE ABDOMINAL PERFORMED WITH EXTERNAL LOADS
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Abdominal exercises have been used thoroughly as a form of physical training. The objective of this study was to analyze electromyographic signs of the Rectus Abdominis and Obliquus Externus muscles during the execution of the movements with the addition of external overload. 18 students (18 and 25 years) participated in the study. The exercise abdominal crunch was used. The time of execution of the movement was 4 seconds. Initially, the test was accomplished using the maximum load. The movements were accomplished with a load of 20% and 40% in relation to the test of maximum load. For the collection and processing of the electromyographic signs, the acquisition system and analysis of signs MP150 BIOPAC Systems were used. The sampling frequency was established in 2000 Hz. The low pass filter to 500 Hz and the high pass to 10 Hz. For each registration, the root mean square (RMS) was calculated. Medium frequency (MF) of the average of the first three (I) and of the last three repetitions (F) were also found. Shapiro-Wilk’s test (to verify the normality of the data) verified the differences of the normalized values of RMS and MF among the analyzed phases and among the beginning III and final FI repetitions. Wilcoxon test was performed to locate the possible discrepancies. The results are as follows: the average of the movements in the load of 20% was 94 repetitions and for 40% it was 35. We presented the normalized values (%) (RMS) and (MF) expressed in medium and semi-width interquartilica for the somatoria of the muscles of the abdomen in the concentric and eccentric phases. In the load of 20% RMS in the concentric phase, the results were 56.86 (±12.37) in the beginning and 83.37 (±21.29) in the load. In the concentric phase, the value was 52.58 (±13.38) in the beginning and 46.68 (±12.37) in the load. For the load of 40% RMS in the concentric phase was 76.98 (±12.20) in the beginning and 103.67 (±17.48) in the end. In the eccentric phase the value was 65.70 (±5.97) in the beginning and 71.09 (±9.88) in the end. The difference was found between the phases and among the phases. The normalized values (%) of MF was 97.55 (±5.04) in the beginning of the concentric phase and 82.59 (±3.19) in the beginning of the concentric phase. In the eccentric phase it was 119.71 (±10.13) in the beginning and 93.60 (±6.25) in the end. We found differences between I and F for the two loads, between 20 and 40% in the eccentric phase and between concentric and eccentric in the same load. Considering Abdominal Synergy the representative measure of the abdominal muscles, in general, we can conclude that the abdominal muscles were significantly repeated with 100% repetition. The values in RMS demonstrated the participation of the muscles in the accomplished movements, while MF demonstrated there to be muscular fatigue among the initial and final repetitions for loads 20% and 40%.
CHANGES OF MAXIMAL POWER OUTPUT AND MUSCLE TORQUE IN MALE VOLLEYBALL PLAYERS DURING THE COMPETITIVE SEASON

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INTRODUCTION
In volleyball technical and tactical skills, anthropometrics characteristics and individual physical performance capacities are most important factors that contribute to the competitive success of a whole team. Training for physical fitness in volleyball takes place primarily during the preparatory training period of the season, when less emphasis is directed to training of starting drills.

The aim of the study was to follow the changes of maximal power output and maximal muscle torque in male volleyball players during training performed in the preparatory period and competitive season.

METHODS
The study was conducted on 6 volleyball players from first league, age 25.0±5.3 years, body height 195.2±7.2 cm and body mass 91.2±14.7 kg. Force-velocity and power-velocity relations were determined from 5 maximal cycle ergometer exercise bouts, 10 s each, at increasing external loads equal to 2.5, 5.0, 7.5, 10.0 and 12.5% of body weight. The bouts were separated by 2 min intermissions. Maximal power output were computed from power-velocity curves. Maximal torque of the elbow, shoulder, knee, hip and trunk flexors and extensors were measured under isometric conditions on a special stand. ANOVA procedures for repeated measures were employed to data processing with post-hoc LSD test.

RESULTS
The sum of muscle torque of right and left lower extremities increased insignificant between the preparatory period (I) and the first competitive season (II) but decreased insignificant during the second competitive season (III). The sum of muscle torque of right upper extremities increased (p<0.05) from 316.9±37.4 Nm (I) to 341.7±32.0 Nm (II) and it decreased (p<0.05) during the second competitive season (315.9±22.2 Nm). The sum of muscle torque of left upper extremities increased (p<0.05) from 300.9±35.6 Nm (I) to 328.6±44.5 Nm (III) and 331.8±43.2 Nm (III). The sum of muscle torque of the trunk increased significant, too. Significant increases occurred in the maximal power output from 12.80±0.79 W (I) to 13.11±0.94 W (II) and 13.44±0.62 W (kg-1) (III).

DISCUSSION
The volleyball players were classifying to athletes specializing in power events. Thus the training of volleyball players should developed of strength and power output. In this study training of volleyball players improved the muscle torque of the trunk, upper extremities and maximal power output but the muscle torque of the lower extremities changed insignificant. In conclusions, in volleyball players increases occurred in the maximal muscle torque of the right and left upper (significant), and lower (insignificant) extremities during the preparatory period and the first competitive season while decreases were observed during the second competitive season (with the exception of the left upper extremities). The maximal power output increased during the all competitive season.

SPRINT RUNNING MOVEMENTS OF TYSON GAY AND ASAFA POWELL IN THE 100-M RACE DURING THE 2007 IAAF WORLD CHAMPIONSHIPS IN ATHLETICS

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In the present study, the running movements of Tyson Gay (9.85 seconds) and Asafa Powell (9.96 seconds) who finished first and third, respectively, in the 2007 IAAF World Championships in Athletics were analyzed. Two high-speed video cameras (Phantom v4, Vision Research Inc, USA) were placed at the spectator stands in order to capture (100 Hz) Tyson Gay and Asafa Powell at the 60-m mark. The direct linear transformation method (DLT) was used to calculate three-dimensional coordinates of 24 body landmarks.

For Gay and Powell, step frequency was 4.90 and 4.96 steps/s, respectively, and step length was 2.42 and 2.40 m, respectively. Recovery leg movements were analyzed in terms of high knee angle (maximum angle formed by the thigh and the vertical line) and minimum knee angle. According to Itô et al. (1998) sprint running velocity is not related to the high knee angle, but the faster the sprint running velocity, the greater the minimum knee angle. For Gay and Powell, the high knee angle was 65° and 70°, and the minimum knee angle was 41° and 38°, respectively, and these numbers were similar to the data obtained by Itô et al. (1998). The horizontal distance from the toe at the point of landing to the center of gravity for the two sprinters was 0.31 m, and this number is comparable to that for sprinters who run 100 meters in 11 seconds (Fukuda and Ito, 2004). Itô et al. (1998) reported that while fast sprinters exhibited fast hip extension and slow knee extension of support leg, the maximum ankle planter flexion velocity of support leg did not correlate to sprint running velocity. However, an interesting finding was seen with maximum knee extension velocity of support leg for Gay and Powell. During landing, the knee joint of both sprinters always remained bent, and during the later half of the support phase, the extension velocity had a negative value, and the results of the present study suggest that sprint running technique has entered a new era. The maximum hip extension velocity for Gay and Powell was 774 and 693 degrees/s, and the maximum ankle extension velocity 664 and 743 degrees/s, respectively, and these values were most comparable to the data obtained by Itô et al. (1998).

The present results suggested followings. Training guidance that attempts to increase sprint running velocity by reducing the deceleration associated with landing must be reevaluated because the landing distance for Gay and Powell is comparable to that of sprinters who run 100 m in 11 seconds. What is important here is that Gay and Powell continue to bend the knee of the support leg during the support phase, and training guidance that instructs sprinters to actively extend the knee and ankle joints of the support leg must be reevaluated.

THE INFLUENCE OF THE GRAVITY CORRECTION TECHNIQUE TO THE RESULTS OF AN ISOKINETIC EVALUATION

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Introduction: Isokinetic Dynamometry (I/D) is a useful method for muscle torque evaluation. Corrections in the gravity of the evaluated limb are required for the accuracy of the method. The estimation of gravity torque is conducted through techniques such as 1) CM, maximum torque and respective angle during a passive drop of the limb and extrapolation to all angles of the movement range, 2) C30, torque at 30 angle during a passive drop of the limb and extrapolation to all angles of the movement range and 3), CAN, indirect estimation through anthropometric characteristics. The purpose of the study was the co-estimation of gravity torque, using the above techniques, in knee extension (E) and flexion (F) and comparison of the correction values among techniques.
**EFFECT OF ARM SWING ON RUNNING LONG JUMP PERFORMANCE**

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Long jump involves a running approach until a take-off point after which a jump is made so as to achieve the maximum displacement of the centre of mass (CM). At take-off, one leg serves as the pivot for the jump. Previous studies on vertical and standing broad jumps report that arm swing affects lower extremities’ mechanical output and jump performance (Ashby et al., 2006; Hara et al., 2006). It may also significantly affect running long jump performance. This study quantifies and compares how the arm swing affects the biomechanical parameters at take-off during a running long jump, and understands the mechanisms that help arm swing lead to better long jump performance.

Five subjects (176.9 ± 11.5 cm, 72.6 ± 8.3 kg, 21.3 ± 2.8 years) executed long jumps with a short running approach. The jumps were made in two take-off conditions: with arm swing (LJA) and without arm swing (LJNA). The subjects ran on a runway and took off from a force platform. All performances were simultaneously captured with a 3-D motion capture system. From the obtained 3-D coordinates, the centre of joint was determined. Further, values of take-off CM velocity, radiation angle (take-off angle of CM relative to the transverse plane), jump displacement, and each joint variable were calculated. A one-sided paired t test compared the statistical differences between LJA and LJNA for each variable.

The CM displacements in LJA and LJNA were 4.38 ± 0.28 and 4.09 ± 0.34 m respectively. The jump performances were significantly better in LJA than in LJNA (p < 0.01). The radiation angles in LJA and LJNA, 25.7 ± 2.6 and 24.4 ± 2.0 deg respectively, and the CM velocities in LJA and LJNA were 6.28 ± 0.18 and 6.04 ± 0.27 m/s respectively. The radiation angle was significantly larger in LJA than in LJNA (p < 0.05). However, there was no difference between the take-off CM velocity in the two conditions.

A previous study on standing broad jumps reported that arm swing leads to improved jump performance because of increases in take-off CM velocity and lower extremities’ work output. However, in standing jumps, the radiation angle was not significantly larger with arm swing as compared to without arm swing (Hara et al., under submission). Given these, the results of this study suggest that in running long jumps, arm swing affects the increase in the radiation angle rather than that in the take-off CM velocity, thereby leading to an increase in horizontal displacement.

References:

**RELATIONSHIP BETWEEN TIME TO PEAK TORQUE OF HAMSTRINGS AND SPRINT ACCELERATION IN MALE ATHLETES**

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Muscle strength is thought to be a major factor in athletic sprint performance. Previous studies have investigated the role of hamstrings peak torque at high concentric velocities (240° and 300°/sec) finding significant positive correlations between two variables. However, no studies so far have investigated the relationship between time to peak torque (PTTof hamstrings and quadriceps) and sprint ability. A PTTo represents the time from the start of muscular contraction to the point of the highest torque development and is therefore a good indicator of the muscles functional ability to produce torque quickly.

36 healthy physical education students (age 19.69±1.36yrs, height 180.66±4.79cm, body mass 75.04±7.31kg) without previous injury participated in investigation. The measurements of the sprint acceleration phase were carried out in the Track and Field Centre. The infra-red photocell (Brower Timing System, USA) was used to time the performance. The subjects performed the 20m block-start sprint test 3 times, with 10min breaks between each effort. The best result was used in further analysis. Quadriceps and hamstrings strength was tested in the concentric mode of contraction at testing velocities 60, 180 and 240°/sec using Biodex System 3 dynamometer (Biodex Medical System, USA). The range of motion was set from 90° to 30° flexion. The main outcome measure for this study was peak torque (PTTo) and TPT of the knee extensors and flexors at 240°/sec. PTTo was adjusted for body weight and represented as peak torque to body weight (PTTo/BW). Multiple linear regression was used to evaluate the influence of predictors (PTTo/BW and TPT of quadriceps and hamstrings) on sprint times of 5, 10 and 20 meters.

The regression analysis has revealed that PTTo of hamstrings and quadriceps can predict the sprint times at 5, 10 and 20 meters. At all instances the linear regression model was statistically significant (F>7.11, p<0.01; F=5.31, p<0.01; F=4.10, p<0.01 for sprint times at 5, 10 and 20 meters, respectively) and R square values were 0.31, 0.26, and 0.21 for sprint times 5, 10 and 20 meters, respectively. The statistically significant predictor of sprint times was flexors TPT at 240°/sec (p values were 0.002, 0.05 and 0.02 for sprint times at 5, 10 and 20 meters, respectively). We must also mention that this parameter was statistically significant on univariate level as well (p<0.01 for all sprint times). TPT of quadriceps was not statistically significant predictor of sprint times.

The ability of hamstrings to produce torque quickly can significantly influence the sprint times at 20m sprint. The most of this effect is seen in the acceleration phase (first 5m) while later on (at 10 and 20m) this influence slightly decreases but remains significant. It seems that not only the absolute amount of strength, but also the rate of strength development within the muscle can influence the sprint times. We
can further argue that fast twitch fiber are those responsible for this fast torque production, and it is well known that these fibers play an important role in sprinters.

ESTIMATION OF THE SWIMMING PROPELLING ABILITY (PILOT STUDY)
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The amount of propelling force which moves the swimmer's body in the right swimming direction is the optimised interaction between the swimmer's hand-arm complex and the water, but the real way of the energy exchange is still unknown because of unsteady effects. Several model and analytical experiment provided considerable contribution to the explanation of the mechanism, but for the practical application the methods do not serve meaningful information. Direct force measurement is impossible during swimming and the Quasi steady method failed to be a useful tool. In this context, the purpose of this study was to investigate the relationship between the measured force data during tethered swimming and the force computed based on the kinematic parameters to obtain an insight about the swimmers propelling ability. We expect systematic changes across the parameters increasing the stroking frequency. An international level adult female swimmer participated in the study. Crawl arm stroke was performed from 25 to 55 c/m, the legs were tied and supported, 3 whole arm cycles were used for the analysis. Force production was calculated using a simple three segment model based on the kinematic parameters. Newtonian equation was used to calculate force production during the arm stroke and its projection to the swimming direction was compared with the measured force data, regression analysis was performed to test the expectation. The obtained results for force data were in accordance with the literature. The lowest mean value at 25 c/m was 32.64 N and the maximal 112.81 N. Increasing the frequency the mean and the maximal achieved force increases till the 30 c/m where the mean force rises up to 71.48 N and the maximal force 195.21 N. At the highest frequency step the mean force dropped considerably 63.03 N. Autocorrelation showed that the data were consistent during the experiments, highest R (0.923) value was observed at 40 c/m step. Regression analysis showed, that the performance can be described with a second order polynomial function: c=−75,551, b1=5,555 and b2=0.054, R Square: 0.951 considering the mean values. The ratio between measured and the computed values are at 25 c/m: 2.20 and reaches at 35 c/m the maximum 20.72 at 40 c/m: 16.59 and at the last two steps drops to 3.49. The shape of the function shoved an inverted U form the parameters of the second order function; c=−84,166 b1: 5,082 and b2=0.65, R Square: 0.714. By the results pointed out we can conclude that this method fits the requirements to express the magnitude of the unsteady effect caused by the swimmer’s hand arm complex. The combination of the kinematical parameters can give meaningful information from the structure of the performance. Further investigation is needed to reveal this function based on the gathered data and extend the experiment to higher number of participants.

NEW EVALUATION OF MUSCLE HARDNESS BY TAKING INTO ACCOUNT INDIVIDUAL MUSCLE THICKNESS
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The evaluation of changes in muscle hardness is widely used for medical rehabilitation and conditioning in sports. Horikawa et al. (1993) provided the evaluation of muscle hardness based on a two-layered spring model by using a pressure devise non-invasively. An advantage of this model is that it can calculate two discrete hardness values of the subcutaneous and muscle components. However, it was not clear how much pressure should be applied on the body surface in order to evaluate muscle hardness. In fact, as the amount of distortion increase, the force-displacement relation will not be linear but exponential. If muscle hardness is calculated by the same amount of distortion, it will be overestimated in the case of an individual who has smaller muscle thickness. Therefore, in order to normalize the individual muscle hardness value, we attempt to compare the hardness values calculated from 5% to 30% muscle thickness. The purpose of the present study was to propose a relevant range of distortion for muscle hardness evaluation and the standard hardness value in the human elbow flexor muscles by taking into account individual muscle thickness.

A total of 157 college students volunteered to participate in this study. The thickness of the elbow flexor muscles (MT) and subcutaneous tissue (ST) were directly measured by ultrasonography. The muscle hardness meter, which was adjusted to the stage controller system, was used. The muscle hardness meter could be shuttled linearly for approximately 25 mm at 40 mm/sec by the stage controller system. During the muscle hardness measurement, the subjects remained in a sitting position with their back and arms positioned against a wall.

The mean value ± SD of the final depth of distortion was 49.7 ± 8.2 % and 54.8 ± 12.8 % of the MT in the male and female subjects, respectively. Consequently, it was suggested that the valid range of distortion was below 30% of the MT for the calculation of muscle hardness in the elbow flexor muscles of various individuals. Interestingly, there were no significant differences between male and female subjects in the each of the mean values of muscle hardness calculated from 5%, 10%, 15%, 20%, 25% and 30% MT. Therefore, a gender difference was not observed in muscle hardness. Although there were high correlations among muscle hardness values in 5% to 30% of the MT, it is possible that muscle hardness calculated from 10% or 15% MT is more adequate, because only these hardness values had no significant correlations with the ST. Furthermore, since 15% MT is a middle range for 30% MT, this area could represent the properties of hardness in both shallow and deep areas. In conclusion, muscle hardness should be calculated from an approximately 15% MT range.

As was described, the edge of the MT is a middle range for 30% MT, this area could represent the properties of hardness in both shallow and deep areas. In conclusion, muscle hardness should be calculated from an approximately 15% MT range.
THE RATIOS OF FLEXION/EXTENSION STRENGTH AFFECT BILATERAL DIFFERENCES IN THE JOINT TORQUES DURING SQUAT EXERCISES

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Introduction: Although we often assume that the kinetics in bilateral tasks such as squat exercises are almost symmetric, previous investigations show bilateral differences in vertical ground reaction forces (1) and the joint torques of lower limbs (2) during squat exercises. We hypothesized that these bilateral asymmetries were the results of the functional strength imbalance, such as greater right-left differences in maximal strength and/or larger ratios of flexion/extension strength.

Purpose: The purpose of this study was to investigate the relationship between the functional strength imbalance of lower limbs and bilateral differences in the joint torques during squat exercises.

Methods: Eight male subjects (age: 23 ± 1 yrs, height: 173.9 ± 7.3 cm, weight: 66.9 ± 6.0 kg) participated in this study. Before the experiment, isokinetic flexion and extension strength of the hip and knee joint were measured at 60 and 180 deg/sec, and the ratios of flexion/extension strength of each joint were calculated. Experimental protocol consisted of three sets of three repetitions of the squat exercise with the load of 50, 70, and 90% of 1 repetition maximum (1RM: 94 ± 17 kg). During the squatting movements, the positions of reflective markers attached to an anatomical landmarks of their body were recorded using three-dimensional motion capture system sampling at 120 Hz. Ground reaction forces were simultaneously recorded by two force platforms sampling at 1080 Hz. These data were processed to calculate the joint torques for the hip and knee joint. Pearson correlation analysis was used to evaluate the relationship among bilateral differences of each variable.

Results: In both knee and hip joint, there were no significant relationship between bilateral differences in isokinetic strength and bilateral differences in the joint torques during squat exercises. But bilateral differences in the ratios of knee flexion/extension strength at 60 deg/sec were significantly correlated with bilateral differences in the knee joint torque during squat exercises under any loading conditions (r = -0.764 ~ -0.782, p < 0.05).

Conclusion: These results suggest that the imbalance for the ratios of knee flexion/extension strength may affect bilateral asymmetries in the joint torques during squat exercises. Further studies are required to determine whether correcting the imbalance for the ratios of flexion/extension strength by strength training reduces bilateral differences in the joint torques during squat exercise.

References:

Poster presentations (PP)
PP-HF03 Health and Fitness 3

THE ASSOCIATION BETWEEN SKELETAL MATURITY, SOCIO-ECONOMIC STATUS AND BODY MASS INDEX IN MADEIRAN CHILDREN AND ADOLESCENTS

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The association between skeletal maturity, socio-economic status and body mass index was investigated in a mixed longitudinal sample of Portuguese children and adolescents (251 girls and 256 boys, 7 through 18 years of age).

Skeletal age was estimated from a radiograph of the left hand and wrist using the Tanner-Whitehouse method II. Socio-economic status was based on Census 91 developed by the Portuguese Institute of Statistics. Stature and body weight were measured and body mass index was used as an adiposity indicator.

Early maturing boys and girls showed higher body mass index values than their average and late maturing peers. The significant differences among maturity groups were not present in boys 14 to 15 years of age. Youngsters from families with a high socio-economic status showed a higher body mass index than those from families with an average or low socio-economic status. However, no significant differences were found between socio-economic categories for boys 10-11 years and for girls 12-14 and 15-18 years.

Body mass index is associated with skeletal maturity and socio-economic status in children and adolescents from Autonomous Region of Madeira, Portugal.
Results showed that the prevalence of physical inactive women was 55.6%, 52.3% had a BMI => 25 kg/m2, 18.5% were current smokers and 72.4% had an inadequate sleeping time. The risk behavior combination with higher prevalence was “physical inactivity, overweight) with physical inactivity.”

Conclusions: Among Azorean women, physical inactivity was not a predictor of the number of clustered risk behaviors, although having 1 overweight with physical inactivity.

FREE-RUNNING CIRCADIAN RHYTHM OF ISOMETRIC AND ISOKINETIC CONCENTRIC FORCE IN BLIND ATHLETES

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Light is considered the main endogenous stimulus synchronizing circadian rhythms to 24 hours with the environment through body temperature, hormonal secretion and variables related to physical performance, particularly muscular strength. In light absence, as in the case of totally blind individuals, the circadian rhythms of body temperature and hormonal secretion tend to be free-run, with endogenous period of force and body temperature was statistically significantly longer than 24 hours, suggesting free-running of strength in totally blind athletes with free-running circadian rhythms. Data from participants six blind athletes with free-running rhythms for melatonin (or cortisol) secretion were collected for isometric force (handgrip and back flexion-extension), and isokinetic concentric knee flexion (at speeds 60º/s and 90º/s), and body temperature during three sessions at one- and two-week intervals. In each session, data were collected at 6 different times of day, with a minimum of 8-hour apart. Statistical analysis employed the cosinor method to determine each from initial acrophase (first session). Relative acrophases were pooled across all 6 subjects and linear regression as a function of days from start, the slope as a gauge of average daily shift. The results show that regardless of muscle group or contraction speed, the endogenous period of force and body temperature was statistically significantly longer than 24 hours, suggesting free-running of strength in
this athletes. Like as example: endogenous period (tau) of body temperature estimated as 24.8 hours, with 95% confidence limits of ±0.7 hour, for back strength tau = 24.7 hours (95%CI = ±0.8 hour) and for dominant extension of knee in 90°'s tau = 24.9 hours (95%CI = ±0.8 hour). It is concluded that the muscular strength rhythm is generated by an internal mechanism, since in absence of light perception the organism expresses a circadian rhythm. As far as we know, this is the first research to show the circadian rhythm of sports-related variable in blind individuals. Therefore, trainers and health professionals working with blind people should be aware of the importance of including a circadian rhythm evaluation in their routines.

CENMA, FAPEPS/CePID-SONO, CEPE, CAPES, CNpq

ANALYSIS OF QUALITY OF LIFE AND HEALTH IN THE ADULT AGE: IMPLEMENTATION OF WHOQOL-BREF AND SF-36


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The quality of life is directly associated with the design of health, with both related to the different phases of life. With the increase in the aging population due to the increase in life expectancy, it is necessary to understand the interference factor of years of life in the daily routine of the population. The objective of the study was to analyze the relationship between quality of life and conception of health in people in three different phases: 30 to 44 years, 45 to 59 years and older than 60 years. Study participants were only women at the beginning of the programme with emphasis on the holding of regular physical activity in the Lutheran University of Brazil in Canoas, Brazil. The sample was composed, respectively, according to the age groups mentioned (mean +/ - average standard deviation), by 7 (41.71 years, 14 (52.71 +/- 4.12) e 11 (66.18 +/- 6.59) women. The instruments used were the Organization Quality of Life Assessment / WHOQOL-bref proposed by the WHO (Whool Group, 1998) and 'Short-Form Health Survey/SF-36'. It was used ANOVA and Pearson's correlation in the SPSS statistical program. The respective averages and standard deviation for each group on the components of the SF-36 were: emotional aspect 67.40 +/- 12.91; social support from family 75.57 +/- 13.26; self-efficacy 75.20 +/- 8.26; self-efficacy for physical activity 75.20 +/- 8.26; self-reported, generalized question measuring total physical activity.

Results: Based on multiple regression analyses conducted separately for boys and girls preliminary findings revealed significant relationships between the psychological, social and environmental factors hypothesized to mediate change in these behaviors has also been called for. The main objective of HEIA, a two-year multi-component school based intervention program, is to increase school children's physical activity, reduce sedentary behaviors (tv- and computer use) and improve specific eating behaviors.

Purpose: The present paper concerns the pre-intervention relationships between physical activity and factors hypothesized to mediate physical activity change. To this end we investigated associations of physical activity enjoyment, self-efficacy, social support from significant others and environmental opportunities for physical activity from friends and parents, hold school component x domain emotional and physical environment, social component x domain environment. Although the difference in age between the groups is statistically significant, the quality of life and conception of health presented no differences. Indeed, indicated the inter-relationship between some of its parts and areas, so more expressive in the group younger and older. Studies with similar themes need more attention!

CORRELATES OF CHILDREN'S PHYSICAL ACTIVITY: BASELINE RESULTS FROM HEIA, A TWO-YEAR MULTI-COMPONENT SCHOOL BASED INTERVENTION PROGRAM

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Background: There is a need for innovative school-based intervention programs to promote healthy weight development in youth. With this in mind, influencing changes in physical activity, inactivity and eating behaviors seem important! Research on theoretically informed psychological, social and environmental factors hypothesized to mediate change in these behaviors has also been called for. The main objective of HEIA, a two-year multi-component school based intervention program, is to increase school children's physical activity, reduce sedentary behaviors (tv- and computer use) and improve specific eating behaviors.

Purpose: The present paper concerns the pre-intervention relationships between physical activity and factors hypothesized to mediate physical activity change. To this end we investigated associations of physical activity enjoyment, self-efficacy, social support from significant others and environmental opportunities for children's physical activity at baseline.

Methods: Children in 6th grade (11 year old) at 12 intervention schools and 25 control schools (N=1600) from the eastern part of Norway participated. As part of a comprehensive data collection at baseline (September 2007), pupils provided self-reported data for enjoyment, self-efficacy, social support by friends, parents and teachers and perceived environmental opportunities were collected together with a self-reported, generalized question measuring total physical activity.

Results: Based on multiple regression analyses conducted separately for boys and girls preliminary findings revealed significant relationships between the psychological, social and environmental factors and self-reported physical activity. Among boys the predictor set accounted for 30% of variance in physical activity, and 21% of the variance among girls. For boys, social support from friends (beta = .27, p<.001), social support from parents (beta = .12, p<.01), self-efficacy for physical activity (beta = .30, p<.001) were genuinely related to total physical activity. Among girls social support from friends (beta = .23, p<.001), social support from parents (beta = .12, p<.01), self-efficacy for physical activity (beta = .21, p<.001) and perceived environmental opportunities for physical activity (beta = .08, p=.05) were genuinely related to total physical activity.

Conclusion: Baseline results reveal that psychological and social factors amenable to change hold a stronger relationship to physical activity than environmental factors both among boys and girls. Future pre to post intervention analyses are needed in order to sort out whether these factors operate as mediating mechanisms in physical activity change. Current findings, however, suggest that influencing boys' and girls’ efficacy for physical activity as well as enhancing their social support for physical activity from friends and parents, hold promise as intervention target points.

Key words: Physical activity, correlates, children
LOYALTY IN PORTUGUESE HEALTH AND FITNESS CLUBS

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In this study, global satisfaction, measured in the long term, is evaluated in respect of three constructs (1-2): expectations (3), facilities (4) and loyalty (5). Expectations are considered as an innovative construct in their relationship with consumer satisfaction in health and fitness clubs. Facilities are measured in the short term in order to evaluate satisfaction by attributes, that is, all of the aspects encountered in using the various services provided by the HFCs. Loyalty is analysed by means of repeat purchases, recommendations to third parties and frequency of use. The sample comprises 463 respondents to a questionnaire, who are clients of two health & fitness clubs in the Greater Lisbon suburb of Oeiras, Portugal. The data was gathered by means of a questionnaire. Structural equation models were used. The model was analysed using a covariance matrix between the different variables manifested. The analysis was carried out with AMOS 7.0(6) statistical software. The results suggest that satisfaction is an intermediate variable, positively related with various other constructs and of crucial importance in determining the loyalty of health and fitness clubs. We concluded that global satisfaction takes on a role as intermediate variable with regard to the other constructs studied: expectations, facilities and loyalty. By taking expectations into consideration, we are able to conclude that their inclusion is essential in models studying their effect upon and relationship with satisfaction, which in the final analysis indirectly influences consumer loyalty through satisfaction. We also concluded that global satisfaction plays a vital role in consumer loyalty and that satisfaction with the facilities also indirectly affects consumer loyalty. Additionally, we complemented our conclusions by means of the verification that satisfaction with the facilities and global satisfaction, despite being two distinct concepts, are interconnected and are influential to consumer loyalty.

References:

LOWER AND UPPER LIMB STRENGTH CORRELATE WITH AGE BUT NOT WITH BMI IN WOMEN AGED FROM 60 TO 83-YEARS

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The increasing ageing of modern populations drawn attention to the need to promote functional autonomy among the elderly, as independence and self-esteem seem to be dependent on the former. Aging promotes loss of strength, due to sarcopenia and osteopenia, which tend to lower the elderly functional autonomy. The aims of the study were to evaluate lower and upper limb strength in aged women from 60 to 83 years and to investigate possible correlations between those measures and body mass index (BMI). 125 women with mean age, weight, height and BMI of, respectively 67.79±5.60 years 64.68±11.39 Kg 1.54±5.11 m and 27.42±4.67 kg/m-2, performed the Chair-Stand (CS) and the Biceps Curl (BC) tests. These tests were used as described by Jones & Rikli, (2002). No correlation was found between the BMI and the CS and BC tests. However, we observed negative correlations between age and CS (-0.43) and between age and BC (-0.26) with statistical significance (P<0.00). The mean performance of the women in CS and BC were 10,95±3.87 times for CS and 13,42±3.47 times for BC. We concluded that the subjects that were evaluated did presented a deficit of lower and upper limbs strength. Moreover, these deficits increased with the age and were not influenced by the BMI. Therefore, engagement in physical activity programs was advised to the women that were evaluated.

METABOLIC SYNDROME AND PHYSICAL ACTIVITY IN ADOLESCENTS

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Purpose: Metabolic syndrome (MS) is defined by the clustering of central obesity, impaired glucose metabolism, dyslipidemia and hypertension and indicates increased risk of cardiovascular disease and diabetes. In adults, higher levels of moderate to vigorous intensity physical activity have been associated with a reduced risk of having MS, but there is little information regarding adolescents. This study aimed to evaluate the association between the level of physical activity and prevalence of MS in adolescents.

Methods: The study population consisted of 2565 males and 2638 females aged 16 years, members of population based Northern Finland Birth Cohort 1986 (NFBC 1986), who responded to a mailed questionnaire and were clinically examined in 2001-2002. Metabolic syndrome was defined using the International Diabetes Federation paediatric definition (Zimmet et al. 2007). Physical activity was assessed by self-report taking into account light, moderate and vigorous intensity activity after school hours and during transportation to and from school, and was summarised as metabolic equivalent hours (MET hours). Prevalence of MS and 95 % confidence intervals (CI) were estimated in the quintiles of physical activity described by MET hours.

Results: The overall prevalence of MS was 2.4%, and was higher in males (3.5 %) than in females (1.1%). In males, the prevalence of MS was inversely associated with the level of physical activity, and was 2.0% (CI 1.0 to 3.7) in the physically most active quintile and 4.7% (CI 3.1 to 7.4) in the least active quintile. In females, the prevalence of MS showed no significant variation by physical activity.

Conclusion: In males aged 16 years, the level of physical activity was inversely associated with the prevalence of MS while no such association was seen in females.

Reference:
MUSCLE STRENGTH AND FUNCTIONAL PERFORMANCE IN ELDERLY MEN AND WOMEN

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Elderly people show age-related decline in physical performance and decreased strength (sarcopenia) could be one of the important determinants of frailty. The purpose of this study was to assess the relationship between relative strength of leg and trunk muscles and different functional performance tasks. The aim was also to explore age and gender-related differences in measured abilities. Eighty-five nursing home residents, 30 men and 55 women aged between 60 and 94 years (79 ± 9), voluntarily participated in the study. The maximal strength of plantar and dorsiflexors, knee extensors and trunk extensors, flexors and lateral flexors was measured as isometric torque in the joint (the strength measures were adjusted for body weight). Performance measures were obtained by timing gait tasks in self-selected pace (6-m walk, ascending and descending stairs), Berg balance scale (comprised of 14 functional tasks) and maintaining static balance (20 second stance on the force platform with opened eyes and feet together). Pearson's correlation coefficient was used to determine the relationship between strength and functional performance and also for relationship between performance and ageing. Gender differences in strength and functional performances were measured with t-test.

All relative trunk and leg strength measures were significantly correlated with time to negotiate all three gait tasks (r=-0.27 to -0.52, p<0.05) and with total score of Berg balance scale (r=-0.33 to 0.59, p<0.005), while ability to maintain static balance didn’t show significant correlation with any of the relative strength measure. The only strength measures that showed a significant decline with age were trunk flexion (r=-0.31, p<0.005) and knee extension (r=-0.40, p=0.000), correlation with age was significant also in Berg balance scale (r=-0.32, p=0.003), maintaining static balance (r=0.24, p=0.03) and time to walk 6 meters (r=0.324, p=0.002). There were no significant gender differences in age or body weight. Men had compared to women significantly greater absolute and relative strength of all measured trunk and leg muscle groups (p<0.005). Men were faster in 6-m walking test and descending stairs (p<0.015) and had greater total score of Berg balance scale (p<0.05). But there were no gender differences in stair ascending speed and maintaining static balance. This study indicated that relative strength of the ankle, knee and trunk muscles showed important association with different functional performance measures, which all tend to decline with age. Men were relatively stronger and showed better functional performance than their women counterparts.

METABOLIC EXPENDITURE OF DEEP AND SHALLOW WATER RUNNING AT DIFFERENT STEP FREQUENCIES

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Water running is a wide spread training method for enhancing strength and endurance without stressing impaired structure. Water running can be practiced in shallow water (WR), or in deep water (DWR). Work load can be modulated by varying movement frequency and range of motion. During water immersion, Heart Rate (HR) is reduced, if compared with land condition (1,2), for this reason it can not be a reliable parameter to calibrate work load. Therefore, aim of this study is to directly investigate various metabolic parameters during deep and shallow water running at different stride frequency (SF).

Nine female university students participated in the study. For WR subjects ran pushing against the bottom of the pool, at a water depth of 120 cm, for DWR they wore a specially designed buoyancy jacket and ran at a water depth of 180 cm. For both WR and DWR subjects ran for 4 min, at four progressive exercise intensities (at a frequency of 30, 40, 50 and 60 cycles min-1). Oxygen uptake, HR, ratings of perceived exertion (RPE) and blood lactate concentration were determined at each work load. Maximal oxygen uptake (VO2max) was determined on a treadmill.

Results demonstrated that between WR and DWR at the four SF there are no statistically significant differences in lactate accumulation, RER, energy cost, VO2 as percentage of VO2max and VO2 at the intensity estimated to produce 2 mM (aerobic threshold: AT) and 4 mM (anaerobic threshold: AnT) of lactate accumulation. HR, HR relative to estimated maximal HR and HR value relative to estimated maximal HR at AT and AnT. The HR values relative to estimated maximal HR at AT and AnT resulted of 70% and 82%, respectively, for WR and 66% and 77%, respectively, for DWR. A difference was instead found for RPE with significantly higher values during DWR at 40, 50 and 60 cycles min-1, but not at the lowest intensity of 30 cycles min-1.

The hydrodynamic resistance profile is different between DWR and SWR, therefore, it can be supposed that athletes less accustomed to DWR could be solicited to utilise their muscles in an unfamilier fashion. Additionally, the propulsive muscles of the lower limb (in particular Gastrocnemius and Soleus) are not heavily recruited in DWR due to the lack of ground reaction force (3). The higher exertion perceived by the subjects during DWR should be taken into account for rehabilitation purposes.

In conclusion, water running continuously for 60 minutes at 50 stride per minute, produces an energy expenditure of around 380 Kcal for the subjects during DWR should be taken into account for rehabilitation purposes.

References:

THE FACTORIAL STRUCTURE OF THE GREEK SF-36 HEALTH SURVEY

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Background: The SF-36 Health Survey is the most widely used questionnaire for the assessment of quality of life. The 36 item survey assesses eight separate factors of quality of life: physical functioning, bodily pain, general health perceptions, vitality, social functioning, role disability due to emotional problems, and general health. The SF-36 was evaluated in samples from ten nations: Denmark, France, Germany, Italy, the Netherlands, Norway, Spain, Sweden, the United Kingdom, and the United States(1). A first-order confirmatory factor analysis (CFA) that hypothesizing 8 latent factors was found to describe the SF-36 data adequately for each nation. A hierarchical CFA model that hypothesized one third-order factor and three second-order factors (physical health, mental health, and general well-being) also demonstrated good fit to the data(2). The present study examined the multidimensional and hierarchical structure of the SF-36 in a Greek population.

Methods: Data were obtained from 327 healthy men and women residing in Athens. The Greek-language version of the SF-36 was used(3). The eight subscales were scored from 0 to 100. A CFA was employed to examine the factorial structure of the SF-36 questionnaire. The evaluation of the structure was made using the AMOS Version 6 computer program(4).
Results: Results suggested that the model with the eight first-order correlated factors provided a satisfactory fit to the data ($x^2(526) = 1019.23$, RMSEA = .054, NNFI = .87, and CFI = .89). However, higher order analyses showed that a model with two correlated second-order factors (physical health and general mental health) did not provide a satisfactory fit to the data ($x^2(552) = 1633.20$, RMSEA = .078, NNFI = .73, and CFI = .75). Finally, a third-order factor (health) model, including a third second-order factor (general well-being), represented a reasonable fit to the data ($x^2(526) = 1116.58$, RMSEA = .057, NNFI = .86, and CFI = .87).

Conclusions: Results of the study confirmed the multidimensional and hierarchical structure of the SF-36. Further research is needed with this questionnaire in order to determine the construct validity of its proposed hierarchical 8-factor structure.

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dependent and independent variables we used the Spearman correlation coefficient. The overweight and obesity prevalence in the studied sample was 38.8% in total, 48.8% in girls and 32.7% in boys. Significant results were found between the BMI comparison and the following variables: BMI in categories (p=0.000 for both sexes), age (p=0.000, for boys), spare time on physical activities (p=0.002, for boys). Only one association was found, between BMI and time spent at the computer (p=0.05, for 8 years old girls). The results suggest that the prevalence of children with overweight and obesity is high. Factors like gender, age, time spare in physical activity and watching television, have influence on the variation of the BMI values. To prevent obesity the sedentary lifestyle reduction and physical activities promotion are suggested.

DIFFERENCES IN CORONARY HEART DISEASE RISK FACTORS ACCORDING TO PHYSICAL ACTIVITY LEVEL IN YOUNG ADULTS

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The purpose of the present study was to determine differences in coronary heart disease risk factors according to physical activity level in young adults. A total of 188 volunteer university students (female: 98, male: 90) participated in this study. For the determination of coronary heart disease risk factors subjects’ body mass index (BMI), body fat percentage (Fat %), systolic (SBP) and diastolic (DBP) blood pressures, total cholesterol (TC), triglyceride (TG), low-density lipoprotein cholesterol (LDL-C) and high-density lipoprotein cholesterol levels were determined. Physical Activity Assessment Questionnaire (PAAQ) was used for the determination of physical activity levels and subjects were divided into two groups as highly active and moderately active based on the median values of the PAAQ (MET/week). Results indicated that for the whole group and for female and male university student separately significant differences were only observed in physical activity levels (total group: t=18.301, p= .000; females: t=12.519, p=.000; males: t=13.676, p=.000) however no significant differences were determined in BMI, Fat %, SBP, DBP, TC, TG, LDL-C and HDL-C. As a conclusion present results suggest that coronary heart disease risk factors were not affected by physical activity levels in young adults.

COMPARISON OF TWO ACCELEROMETERS FOR THE MEASUREMENT OF ENERGY EXPENDITURE IN FEMALES DURING WALKING

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Objective and valid measures of Physical Activity (PA) are important for quantifying free living PA levels in different populations (Rowlands & Eston, 2007). One non-invasive method of estimating PA is collection of data from recording accelerometers, which allow several days of continuous measurement. Data from accelerometers can be used to estimate energy expenditure in activities such as walking. The aim of the study was to compare the effectiveness of two accelerometers, the ActivPAL Professional physical activitylogger (PAL Technologies Ltd, Glasgow, Scotland) and the Actigraph accelerometer (LLC, Pensacola, Florida) in predicting Energy Expenditure (EE) during walking.

The study was approved by the University of Limerick Research Ethics Committee, and volunteers completed informed consent documents prior to participation. Seventeen females aged 23 (SD 2) yrs walked for 7 minutes at each of 5 speeds (3.2, 4.8, 5.6, 6.4 and 7 km per hour) on a treadmill whilst simultaneously wearing the ActivPAL and the Actigraph accelerometers. Oxygen consumption and other variables were recorded for the last 2 minutes at each walking speed by expired gas analysis. Step counts were recorded every 15 seconds by the accelerometers and also by analysis of video recordings. Additionally, accelerometer counts were sampled by both accelerometers for each 15 second epoch. Step count agreement r-value between ActivPAL and Actigraph was 0.954. Correlations between ActivPAL steps and Actigraph steps with manual steps count were 0.988 and 0.953 respectively. When comparing energy expenditure (kilojoules per minute) with the two accelerometer step counts, the agreement was 0.594 and 0.552 for the ActivPAL and Actigraph respectively. Adjusting the energy expenditure for body weight increased the agreement to 0.632 and 0.581 for the ActivPAL and Actigraph respectively. On comparing metabolic equivalent to step count of the two accelerometers, correlations of 0.543 and 0.528 for the ActivPAL and Actigraph respectively were seen. Comparing heart rate at each speed to step count revealed correlations of 0.727 and 0.685 for the ActivPAL and the Actigraph respectively. However, accelerometer counts correlated more closely with EE.

Both accelerometers accurately measured step count, though the Actigraph tended to underestimate counts at low speeds. Relatively low correlations between accelerometer and measured EE indicate that accelerometer can at best only approximate EE with the ActivPAL outperforming the Actigraph in all analyses. However, raw acceleration data may provide a better predictor of EE since it is more sensitive to small changes in intensity.

CLIMACTERIC SYMPTOMS, OBESITY AND SARCOPENIA IN POSTMENOPAUSAL WOMEN

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The aim of this study was to investigate the effect of obesity and sarcopenia in climacteric symptoms in postmenopausal women. One hundred twenty eighth healthy postmenopausal women (ages, 41 to 77 yrs; BMI, 16 to 44 kg/m2; SMI, 24 to 41 %) participated in this investigation. Skeletal muscle mass (SMM) and weight (Wt) were evaluated by tetrapolar bioimpedance being the first expressed as skeletal muscle mass index (SMM = skeletal muscle mass/body mass × 100). The subjects were considered to have a normal SMI if their SMM was higher than– one standard deviation above the sex-specific mean for young adults (aged 18–39). The height (H) is measured in meters and based on the combination of sarcopenia and obesity subjects were further classified into three groups: nonobese/nonsarcopenic (n=42), obese/nonsarcopenic (n=71) and obese/sarcopenic (n=15). Greene Climacteric Scale was used to assess climacteric symptoms (psychological, somatic, vasomotor, loss of sexual interest and total of these symptoms). The nonparametric tests Kruskal-Wallis and Mann-Whitney, with Bonferroni correction, were employed to compare groups.

The mean values of total sample were: 8.06(±5.50) for psychological symptoms, 4.63(±3.07) for somatic symptoms, 1.33(±1.48) for vasomotor symptoms, 1.18(±1.13) for loss of sexual interest and 15.90(±9.27) for total of these symptoms. The mean values of total sample were: 8.06(±5.50) for psychological symptoms, 4.63(±3.07) for somatic symptoms, 1.33(±1.48) for vasomotor symptoms, 1.18(±1.13) for loss of sexual interest and 15.90(±9.27) for total of these symptoms. The mean values of total sample were: 8.06(±5.50) for psychological symptoms, 4.63(±3.07) for somatic symptoms, 1.33(±1.48) for vasomotor symptoms, 1.18(±1.13) for loss of sexual interest and 15.90(±9.27) for total of these symptoms. The mean values of total sample were: 8.06(±5.50) for psychological symptoms, 4.63(±3.07) for somatic symptoms, 1.33(±1.48) for vasomotor symptoms, 1.18(±1.13) for loss of sexual interest and 15.90(±9.27) for total of these symptoms. The mean values of total sample were: 8.06(±5.50) for psychological symptoms, 4.63(±3.07) for somatic symptoms, 1.33(±1.48) for vasomotor symptoms, 1.18(±1.13) for loss of sexual interest and 15.90(±9.27) for total of these symptoms. The mean values of total sample were: 8.06(±5.50) for psychological symptoms, 4.63(±3.07) for somatic symptoms, 1.33(±1.48) for vasomotor symptoms, 1.18(±1.13) for loss of sexual interest and 15.90(±9.27) for total of these symptoms. The mean values of total sample were: 8.06(±5.50) for psychological symptoms, 4.63(±3.07) for somatic symptoms, 1.33(±1.48) for vasomotor symptoms, 1.18(±1.13) for loss of sexual interest and 15.90(±9.27) for total of these symptoms. The mean values of total sample were: 8.06(±5.50) for psychological symptoms, 4.63(±3.07) for somatic symptoms, 1.33(±1.48) for vasomotor symptoms, 1.18(±1.13) for loss of sexual interest and 15.90(±9.27) for total of these symptoms. The mean values of total sample were: 8.06(±5.50) for psychological symptoms, 4.63(±3.07) for somatic symptoms, 1.33(±1.48) for vasomotor symptoms, 1.18(±1.13) for loss of sexual interest and 15.90(±9.27) for total of these symptoms. The mean values of total sample were: 8.06(±5.50) for psychological symptoms, 4.63(±3.07) for somatic symptoms, 1.33(±1.48) for vasomotor symptoms, 1.18(±1.13) for loss of sexual interest and 15.90(±9.27) for total of these symptoms.
Effects of and Exercise on the Body Composition, Resting Metabolic Rate and Exercise Capacity of Patients with Severe Mental Illness

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Weight gain is an established side effect of atypical antipsychotics in patients with severe mental illness (SMI). Previous studies have shown positive effects of lifestyle interventions of diet and exercise in weight loss in this population. The purpose of this study was to investigate the effects of a 3-month nutrition and exercise intervention on the body composition, resting metabolic rate and exercise capacity of SMI patients in Greece.

Forty-seven females (N=34), males (N=13) obese patients diagnosed with SMI (age: 41.5±1.8 years; body mass: 91.6±18.6 kg; body mass index: 33.4±6.2 kg/m²; mean±SD) volunteered to participate in the study. The duration of the study was 3 months and patients had to attend nutritional and exercise counselling sessions every 15 days. Prior to the start of the study patients' body weight, body composition (Bodpod, Life Measurement Inc, CA) and resting metabolic rate (RMR) (Cosmed, Italy) were assessed. Patients also participated in a sub-maximal exercise stress test in order to assess their maximal oxygen consumption (VO2max) (Cosmed, Italy). At the end of the study the same experimental measurements were performed to assess differences in body composition, RMR and VO2max. Significant improvements were found in the body weight (-5.5±0.7 kg, P<0.01), fat mass (-5.3±0.1 kg, P<0.01) and RMR (+244±43.2 kcal, P<0.01) of the patients in the 3-month intervention period. Exercise capacity was also found to be increased as a result of the intervention from 26.9±5.5 ml/kg/min to 30.4±5.3 ml/kg/min (P<0.01). The changes in VO2max were correlated to the changes in body weight (r=0.3, p<0.05) and fat mass (r=0.3, p<0.05) of the patients. When dividing the patients by gender, no differences among genders were found in the responses to the intervention in the body weight, body composition and RMR. However, significant gender differences were found in the improvements in exercise capacity, with females significantly improving VO2max by 15% (pre: 25.2±4.73 to post: 29.6±5.41 ml/kg/min, P<0.02), while no significant difference was found in males (pre: 31.3±4.34 to post: 32.5±4.34 ml/kg/min, P=0.05).

In conclusion, SMI patients respond favourably to lifestyle interventions of diet and exercise as demonstrated by improvements in their body weight, body composition, RMR and exercise capacity. More investigation is needed to examine whether gender differences exist in the exercise capacity of this population.

References.

Short-term Psychosocial Changes in an Exercise Based Weight Management Program: A Study with Obese Outpatients Adolescents

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Purpose
The goal of this study was to analyze the changes in self-esteem, emotions, self-efficacy, exercise motivation and body image after the first two months of an exercise based weight management program in obese adolescents.

Methods
Subjects were 49 obese adolescents (BMI M=30.7 SD=4.5 kg/m², age M=13.6 SD=1.5 y, 25 girls) being followed in a tertiary health unit, who are participating in a long-term program that comprises medical, nutritional, physical activity and psychological interventions. The program comprises up to 3 sessions of exercise per week in addition to lifestyle physical activity recommendations. Self-esteem (Rosenberg, 1965), Emotions (PANAS, Watson et al., 1988), Weight Efficacy Lifestyle Questionnaire (WELQ, Clark et al., 1991), Exercise motivation (BREQ-2, Markland & Tobin, 2004), Body Size Dissatisfaction (BIA, Williamson et al., 1989), weight and height were measured at baseline and 2 months later during the program. Paired t-tests were used for the analysis of differences between baseline and 2 months’ values. Pearson correlations measured the association between psychosocial changes with weight and BMI changes, while independent t-test evaluated change differences between gender.

Results
Although no differences were found in weight or BMI, improvements were observed in positive emotions (p<0.03), intrinsic motivation (p<0.026), and in the WELQ's sub-scales: negative emotions (p<0.043), availability (p<0.026) and social pressure (p<0.013). There were also marginally significant improvements in identified motivation (p=0.094) and total self-efficacy (p=0.070). These improvements were similar between gender and were not associated with weight and BMI changes.

Conclusion
Despite the short-term time frame of the analysis, the positive changes observed in psychosocial variables suggested the same conclusions registered in studies with longer periods (Blaine et al., 2007). The improvements in the more self-determinate type of motivation, which should influence exercise and program adherence (Teixeira et al., 2006), represent a particularly strong sign that the program might be successful among the adolescents that increased their exercise’s intrinsic motivation. Further data with longer time periods, within the present study, should provide more scientific evidence of psychosocial processes in obese adolescents seeking weight loss.
MEDICAL PROFILE OF THE SENIOR GOLFER

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Half of the German golfers are older than 50 years. A high percentage of them have a sport vita with characteristic injuries as well as diseases. The knowledge of anthropological and medical data constitutes the base of an optimised therapeutic care. The aim of the study was to create a medical profile of senior golfers (SG). This data was compared to the profile of non-golfing German seniors (GS) as well as to golfers of all ages (AG).

In 2007 an online questionnaire was available to all German golf clubs. The senior members were asked to fill in that questionnaire, which contained the following topics: golf biography, sport biography, actual health status, arthritic ailments and suffered golf-specific injuries.

395 golfers completed the questionnaire (mean age 65.68 years; 303 male; 92 female). Senior golfers suffered less often from the risk factors diabetes (SG 5.6%; GS 11.5%), high blood pressure (20.3%; 42.2%), overweight (SI 4.4%; 77.7%) and physical inactivity (3.4%; 42.1%). Furthermore they were less likely to smoke (34.5%; 19.4%). The ratio of injured body regions showed increased percentages in the back (SI 42%, AG 36%) and the shoulder (18%; 13%) on the one hand, as well as decreased percentages in the elbow (20%; 24%), the wrist and hand (12%; 14%), the knee (4%; 7%) and the ankle and foot (4%; 6%) on the other hand.

Referring to the risk factors senior golfers have a less dangerous health profile as non-golfing seniors. In comparison to the current literature the different body regions attacked of golf injuries show only few differences between senior and all-aged golfers, whereas the back and the shoulder tend to be injured more often. Senior golfers have an improved general health profile without an increased risk of specific orthopaedic injuries.

PREDICTION OF BODY FAT BY AIR PLETHYSMOGRAPHY, SKINFOLD AND BIOELECTRICAL IMPEDANCE IN HEALTHY YOUNG MALE ADULTS

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Air displacement plethysmography (BodPod) is a popular method of body composition assessment (Dempsiter & Aitkens, 1995). Like hydrostatic weighing, it estimates body composition by determining whole body volume (corrected for residual lung volume) and uses this value to compute body density. The percentage body fat is estimated from assumed densities of fat and the average density of the lean compartment using well established equations (Siri, 1961). As the prediction of body density from hydrostatic method is based on hydrostatically determined whole body density, there should be a high correlation between skinfold techniques and BodPod. The purpose of this study was to compare prediction of %fat from the BodPod, with two generalized skinfold equations for men (DW, Dunnin and Womersley, 1974; JP, Jackson and Pollock, 1978) and bioelectrical impedance analysis (BIA). Fifteen healthy and fit young men (age 24.5 ± 3.1y) volunteered for the study. Measurements occurred across two consecutive days to assess reliability. The relationship between methods was assessed by correlation analysis (r). Reliability within methods was assessed by intraclass correlation analysis (RI). Repeated-measures ANOVA was used to compare differences between methods. All methods were highly reliable (r values between trials 1 and 2 were BodPod R = 0.991; BIA R = 0.980; DW R = 0.981; JP R = 0.966, all < 0.001). The correlations r between %fat values from trial 1 for BodPod were BIA = 0.682 P = 0.005, DW 0.764 P = .001; JP 0.705 P = 0.003. Values for trial 2 were similar. There were no differences between trial 1 and trial 2 for each measure, but there were significant differences between the four methods (F = 31.3-22, 31 df).

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ASSOCIATIONS OF HABITUAL PHYSICAL ACTIVITY, ENERGY INTAKE AND INFLAMMATION WITH BODY WEIGHT AND COMPOSITION IN PATIENTS WITH RHEUMATOID ARTHRITIS

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Obesity, a risk factor for several diseases, is very common among patients with rheumatoid arthritis (RA) [1]. Moreover, these patients exhibit increased levels of body fat compared to healthy controls of the same BMI [1]. The exact reasons for this remain undetermined. However, physical inactivity, altered energy intake and inflammation associated with the disease [2] could all result in increases in body weight and fat [3]. Thus, this study aimed to identify possible associations of habitual physical activity, diet and inflammation with body mass index (BMI) and body composition i.e. body fat-BF- and fat free mass -FFM- of patients with RA.

The total of 60 patients (40 females) with RA was assessed for BMI (weight divided by height squared) and body composition (bioelectrical impedance). Habitual physical activity was assessed using the long-form International Physical Activity Questionnaire (IPAQ) and diet with a food diary which assessed food intake over two week days and one weekend day. Pro-inflammatory cytokines i.e. interleukins (IL) -1a, -1b, -6 and tumour necrosis factor alpha (TNFα) were measured in participants’ blood. Disease characteristics were assessed following standard procedures. Duration of RA and smoking habits were also noted.

IPAQ was inversely correlated with weight (r=-0.327, p<0.001), BMI (r=-0.291, p<0.05) and BF (r=-0.264, p<0.05). Total energy intake was positively correlated with BMI (r=0.259, p<0.05). Pro-inflammatory cytokines did not correlate with any of the assessed parameters.

Following correlations for age, gender, disease duration and smoking status, IPAQ remained a significant predictor of the previously named parameters; however the association of energy intake with BMI became insignificant. Therefore, participants were grouped...
According to 1) their BMI and 2) their BF into under-, normal-, over-weight and obese. ANOVA found significant differences between both BMI and BF groups for IPAQ (p<0.05) but not for energy intake or pro-inflammatory cytokines.

In patients with RA increased body weight and fat seem to associate more with decreased physical activity than with increased energy intake or inflammation. Given the adverse health effects of obesity, RA patients should be advised to follow a more active lifestyle. However, exercise professional should take into account the movement limitations of these patients. Further research, investigating the suitability of exercise modalities and the resulting effects on RA, is advocated.

References:

MAXIMAL AEROBIC CAPACITY IN POSTMENOPAUSAL WOMEN: RELATION BETWEEN BODY COMPOSITION AND THE CHARACTERISTICS OF MENOPAUSE

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This study aims to determine if body composition (BMI, body mass index, VFA, visceral fat area and SMI, skeletal mass index) and the characteristics of menopause (time and nature of menopause) are predictors of cardiovascular fitness in two groups of postmenopausal women (G1, 45 to 59-yr-old; G2, 60 to 79-yr-old). Subjects included 196 postmenopausal Caucasian women (age, 57.38±6.04 years old; VO2max, 28.79±5.29 mg/kg/min; BMI, 28.68±4.76 kg/m2); 135 in G1 and 61 women in G2. Skeletal muscle mass (SMM), VFA and basal metabolic rate (BMR) were estimated by tetrapolar bioimpedance. The whole-body adiposity was measured by the BMI (weight/height2) and the subjects were considered to have a normal SMM if their SMM (SMM/body mass × 100) was higher than 28% [2]. The cutoff to define the VFA related to high cardiovascular risk was 100 cm2 [1]. Waist circumference (WC) was measured in the narrowest area of the waist and VO2max was assessed by a modified Bruce treadmill protocol. Independent t tests were used to compare variables between groups and VFA in G1. Stepwise multiple regressions were used in two groups to quantify the independent contribution of predictor variables to VO2max.

Compared to G2, the youngest postmenopausal women had lower (p=0.01) levels of VFA (-13.73 cm2) and higher levels (p=0.05) of SMM (1.42%) and VO2max (2.26 ml/kg/min), but in relation to SMM and BMR there were no differences between groups. Maximal aerobic capacity was inversely (p=0.01) associated with VFA (r=-0.44 and r=-0.60 in G1 and G2, respectively) and WC (r=-0.25 and r=-0.45). By contrast, SMI was positively associated with a dependent variable (r=0.43 and r=0.59, respectively). VFA was the strongest independent variable correlated to VO2max in G1 (r = -0.44, p < 0.01) and G2 (r = -0.60, p < 0.01), explaining respectively 19% and 35% of the variance, when the BMI was controlled. In G1, subjects with high VFA had lower cardiovascular fitness (-4.99 ml/kg/min, p<0.01) and in G2 only 2 women had a normal VFA.

Our data suggest that the oldest postmenopausal women have a lower VO2max and an increased risk of central adiposity and sarcopenia. Visceral fat area is a significant predictor of cardiovascular fitness in postmenopausal women, besides the characteristics of menopause (time and nature) and BMI. The levels of VFA equal or superior to 100 cm2 in G1 are a biological marker that predisposes the youngest postmenopausal women to a lower maximal aerobic capacity.

References:

RELATIONSHIP BETWEEN HABITUAL PHYSICAL ACTIVITY, NUTRITIONAL STATUS AND MOTOR PERFORMANCE FROM A SAMPLE OF BRAZILIAN SCHOOLCHILDREN

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Objective: The purpose of this study was to evaluate the habitual physical activity, the nutritional status, the motor skills and the relationship of these variables of children aged 10-12 years. Methods: This study included 117 children (53.8% men), aged 10-12 years (10.6 ±0.7), randomly selected from the public and private school system from Passos, Minas Gerais. In order to evaluate the habitual physical activity (HPA) the subjects filled out the Physical Activity Questionnaire (PAQ-C). The nutritional status was assessed by anthropometric data (body mass index (BMI), waist circumference (WC) and waist-to-hip ratio (WHR)) and the motor skills were assessed through a physical fitness test battery (9-minute run/walk test, muscular strength/endurance abdominal test, medicine ball seated toss test, horizontal jump test).
test, sit and reach test, agility square test and 20 meters velocity test. Kruskal Wallis test was used to analyze associations among nutritional status classification with motor skills total scores and HPA total scores and to verify associations between HPA classification and motor skills total scores. Spearman test was performed to verify correlations between quantitative measures (HPA, nutritional status and motor skills). Differences between genders were performed by Mann-Whitney test. Results: Regarding to HPA, 15.4% were classified as very sedentary, 42.7% as sedentary, 33.3% as moderately active and 8.5% as active. According to BMI, 8.5% were classified as underweight, 65.8% as euthrophic and 25.6% as overweight. As assessed by the WC, 33.3% were in the first quartile, 23.1% in the second quartile, 22.2% in the third quartile and 21.4% in the forth quartile. According to WHR 32.5% were in the first quartile, 29.1% at second quartile, 15.4% in the third quartile and 23.1% in the forth quartile. The subjects showed a low performance for the most motor skills assessment, except in the sit and reach test. It was a positive relationship (p<0.05) between WC classification and medicine ball seated toss test total score. A negative relationship (p<0.05) among BMI classification and 9-minute run/walk test total score was observed, too. No statistically significant associations were found in any others comparisons performed with nutritional status (by BMI, WC and WHR classifications and total scores). Neither was found statistically significant association in any comparison performed with HPA classification. The boys showed a best performance (p<0.05) in the sit and reach test, were more physically active (p<0.05) and spent less time watching TV (p<0.05). No significant difference was found between gender and others analysis of motor skills and nutritional status. Conclusion. Studies should be directed to investigate and understand the relationship between physical fitness, motor performance and anthropometric profile, to improve quality of life and health conditions for children.

**Fatigue and Recovery in Individuals with Mental Retardation During High-Intensity Intermittent Exercise**

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The capacities of the muscle to resist fatigue and to recover after intense exercise are important components of neuromuscular function. Fatigue originates in peripheral and central (reduced muscle activation) sites. Individuals with mental retardation (MR) may have disturbed central and peripheral processing components, as indicated by the longer reaction and motor times, and the association between the brain nerve conduction velocity and intelligence. Thus, MR individuals might be in disadvantage vs. those without MR (NMR) when performing fatiguing exercise. On the other hand, MR individuals generate less absolute forces which suggest that they may fatigue less and recover faster during intermittent activity. The aims of this study were to compare fatigue and recovery characteristics of individuals with MR vs. NMR.

Nine men with mild-moderate MR (23.8±4.2 yrs.) and 11 NMR men (23.6±3.3 yrs.) performed 4 sets of 18 consecutive maximal knee extensions and flexions with 1 min rest at 120º/sec on an isokinetic dynamometer. Peak torque (PT) and total work (TW) for concentric knee flexors (FL) and extensors (EX) were measured in all sets. Fatigue was assessed as the rate of PT and TW decline in the 1st set calculated by the slope of a linear fit performed on 18 reps. The magnitude of recovery in the 2nd, 3rd, and 4th sets was calculated as a % of TW value achieved in the 1st set. HR was monitored throughout the protocol and blood samples were obtained after the 2nd and 4th sets to assess blood glucose and lactate. All data are presented as means ±SD. MR had lower (p<0.01) absolute values vs. NMR for PTFL (132±30 Nm vs. 169±33 Nm), PTEX (138±34 Nm vs. 94±24 Nm), and TW (5402±1030 J vs. 7560±1593 J). Expressed per unit body weight, the values were not different between groups for PTFL and TW, but different for PT (p<0.05). The slopes of the linear regressions for absolute and relative PTFL and PTEX were smaller (p<0.001-0.05) in MR vs. NMR. Recovery (%) was higher (p<0.05) in MR vs. NMR for TWFL in the 2nd (86±9 vs. 78±6), the 3rd (75±6 vs. 65±6) and the 4th (70±7 vs. 54±9) sets and for TWEX in the 3rd (73±11 vs. 66±9) and the 4th (68±10 vs. 58±7) sets. When % recovery was analyzed using PT and TW of the 1st set as covariates no differences between MR and NMR were observed. Lactate (mmol/L) was lower in MR vs. NMR after the 2nd and the 4th sets (p<0.01), while there were no differences between groups in glucose (mmol/L). The percent (%) of HR decline during the rest period after each set was greater in MR vs. NMR (p<0.01). In conclusion, fatigue develops at a slower rate, as suggested by the slopes, during fatiguing exercise and muscle abilities’ to produce work recover faster during intense intermittent exercise in individuals with MR vs. NMR. This may be due to the lower ability of MR individuals to generate absolute forces as well as to their less reliance on glycolysis for energy production and their greater rate of cardiac-pulmonary readjustment.

**Inpatient Multimodal Youth Obesity Therapy Alters Heart-Rate Variability**

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**Purpose**

Analysis of the natural variation in heart rate (HRV) is considered a valuable non-invasive tool to assess sympathetic heart rate regulation. Despite the accepted diagnostic value of HRV to predict the risk of future cardiac events in clinical cardiology, and the role of the autonomous nervous system (ANS) in metabolic energy homeostasis, studies evaluating exercise-induced modulation of cardiac autonomic function in obese children are scarce. The current study evaluated the effects of a four-week inpatient youth obesity therapy program on heart rate variability.

**Methods**

In a prospective, non-randomized controlled trial, HRV was obtained in mixed-gender obese youth before and immediately after a multimodal inpatient therapy including exercise, nutrition and behaviour modification (verum: 13.0±1.6 years, 32.7±4.1 kg/m², or at a corresponding time interval of 4 weeks (controls: 13.3±1.7 years, 30.7±3.5 kg/m²). Following 10 minute acclimatization, 5-min short-time resting tachograms were obtained by Polar S810® Heart Rate Monitors (Polar Electro Oy, Finland) in supine position in a temperature-controlled, quiet room. In accordance with the standards proposed by the Task Force of the European Society of Cardiology, segments of 256 RR intervals were exported as text files to HRV Analysis Software 1.1 (Department of Applied Physics, University of Kuopio, Finland) after visual inspection of the raw data. RMSSD, low frequency (LF) power within the frequency band of 0.04-0.15 Hz, high frequency (HF) power (0.15-0.4 Hz) and total power (TP) (0.02-0.4 Hz) were analysed by Mann-Whitney U test.

**Results**

No significant between-group differences could be detected in the initial measurement. Changes in BMI (kg/m²) (-2.4±0.6 vs. -0.4±0.7), RMSSD (ln ms) (+0.59±0.64 vs. -0.13±0.37), LF (ln ms2) (+0.72±1.02 vs. 0.44±0.58), HF (ln ms2) (+0.94±1.23 vs. -0.56±0.73) and TP (ln ms2) (+0.73±0.99 vs. 0.44±0.52) differed significantly between verum and controls (p<0.001).
CONCLUSION
The current results underscore the immediate efficacy of inpatient complex therapy in obese youth, reducing body weight and enhancing both sympathetic and parasympathetic nervous activities within four weeks. Absolute spectral values, as well as the magnitude of change differed markedly among individuals. Improving physical activity behaviour and eating patterns seems to induce a reversal effect on initially reduced ANS activity in obese youth, which might have important implications for metabolic energy homeostasis as well as cardiac health. The sustainability of the HRV modulations observed, as well as the general feasibility of HRV parameters as therapeutic outcome should be evaluated in future large-scale studies.

CLUSTERED CARDIOVASCULAR RISK AND AEROBIC FITNESS IN ADOLESCENTS
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Low aerobic fitness strongly and independently predicts all-cause mortality and cardiovascular disease (CVD) outcomes. CVD risk factors seem to cluster in some individuals, which is the case in subjects with metabolic syndrome, and in adults. Moreover, low aerobic fitness is associated with increased risk of developing metabolic syndrome (1). Recent reports have shown similar associations between aerobic fitness and clustering of CVD risk factors in paediatric populations (2,3). However, data from national representative samples are lacking. The aim was to examine the association between aerobic fitness and clustered CVD risk in a representative sample of Norwegian adolescents. Methods: This is a cross-sectional study including a randomly selected cohort of 983 15-year olds. The adherence rate was 73%. Maximal oxygen uptake was assessed directly (MetaMax III X) during a maximal test on a cycle ergometer. CVD risk factors selected to assess the degree of clustering were total cholesterol/high-density lipoprotein cholesterol ratio, triglycerides, insulin resistance (HOMA), sum of four skinfolds, and systolic blood pressure. Results: There was a moderate association between aerobic fitness and clustering of CVD risk factors ($r = -0.351$ and $r = -0.428$ for girls and boys respectively). Subjects in the lowest quintile of fitness ($35.9$ mlkg$^{-1}$min$^{-1}$ and $46.3$ mlkg$^{-1}$min$^{-1}$, for girls and boys respectively) had $8.3$ (95% CI 4.4;15.7) times greater risk of clustering of CVD risk factors compared with subjects having a VO2peak above these values. Conclusions: This is the first study to investigate the association between CVD risk factors and direct measurement of VO2peak in adolescents. We found that low aerobic fitness is associated with clustering of CVD risk factors.

References.

EFFECTS OF AEROBIC EXERCISE ON WHOLE BLOOD FLUIDITY IN ELDERLY JAPANESE MEN
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Disturbance of blood rheology is recognized not only as a coronary risk factor, but also as a risk predictor of cardiovascular disease. Despite the importance of blood rheology in health and disease, remarkably little is known about the effect of aerobic exercise on blood rheology in elderly people. The purpose of this study was to obtain information regarding the effects of long-term aerobic exercise on whole blood fluidity in elderly men. Twenty-four men (65.9±7.9 years), who continuously have taken aerobic exercise (walking, jogging, treking, etc.) for more than 5 years, served as subjects for this study. Whole blood fluidity was evaluated by the passage time of whole blood through artificial capillaries. Maximal oxygen uptake (VO2max) and oxygen uptake corresponding to lactate threshold (VO2LT) were measured using a maximal cycle ergometer protocol. Cardiorespiratory fitness was evaluated by VO2max score and VO2LT score, which were standardized by age. Analyses of the data indicated that the correlation coefficients between whole blood passage time (43.3±8.0 sec) and VO2max score, or VO2LT score were statistically significant ($r = -0.47$ and $r = -0.56$, respectively). Furthermore, Whole blood fluidity correlated linearly with number of red blood cells (464.7±37.7×10^4/ml; $r = 0.48$), and hematocrit (14.6±1.0 %; $r = 0.47$). These findings suggest that whole blood fluidity may be improved by long-term aerobic exercise, through the reduced hematocrit and/or number of red blood cells. These might affect cardiorespiratory fitness through tissue perfusion and oxygen carrying capacity, moreover, might contribute to a permanent reduction of load on cardiovascular system.

DIFFERENCES IN BODY MASS INDEX BETWEEN CHILDREN LIVING IN LARGE URBAN CITIES AND SMALL PROVINCIAL TOWNS
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The study investigated whether there are differences in body mass index (BMI) between children and adolescents living in large urban centers and smaller provincial towns. For this purpose the height and weight of 3763 Greek children were measured. There were 2046 girls (495 from large cities and 1551 from small towns) and 1717 boys (402 from large cities and 1316 from small towns). The process of stratified sampling included two randomizations. Firstly the schools in each area were proportionally and randomly selected and secondly the children in each school were again randomly selected. Six age groups (8 to 13 years) with at least 375 children in each group were formed. Care was taken not include children who had changed their place of residence since their birth. BMI was calculated by dividing weight in kilograms by the square of height expressed in meters. The dependent variable BMI was analyzed using three-way analysis of variance with age group (8, 9, 10, 11, 12 and 13), gender (female, male) and place of residence (large city, small town) as the three independent factors. The interactions of the factors were also taken into consideration. Post-hoc pairwise comparisons with Bonferroni corrections were also performed. Statistical significance was set at 0.01. The results of the ANOVA showed that all three factors had a significant effect on BMI. Age had the most significant effect on BMI (F5, 3739 = 44.2, p<0.01). Gender also had a significant effect on BMI (F1, 3739 = 12.2, p<0.01), which was smaller than the effect of the place of residence on BMI (F1, 3739 =49.2, p<0.01). Post-hoc comparisons showed that starting from the age of 9 and up to the age of 12 children from large cities had higher BMI values than children from small towns. At the age of eight the difference is significant only at the 0.05 level. The greater differences were observed at the
age of ten, when children from large cities had a mean BMI of 19.8±2.8, while children from small towns had a mean BMI of 18.7±2.7. The overall 95 percentile BMI for this age is 23.2, however only 3.6% of children from small towns had BMI larger than this value, while for children from large cities this proportion rose to 9.5%. The present findings indicate that there may be biases when a nationwide BMI growth curve is generated from children living in different areas. The differences in BMI between children living in large cities and small towns may be explained by the interaction of several factors such as nutrition, participation in sports and other activities, socioeconomic status and lifestyle.

RELATIONSHIPS BETWEEN HABITUAL PHYSICAL ACTIVITY AND MORPHOLOGICAL AND METABOLICAL FACTORS OF HEALTH-RELATED FITNESS AMONG ELDERLY MEN

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Health benefits resulting from undertaking appropriate physical activity by elderly people are indisputable nowadays. However, the results of studies on the relations between habitual physical activity (HPA) and health are not clear and potential benefits resulting from this type of activity are often omitted and underestimated. The aim of the study was to assess the relations between HPA and morphological and metabolic factors of health-related fitness (H-RF) among men over 60 years of age. The participants of the study were 137 men (60-88 years, average=72.6±5.8) living in Poznan (city in Poland, about 700 thousand inhabitants). The participants were retired, free from severe illness, who didn’t participate in any organized programme of physical activity. For measuring HPA the Caltrac accelerometer (Muscle Dynamics Fitness Network, USA) was used. HPA was expressed as a value of weekly energy expenditure related to physical activity (PA-EE). The value of PA-EE calculated per kg of weight (PA-EE/kg) was also used. In terms of somatic characteristics body height, weight, waist and hip circumferences, body composition (FFM and FFM), and bone mineral density (BMD) were established.

The analysis of relations between PA-EE and PA-EE/kg and morphological and metabolic components of H-RF showed a very diversified picture. Direct relations (irrespective of age) of a higher level of PA-EE/kg with a more beneficial distribution of fat tissue were found. Lower values of waist circumference (r=-0.29, p<0.01) and WHR (r=-0.31, p<0.001) were related with higher level of HPA. The remaining results of the study do not indicate a significant direct role of separately considered PA-EE and PA-EE/kg in optimization of body weight or improvement of body composition by reduction of FM and increasing the value of FFM. Also BMD and the concentration of lipoproteins, TG and Glc in blood plasma directly do not co-occur significantly with the level of PA-EE and PA-EE/kg. Only in case of HDL and Gc one can mention indirect relationship caused by mutual relations of PA-EE, PA-EE/kg and the discussed factors with age and body weight.

In conclusion, the significant role of HPA in more beneficial distribution of fat tissue was proved, when there is a lack of direct relationships between HPA and other somatic characteristics or between HPA and metabolic components of H-RF. These observations indicate that we should appreciate the significance of HPA for the health of elderly men. It was also showed the necessity of using the relative value of HPA, when expressed by energy expenditure, it must be calculated per kg of weight.

SUCCESSFUL PHYSICAL ACTIVITY AND NUTRITION INTERVENTION AT SEA

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Icelandic fishermen working at fish-processing plants live a potentially unhealthy lifestyle. Staying at sea for a month at time gives little opportunities for regular exercise, and being sleep-deprived and away from home easily leads to limited and unhealthy dietary choices. In this study a physical activity and nutrition intervention was undertaken to increase awareness and facilitate healthier lifestyle among fishermen at sea.

Body composition, health parameters i.e., blood pressure, EKG, triglycerides, cholesterol, physical activity level and food choices were investigated among 62 fishermen (intervention, n=31; control, n=31) before and after a 6-month lifestyle intervention, focussing on an increased physical activity and healthier food choices during tours at sea as well as breaks on land. Physical activity was measured in minutes/week by protocols and questionnaires and fitness by maximal cycle ergometer test. Questionnaires were used to assess food choices and health related quality of life. In order to encourage physical activity at sea a room with fitness equipment was arranged for.

To aid better food choices the cooks were assisted in changing cooking methods and increasing the variety of food available at sea.

The intervention was successful, leading to an average weight loss of 3.5±2.7 kg compared with an average weight loss of 0.2±5.1 kg in the control-group (p=0.002). Changes in waist circumference and percent bodyfat were significant for the intervention-group only (r=3.9±2.5 cm, p=0.001 and -1.7%, p=0.001 respectively). The intervention-group increased their physical activity by 233% compared with an 13.5% increase among controls, resulting in 14.3% gain in fitness in the intervention-group only (p<0.001). Furthermore, the intervention-group had an 11.4% increase in HDL-cholesterol (p<0.001), compared with a 6.1% decrease in the control-group (p=0.049). There were no significant changes in LDL-cholesterol, but triglycerides decreased by 18.6% (p=0.004) in the intervention-group. They also lowered their diastolic blood pressure by 3.3 mmHg (p=0.033). Positive changes in the factors associated with health related quality of life were only found in the intervention-group. These were decreased depression, decreased pain and increased fitness by self-evaluation (p<0.05).

Positive changes in food choice were only noticeable in the intervention-group. After the intervention they ate fresh vegetable and unsweetened breakfast cereals more often and less frequently consumed sweet cakes and biscuits. They also less frequently drank carbonated beverages and fruit drinks with added sugar (p<0.05).

The results state the profit of a work-place intervention among men working and living under potentially unhealthy conditions. Healthier lifestyles leading to better health among fishermen is valuable for their personal well-being and is good investment for their employers.
THE EFFECTS OF CAFFEINE AND WATER INTAKE ON BODY FLUID LOSS THROUGH URINE PRODUCTION AND SWEAT LOSS DURING 2000-M UNDERWATER WALKING

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The aim of this study was to investigate the effects of caffeine and water intake on the body fluid loss during 2000-m walking in the pool. Eight healthy men (age: 20.6 ± 5 years, height: 173.6 ± 4.2 cm, weight: 70.5 ± 4.7 kg) were designated as three experimental conditions: water ingestion (WA), caffeine ingestion with water (CAF: a total of 40 mg of caffeine in 400 ml water), and no fluid ingestion (NO). The fluid was ingested before the start of exercise and during exercise with a rest interval at 1000 m. The pool had 25 m in length and 1.0 m in depth. The subjects walked 2000 m at a speed of 3 km/h in the pool at a water temperature 30.3 ± 0.3°C, a room temperature 29.5 ± 2.7°C, and a relative humidity 83.5 ± 2.7%. We measured the urine volume and osmolarity, sweat rate, heart rate, tympanic temperature, and blood pressure pre-exercise, during exercise with a rest interval at 500 m, 1000 m, and 1500 m, and after exercise. Urine volume after exercise increased in the CAF (253 ± 7 ± 211.3 ml) as compared with the NO (129 ± 7 ± 152.9 ml). There was no difference in the sweat loss among three conditions (NO: 321 ± 7 ± 127.5 g, WA: 281 ± 7 ± 119.3 g, and CAF: 361 ± 7 ± 135.3 g). The total body fluid loss as evaluated with the urine volume plus sweat loss in the CAF (635 ± 7 ± 216.2 g) was significantly increased and that in the WA (433 ± 7 ± 108.8 g) tended to increase to that in the NO (442 ± 7 ± 143.4 g) after exercise (p < 0.05). Post-exercise tympanic temperature in the NO and CAF was significantly higher than the pre-exercise value. Post-exercise urine osmolarity in the CAF and WA was significantly lower than that of the NO (p < 0.05). The systolic blood pressure significantly increased during exercise (in the NO at 500 m, in the WA at 1000 m, and in the CAF at 500 m and 1500 m) compared with the pre-value (p < 0.05). There was no difference in the heart rate and diastolic blood pressure among three conditions. We concluded that water ingestion with caffeine significantly increased total body fluid loss through urine production and sweat loss during 2000-m underwater walking.

BODY COMPOSITION, REGULAR PHYSICAL ACTIVITY AND AEROBIC ABILITY IN PUBERTARY CHILDREN AND ADOLESCENTS

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The aim of our study was to compare the mean values in the performance of the aerobic ability (AA) in boys and girls according to the cutoffs established for the waist circumference (WC) [1], percent fat mass (%FM) [2], and regular physical activity (RPA). The sample was composed by 690 pubertal children and adolescents (10-15 years), 340 females and 350 males. It was made an anthropometric evaluation (weight, height, skinfolds: tricipital, bicipital, suprailiac and geminal, WC in the narrowest waist), the Maturational Status (MS) was obtained through the Tanner stages [3], the RPA was evaluated by the Baeecke's questionnaire [4] and the AA was measured by the progressive aerobic endurance run (PACER) test resorting to the Fitnessgram software [5]. The %FM and the WC were the variables which have shown higher levels of correlation with AA, being the performance on PACER more influenced by the level of total adiposity in boys (r = -0.47, p < 0.01) and by a centralized distribution of fat mass (FM) in girls (r = -0.29, p < 0.01). The association of RPA with AA was positive and low in both genders, particularly in males with r = 0.11 (p < 0.05). The obese boys showed a lower performance in PACER comparing to those who are not obese, with a mean difference of -17.34 laps (p < 0.01). The presence of a more centralized distribution of FM compromised the performance of PACER in both genders, particularly in males. The most active girls registered a mean of +2.83 laps (p < 0.01) on PACER. The centralized distribution of FM consubstantiate in a higher WC, generate a lower performance in PACER in females and males and particularly in the last ones, where the presence of obesity influences negatively their performance in PACER. Girls with levels of RPA7.97 points and boys with RPA 7.5 points performed a higher number of laps in PACER.

References.

ENERGY EXPENDITURE AND PHYSICAL ACTIVITY PATTERNS IN OVERWEIGHT AND LEAN 11-YEAR OLD CHILDREN IN CROATIA

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The growing epidemic of obesity is becoming more and more pronounced, even among children. Physical inactivity, along with inadequate nutrition, is one of the main reasons of the growing prevalence of obesity. Therefore, as a part of a bigger survey, the aim of this study was to objectively evaluate energy expenditure and physical activity patterns in overweight and lean 11-year old children in Croatia. Ninety children (50 girls and 40 boys, mean age 11.3 ± 0.2 years) from six different elementary schools in Zagreb (Croatia) were selected to participate in the study. Height and weight were measured and body mass index (BMI) was calculated. Sixteen girls and sixteen boys were considered overweight or obese according to International Obesity Task Force BMI cut off points for age and gender. Energy expenditure and physical activity were assessed by a multisensor device (Sensewear Armband, BodyMedia, Pittsburgh, USA)2. The device was worn for four consecutive days. Group differences were tested using Student’s t-test for independent samples.

Total daily energy expenditure (TEE) was higher in overweight children (2243 ± 406 kcal/day) when compared with lean children (1756 ± 338 kcal/day), p < 0.001. No significant differences between groups were observed in energy expenditure for physical activity (PAEE) (637 ± 341 and 622 ± 323 kcal/day for overweight and lean children, respectively, p = 0.85). However, when energy expenditure is expressed relatively to body weight overweight children presented with lower values of both TEE (39.3 ± 5.9 and 44.1 ± 6.6 kcal/kg/day for over-

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weight and lean children, respectively, \( p<0.001 \) and PAEE \( (11.3 \pm 6.2 \) and \( 15.9 \pm 8.8 \) kcal/kg/day for overweight and lean children, respectively, \( p=0.009 \)). Also, the group of overweight children exhibited significantly lower values of daily physical activity \( (158 \pm 78 \) min/day) compared with the lean group \( (219 \pm 110 \) min/day, \( p=0.007 \). Concerning the intensity of physical activity, moderate intensity activity \( (13-6 \) MET) was lower in overweight children \( (145 \pm 68 \) min/day) when compared with the lean ones \( (196 \pm 97 \) min/day, \( p=0.009 \), while vigorous activity \( (6-9 \) MET) was not different between groups \( (11.2 \pm 13.1 \) and \( 17.8 \pm 18.7 \) min/day for overweight and lean children, respectively, \( p=0.08 \)).

In conclusion, it seems that overweight 11-year-old children in Croatia are less physically active than their non-overweight peers, but that energy expenditure expended for daily physical activity is the same in overweight and lean children.

References.

EFFECTS OF A SUPERVISED HOME-BASED PHYSICAL ACTIVITY PROGRAM ON THE BURDEN IN INFORMAL CAREGIVERS OF PERSONS WITH DEMENTIA


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Introduction: People who care for patients with dementia usually present lower mental health and a high burden because of caring. Caregivers suffer from the consequences of the disease and drastically reduced their opportunities to do their usual activities. Positive effects of physical activity on mood and subjective well-being in older people have been previously depicted.

Objectives: The purpose is to evaluate the influence of a home-based physical activity program on the perceived burden of the main informal caregiver (MIC) of a family member with Alzheimer Disease (AD).

Measurement and Method: Thirty-two female caregivers were randomly assigned either to an intervention group or to a control group. The intervention was a 3-month supervised and home-based program of physical exercise. The program consisted of two one-hour session per week. Each session included two blocks of aerobics and two of strengthening and mobility exercises. The burden was assessed by Zarit Scale.

Results: All the caregivers in the intervention group completed the program. After 3 months, the caregivers of the intervention group experienced an improvement in the perception of subjective burden in 12% (\( p=0.001 \)) compared to controls.

Conclusions: We conclude that the program is feasible, adherent and effective for reducing the burden of people caring for a patient with Alzheimer’s at home.

EFFECTS OF A 12-WEEK SUPERVISED HOME-BASED PHYSICAL EXERCISE PROGRAM ON THE HEALTH-RELATED QUALITY OF LIFE AND FUNCTIONAL CAPACITY IN PARALYTIC POLIO SURVIVORS

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Introduction: There are few new cases of polio infection but the survivors usually report low levels of functional fitness and health-related quality of life (HRQOL) for decades. Moreover, 25-85% of persons with paralytic polio sequel experience a new significant worsening of their health 10 to 40 years after they suffer the infection. Major symptoms are muscle and joint pain, weakness and fatigue. Purpose: To evaluate the influence of a 12-weeks supervised home-based physical exercise program in lower limb Paralytic Polio Survivors.

Measurement and Method: Twenty-three participants were randomly assigned either to an experimental group or control group. The program was administered at the home of patient. The weekly program included two one-hour sessions directly supervised by a physical technician and another self-administered by patient. Each session was structured into three parts: mobility, flexibility and resistance strength.

The main outcomes measured in the current study were HRQOL assessed by EQ-5D and the walk functional capacity evaluated by the 6-minute walking test. Results: After 12 weeks, the experimental group attended 82% of the programmed sessions. Compared to control group, exercise group improved its HRQOL in mobility (25%; \( p=0.003 \)), anxiety or depression (21%; \( p=0.037 \)) and time-trade-off tariff or preference (overall or utility index) (33%; \( p=0.004 \)). We also have found positive effects on the ability to walk (7%; \( p=0.001 \)) regarding the control group. Conclusions: We conclude that the program is feasible, specially the directly administered sessions, and it is effective in improving health-related quality of life and functional capacity walking.

THE KNOWLEDGE OF ANKARA UNIVERSITY LECTURERS ON EXERCISE RECOMMENDATIONS

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Introduction: Physical inactivity is major risk factor for many diseases such as cardiovascular disease, stroke, diabates, obesity, hypertension and osteoporosis. Present data indicates that physical activity knowledge alone is not sufficient to elicit a behavior. The purpose of this study was to determine whether Ankara University lecturers know which traditional and lifestyle physical activities affect health and how they should be physically active to achieve a desired health benefit. Secondary purposes were to determine whether this knowledge is a function gender, education, age, level of income, type of school and faculties.

Methods: Items based on the Center for Disease Control and Prevention/ American College of Sports Medicine principles included knowledge of exercise guidelines, traditional and lifestyle physical activities. These information were obtained from 20 questions. The research has been performed on 632 lecturers in total, 355 of whom are male and 277 are female lecturer from Ankara UniversitySchool of Physical Education and Sports, Faculty of Dentistry, Faculty of Language, History and Geography, Faculty of Pharmacy, Faculty of Educational Sciences, Faculty of Science, Faculty of Law, Faculty of Teology, Faculty of Communication, Faculty of Engineering, Faculty of Political Sciences, Faculty of Medicine, Faculty of Veterinary Medicine, Faculty of Agriculture. Face-to-face interview method has been employed in obtaining the research data.

Results
By the end of research, we have seen that level of information of the lecturers about lifestyle physical activity is high (91%), about exercise prescription is less (65%), and on the traditional physical activities at the level of 68%. The differences between the levels of information about traditional and lifestyle physical activities only relates to education and age (P < 0.05). There were no significant affect on knowledge about exercise prescription was relatively low and there were no significant differences between schools or departments.

Conclusions
This reveals that the lecturers of Ankara University are informed about type of physical activities that is favorable for the health. But their knowledge about exercise prescription was relatively low and there were no significant differences between schools or departments.

THE PPAR GAMMA GENE, CARDIORESPIRATORY FITNESS AND METABOLIC SYNDROME IN YOUNG AND OLD JAPANESE MEN AND WOMEN
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Objective: Little information is available regarding the relationships among human obesity-related genes, cardiorespiratory fitness and metabolic syndrome (MS) or predisposition to MS (IMP). The present study was performed to investigate the age differences of peroxisome proliferator-activated receptor gamma (PPARG) genotypes and cardiorespiratory fitness to the MS in Japanese men and women. Research Methods and Procedures: Sedentary and moderately active men (n = 149) and women (n = 412) aged 18-85 yrs participated in this study. We measured maximal oxygen uptake (VO2max) during an incremental cycle ergometer exercise test. Serum HDL-cholesterol, triglyceride and plasma glucose levels were measured in all subjects. Total and regional lean soft tissue and fat mass were also measured by dual-energy X-ray absorptiometry (DXA). We analysed the genotype of PPAR (C1431T) using a polymerase chain reaction-restriction fragment length polymorphism (PCR-RFLP) assay.

Results: A total of 11 men (7.4%) and 10 women (2.4%) developed MS. In addition, a total of 35 men (23.5%) and 29 women (7.0%) showed MS. VO2max in men and women with MS (29.3 ± 5.3 and 23.6 ± 4.6 ml/kg/min) were significantly (P < 0.05) lower than in healthy men and women (40.1 ± 10.2 and 32.7 ± 7.8 ml/kg/min). Two-way ANOVA indicated that in younger group, the number of risk factors of MS in low fitness group was significantly higher than that in high fitness group (P < 0.05), and also in C1431T (CC) genotype was significantly higher than that in C1431T (CT + TT) genotype (P < 0.05). In addition, the interaction between fitness and genotype in the number of risk factors was significant. However, in middle-age and older group, the number of risk factors of MS in low fitness group was significantly higher than that in high fitness group (P < 0.05), but not observed in C1431T genotype effect. Furthermore the interaction between fitness and genotype in the number of risk factors of MS was not significant.

Discussion: We concluded that poor VO2max was associated with the prevalence of MS independent of age group. The C1431T genotype in PPAR in younger subjects is associated with the risk factors of MS, but not in middle-aged and older Japanese men and women.

LIFESTYLE PHYSICAL ACTIVITY CHOICES OF CHILDREN AND YOUNG PEOPLE: AN EXPLORATION OF THE GLOUCESTERSHIRE PUPIL ON-LINE SURVEY
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Public health concerns relating to the increasing sedentary nature of contemporary living have prompted the UK Government to support initiatives that promote healthy lifestyles and increase physical activity (PA) participation. In particular, current guidelines to promote PA to children and young people derive from the need to develop preventative health strategies for future generations and reduce health inequalities. The most recent guidelines recommended for this population to reap health benefits are 5 x 60 minutes of moderate physical activity per week (DoH, 2004a).

This reveals that the lecturers of Ankara University are informed about type of physical activities that is favorable for the health. But their knowledge about exercise prescription was relatively low and there were no significant differences between schools or departments.

A WHOLE-BODY VIBRATION PROGRAM WITH SHORT BOUTS IMPROVES MOBILITY BUT NOT SLEEP IN WOMEN WITH FIBROMYALGIA
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Introduction.
As for as women with fibromyalgia (FM) suffers widespread pain, it is usually inaccommoded that exercise in low ballistic impact activities. Whole-Body Vibration (WBV) is an exercise modality that allows it, but to our knowledge these is a lack of evidence about its use in persons with fibromyalgia.

Objective:
The purpose of this study is to assess the feasibility and efficacy of WBV program with short buts on the quality of life in women’s with fibromyalgia.

Method:
Fifty women with FM were randomly assigned to an intervention or to a control one. The intervention consisted of 3 sessions per week than 12 weeks. Each session of exercise consisted of 6 series of vibration in the platform Galileo Fitness (Galileo, Germany), to a frequency of 12.5 Hertz and with a progressive duration of 30 seconds during the first 4 weeks, 45 seconds in the 4 following and 60 seconds during the 4 last weeks. The quality of life was measured with the questionnaire of quality of life 15D.

Results:
96% of intervention group completed the program the score of the dimension of mobility in the questionnaire 15-D has taken place an improvement (p<.05) in the group that has made the vibratory exercise, nevertheless in the dream score has taken place a decrement (p<.05).

Discussion:
The whole body vibration training proposed improves the mobility but not the quality of the dream in people with fibromyalgia. Previous studies with aerobic training have been obtained improvements in mobility and sleep, whereas the made whole body vibration mainly has an neuromuscular activation component. One sets out to study if a training by vibratory exercise with series of greater duration and therefore with greater aerobic component, would improve or at least, it would not negatively affect the capacity to sleep.

Conclusions:
12 weeks of whole body vibration with series of short duration produces improvements in the dimension of mobility of the 15-D questionnaire, but it causes a decrement in the dimension of dream.

THE EFFECT OF 6-MONTHS EXERCISE INTERVENTION ON THE COGNITIVE-MOTOR FUNCTION IN THE MIDDLE-AGED AND ELDERLY JAPANESE

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Introduction
It was reported that six months aerobic training (Kramer, A. F., et al., 1999) or resistance exercise (Cassilhas, R. C., et al., 2007) intervention improved cognitive function of the elderly. However there are few studies about the effect on the brain function by the overall fitness program in which many people popularly participate for improving their physical fitness. We investigated whether the cognitive-motor function in middle-aged and elderly people were affected by the participation in 6-months exercise program which included aerobic and anaerobic exercise.

Methods:
Three men and seven women (mean age 62.8 ± 4.1 years old) participated in a 6-months exercise program. All the subjects gave their informed consent for participation in the study. One hour exercise class, including aerobic exercise, strength exercise and stretching, was held once a week. Before and after the 6-months exercise program, the cognitive-motor function and physical fitness of subjects were evaluated. In present study, the ability that subject reproduces some movement following demonstration is regarded as the cognitive-motor function. After watching 4 cycles of 4 count step pattern projected onto the screen in front of the subject, he/she reproduced 8 cycles of the same movement to synchronize with video pictures. It was evaluated how many cycles were needed to synchronize with the step pattern accurately in the spatial and temporal viewpoints. Subjects performed 13 step patterns at random order. Six in 13 patterns were the single lead leg step in which cycles were started always with the right leg. The rest patterns were the alternating lead leg step in which cycles were started with the right or left leg alternately.

Results and Discussion
Subjects took more cycles to synchronize with video pictures in the alternating lead step patterns than in the single lead step patterns in both the spatial and temporal viewpoints. After the participation in 6-months exercise program, the number of cycle to synchronize with video pictures was significantly reduced in 3 of 7 alternating lead steps in the spatial viewpoints and in 5 of 7 alternating lead steps in the temporal viewpoints. In any of the single lead step, the number of cycle needed to synchronize was not changed. It was suggested that the improvement of cognitive function by aerobic exercise appeared selectively in the task condition depending on executive control processes (Kramer, A.F., et al., 1999). In the present study, the alternating lead step patterns are more difficult than the single lead step patterns and may need more executive control processes.

References.

MUSCULAR STRENGTH, BONE MINERAL DENSITY AND BODY COMPOSITION IN ADULTS WITH MENTAL RETARDATION (WITH AND WITHOUT DOWN SYNDROME)

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The purpose of this study was to compare the characteristics of muscular strength, bone mineral density (BMD) and body composition (BC) between individuals of three distinct groups: (i) moderate/mild mental retardation with Down Syndrome (DS); (ii) moderate/mild mental retardation without Down Syndrome (WMR); (iii) without mental retardation (WNR).

Forty-six persons of both genders (20 to 40 years old) participated in this study. 15 DS (29.7 ± 5.1 years), 16 MR (28.7 ± 5.8 years) and 15 WMR (25.7 ± 4.2 years). Participants with DS and MR were recruited from three local vocational and educational training centres, all of them lived at home and received special education services in specialized centres 5 days per week. These services included 2 to 3 exercise sessions per week, 60 min each. The participants WMR were not engaged in any competitive sport and the majority practised recrea-
Total fat (%) was determined from a total body scan by dual-energy X-ray absorptiometry (Hologic®). The same instrument was used to conduct evaluations of BMD in lumbar spine (L2-L4), right hip (femoral neck) and upper and lower limbs (mean of the left and right sides). Isokinetic knee strength was measured using an Isokinetic Dynamometer (Biodex System 3). The variables measured were peak torque (highest peak torque of 3 repetitions at 60°.sec⁻¹ and average power (25 repetitions at 180°.sec⁻¹). Mean values of the left and right sides at flexion and extension were used for comparisons. The results showed significant differences between groups for all measures of muscle strength (p<0.001), BMD and BC (p<0.05). Post hoc analysis revealed that: (i) MR have greater isokinetic knee strength then DS (p<0.05 for all), WMR have greater knee isokinetic strength then MR and DS (p<0.01 for all); (ii) WMR have smaller total fat then MR (p=0.035) and DS (p=0.036); (iii) WMR have bigger BMD than DS and MR in the right hip and lower limbs (p<0.01 for all) and WMR also have superior BMD then DS in upper limbs (p=0.003). Among DS, the prevalence of osteoporosis and osteopenia was 6.7% and 73.3% for femoral neck, and 20.0% and 53.3% for lumbar spine, respectively; among MR, the prevalence of osteoporosis and osteopenia was 12.5% and 31.3% for femoral neck, and 6.3% and 43.8% for lumbar spine, respectively. WMR have a smaller prevalence of osteopenia, namely 6.7% for femoral neck and 20.0% for lumbar spine.

We concluded that persons with mental retardation when compared with persons without mental retardation have obvious disadvantages in muscle strength, BMD and BC, these disadvantages are more evident for persons with Down Syndrome. High prevalence of osteoporosis and osteopenia occurs among young adults with mental retardation.

TRENDS IN HEALTH-RELATED PHYSICAL FITNESS (FITNESSGRAM): A POPULATION STUDY IN CHILDREN AND ADOLESCENTS FROM ESPOSENDE, NORTH OF PORTUGAL

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PURPOSE. The aims of this study were: (1) to describe passing rates in individual health-related tests, (2) to identify rates of success in all fitness tests and, (3) to test for specific trends across age in each gender.

MATERIAL AND METHODS. A random and stratified sample representing 87% of the total population of students from 10-17 years of age living in the area of Esposende, north of Portugal, were enrolled in the study (males, n=1412; females, n=1458). Health-related physical fitness was assessed with the Fitnessgram test battery (1 mile run-walk, trunk-lift, curl-up and push-up). Intra-class correlation coefficients were computed to estimate reliability. Chi-square statistic were used to test for trends of unfit-fit across age in each gender. SPSS 15 and PEPI 4 were used in all computations.

RESULTS. Reliability estimates for all tests ranged from 0.84 and 0.95 in girls and 0.78 and 0.96 in boys. Across tests, and in both genders, the rate of success was evident. The only trend of interest is a push-up in girls, where the prevalence of unfit across all ages is 58.6%. In all tests and in boys and girls no significant trend (p>0.05) was evident for passing rates. Success rate in all tests ranged from 18% at 10 years to 33% at 17 years in girls (trend, p>0.05); in boys, the range was increasing, from 25% at 10 years to 71% at 17 years (linear trend, p<0.05). There are marked differences in success rate favoring boys at all ages (p<0.05).

CONCLUSION. In conclusion, these results show that notwithstanding the success rate in health-related physical fitness in these youngsters, there are also problems associated with unfit ones (from 8% to 58%) in different fitness components. The implementation of specific programs to surpass this fitness failure is needed. Moreover, a specific attention should be given to avoid low levels of physical activity-sports practice, and other co-morbidities such as overweight-obesity that are usual linked in unfit youngsters.

ACUTE EXERCISE, OXIDATIVE AND INFLAMMATORY INJURY IN TYPE 2 DIABETES

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Diabetes is associated to oxidative injury and inflammatory process. Physical activity, which is part of diabetes treatment, increases free radicals formation and, in counterpart, improves antioxidant defenses. Nevertheless, little is known about the effects of acute exercise on the oxidant and antioxidant system of type 2 diabetics. This study aimed to assess the effects of acute exercise on oxidative stress and inflammatory markers in type 2 diabetic. This study was approved by the ethics committee of HCPA-UFRGS (06252) and all patients signed a consent form. Thirty type 2 diabetic patients (age = 50.57 ± 6.28 years; years of disease = 6.0 (1.0 – 25.0); weight = 74.88 ± 9.99 kg, height = 162 ± 0.94 cm, body fat = 33.36 ± 9.34%; VO2peak = 23.96 ± 7.71 ml.kg⁻¹.min⁻¹, maximal workload = 140 ± 42.35 W and Antf = 16.23 ± 36 ml.kg⁻¹.min⁻¹) without complications took part in this study. In the first test, a progressive cycling protocol, in which initial workload was 25 W with an increment of 25 W per minute, was used to determine the individual’s VO2peak, aerobic threshold (AeT), and anaerobic threshold (AnT = 16.23 ± 36 ml.kg⁻¹.min⁻¹) and average power (25 repetitions at 180°.sec⁻¹) without complications took part in this study. In the second test, that was performed one week after the previous visit, patients performed a submaximal cycling exercise at an intensity based on the oxygen uptake of the anaerobic threshold. In the second test, that was performed one week after the previous visit, patients performed a submaximal cycling exercise at an intensity based on the oxygen uptake of the anaerobic threshold.
The prevalence of obesity was 31-38% in males (n=16) and 17% in females (n=12) using IOTF and CDC age- and gender-specific BMI cut-offs. Children (7.43 yrs ± 0.5 mths). Percentage body fat (%BF) was calculated using the equation of Siri (1961). The BMI results of participants were employed to examine the weight profiles of 28 children aged 7 - 8 years from a socio-economic disadvantaged primary school.

This study aimed to investigate the weight profiles of children aged 7 - 8 years from a socio-economic disadvantaged primary school.

Body mass index (BMI), waist circumference and skin fold thickness at four sites were employed to examine the weight profiles of 28 children (7.43 yrs ± 0.5 mths). Percentage body fat (%BF) was calculated using the equation of Siri (1961). The BMI results of participants were classified using the International Obesity Task Force (IOTF) devised by Cole et al. (2000) and the CDC growth charts (CDC, 2000a). The prevalence of obesity was 31-38% in males (n=16) and 17% in females (n=12) using IOTF and CDC age- and gender-specific BMI cut-off points respectively. Using the IOTF cut-off points and CDC standards, the level of overweight was 44% in males and 37% in females. A significant difference was found between 7 and 8 year old males for %BF (P<0.05). A strong relationship existed between BMI and %BF (r=0.86, P<0.01) suggesting that BMI may not be a poor index of body fatness in socio-economic disadvantaged children.

The current investigation contributes to the limited body of knowledge available concerning the weight profiles of Irish children and illustrates that children of this socio-economic disadvantaged school, especially males, have more adverse weight profiles than children from past national and international data. The current investigation contributes to the limited body of knowledge available concerning the weight profiles of Irish children and illustrates that children of this socio-economic disadvantaged school, especially males, have more adverse weight profiles than children from past national and international data.

Characterization of a seven minutes aquatic exercise maximum effort and health risk determination


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Literature on hydrogymnastics is scarce and has been situated mainly on the estimation of aerobic performance indicators. According to the guidelines of the ACSM (Haskell et al., 2007) healthy adults need moderate-intensity aerobic physical activity. Anaerobic performance development as been neglected in fitness field without any sustained reason. Apparently, this kind of efforts still needs to be studied and possible health risks associated to it should be assessed. The aim of the present study was to characterize a long effort peak and detect possible health risk factors associated with it. Ten healthy women (36.3±6.1 yrs) experienced in hydrogymnastics participate in the study. Exercise protocol consisted on a 3 min warm up (level 11 in Borg’s 6 to 20 Rate of Perceived Exertion (RPE) Scale), followed by 5 min of aquatic exercise of moderate intensity (13 to 15 in Borg’s RPE scale), and a peak effort (18 to 20 in Borg’s RPE scale) of 7 min duration. Rest HR values (POLAR Vantage NV™) were obtained both on land and in water and during exercise. Blood pressure (BP) was evaluated at rest and after exercise by experienced health professionals using a sphygmomanometer and a stethoscope. Mean BP was also calculated using systolic (SBP) and diastolic blood pressure (DBP) [MBP=1/3 (SBP-DBP)+DBP] and used as a health risk factor. Blood lactate concentration (L.0-I) was determined at rest and after exercise (LactatePRO). Due to the lower number of subjects studied, both non-parametric Wilcoxon test and parametric Paired Samples T-Test were applied to data. The level of significance was established on 5%.

Differences obtained through both statistical procedures led to the same results. HR rest values were significantly lower on water (69.9±11.60 bpm) comparatively to land (75.7±11.63 bpm). Peak and mean HR values of the 7 min peak were 185.3±11.54 and 179.9±10.81 bpm, respectively. After exercise systolic blood pressure was significantly higher (mean difference of 26.40±15.02 mmHg) and diastolic blood pressure was significantly lower (mean difference of 21.3±8.5 mmHg) than in rest. The same MBP was observed in rest (88.3±12.22 mmHg) and after exercise (83.4±14.41 mmHg), showing a lower cardiovascular risk associated to an exercise performed at maximum intensity during a seven minutes period. Lactate values were significantly higher than in rest (0.4±0.1 mmol/l-I) comparatively to rest (0.8±0.1 mmol/l-I) and showed the high level of participation of the anaerobic metabolic pathway during the 7 min peak. BP and L.0-I results combined leads to the conclusion that anaerobic exercise could be safely used in hydrogymnastics with healthy subjects.

References.
Human health depends on the level of physical maturity and activity which is established in childhood and youth. The best opportunity to prepare the majority of people to live physically active, healthy lives is through sports. Regular physical exercises and participation in various physical activities influence the functional state of organism favourably. Physical inactivity is one of the major risk factors for fatness, cardiovascular diseases, type 2 diabetes, and certain cancers (I). The recognition of the importance of regular physical activity for physical fitness has led to an increased interest in the study of different aspects of physical activity. The aim of the work was to compare sport activities of different age Latvian primary and basic school students. The questionnaire of Latvian primary school (4th grade) students and basic school (6th and 8th grade) students about their sport activities and interest about sports was carried out. The results of investigation showed that the most active lifestyle have 6th grade students. 17% of 6th grade students go into sports more than 8 hours in a week, 34% of 6th grade students go into sports 4-8 hours in a week, 23% of these students go into sports 2-4 hours in a week, 16% of 6th grade students go into sports 1-2 hours in a week and 10% of 6th grade students don’t participate in regular sport activities. The activities of 4th grade students and also 8th grade students are lower than 6th grade students. The majority of 4th grade students go into sports 1-2 hours in a week (40%) or 2-4 hours in a week (35%) or 1-2 hours in a week (21%). 30% of 4th grade students, 38% of 6th grade students and 35% of 8th grade students regularly train in separate branch of sports. The greatest number of students who go in for sports in order to reach high results in separate branch of sports are in 6th grades. Most of all students among boys as well as girls are going into basketball. The most popular branches of sports among boys are sport games (basketball, football and hockey). Rather many boys go into various branches of wrestling. Among girls popular are such branches of sports as basketball, volleyball, swimming, sport dances and aerobics. The main factors why students go in for sports are improvement of health, necessity to sustain good physical state and they are fascinated by the process of going in for sports. For many basic school students sport is the most important hobby. The main factor, which doesn’t allow students to go in for sports more than they do it, is a lack of time. The mission of sport teachers and pedagogues is to increase interest of children and young people about physical activities and sports.

References

TRACKING OF HEALTH-RELATED PHYSICAL FITNESS FROM CHILDHOOD TO ADOLESCENCE: A 4-YEAR PROSPECTIVE STUDY IN BRAZIL
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INTRODUCTION: Epidemiological studies have shown a positive association between health-related physical fitness components and lower risks of mortality in adulthood1,2. Physical fitness is also important in youth. For example adequate levels of body composition and cardiorespiratory endurance are positively associated with health outcomes3. Thus the maintenance of high levels of the health-related physical fitness components throughout the life is desirable. OBJECTIVE: To verify the tracking of health-related physical fitness components from childhood to adolescence. METHODS: Four birth cohorts (1992, 1993, 1994 and 1995) were selected and visited in 2002 and 2005 (ages 7 to 10 years among the youngest and 10 to 13 years among the oldest). Participants were selected from a private school in the city of Londrina - Brazil. The following measurements were taken following standardized protocols: tricipital and subescapular skinfolds, the sit and reach flexibility test, the 1min sit up test, and a cardiorespiratory test of nine or twelve minutes. Based on the results of each test, individuals were classified as sufficiently fit (SF) or insufficiently fit (IF) according to the Physical Best criteria. This criterion takes into account age and gender of the individual. Thereafter, the results of the first assessment (2002) were compared with the later one (2005), comprising four groups: a) SF (first assessment) and SF (fourth assessment), b) SF and IF, c) IF and SF and; d) IF and IF. The McNemar and Kappa (K) statistics were applied to evaluate the tracking of the physical fitness. RESULTS: A total of 375 individuals participated in the study (197 (52.5%) boys). The overall proportion of individuals classified as SF in all tests decreased from 21.1% in the first assessment to 10.4% in the fourth one (p < 0.001) (K=0.31). The health-related component who presented the highest prevalence of IF throughout the study was the cardiorespiratory endurance (67.5% in the first test and 74.1% in the last one). The overall proportion of individuals who changed from SF to IF was much higher than IF to SF (69.6% and 5.1%, respectively). CONCLUSION: A markedly decrease in fitness was observed in this longitudinal study, suggesting that the risk of several adverse health outcomes increased. Thus, interventions aimed to keep or improve physical fitness among children and adolescents are warranted.

References

PREVALENCE OF OVERWEIGHT AND OBESITY IN LEIRIA’S ELEMENTARY SCHOOL PUPILS
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The prevalence of overweight and obesity has shown a worldwide increase in recent years, both considered key factor risks in the development of cardiovascular diseases, a major cause of mortality in developed and developing countries[1]. In recent years several studies have shown a global trend for increasing overweight/obesity in children and youth, Portugal is no exception: one of Europe’s highest prevalences[2], where almost one third of 7-9-y-o(3) and 7-11-y-o[4] are obese/overweight. The aim of this study was to assess the prevalence of overweight and obesity in Leiria’s elementary school students, aged 7-11-y-o.
Data were collected in 2006 in 5 randomly chosen city’s elementary schools, comprising 773 children. Overweight/obesity was assessed according to CDC’s BMI percentile classification and a simple questionnaire was given to the students focusing on 1) school transportation, and 2) type of off-school leisure time activities.

We have found a total percentage of 18.4% overweight and 11.0% obese children, which indicate a prevalence of 29.4% of overweight/obesity. Boys presented a higher prevalence of obese individuals over girls (12.5% vs. 9.4%). Girls had a higher prevalence of overweight/obesity at ages 7 and 9-y-o (36.5% vs. 31.9% and 35.1% vs. 23.6%). On the other hand, boys were significantly more overweight/obese at age 10 (37.1% vs. 15.5%).

Most of the children did not engage in any kind of off-school leisure time activity (67.8%) and only 32.2% did have a regular sports practice. Boys were significantly more engaged in sports practice than girls (38.4% vs. 25.5% p=0.000). Children mainly use motorized school transport (67.2%) and only about a third walked to/from school (31.5%). No association was found between overweight/obesity and type of school transport use.

These results on overweight/obesity are consistent with Padez et al. (2004) and Lobstein et al. (2005), school transportation cannot be regarded as a single factor to promote an increase in physical activity and prevent overweight/obesity.[5]

References.


PREVALENCE OF OVERWEIGHT AND OBESITY IN LEIRIA’S 2ND GRADE SCHOOL PUPILS

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The economic burden of obesity on total health care costs ranges from 2.7%-underestimated[1] and in the USA it is expected to increase to 20% and 25% by 2020 and 2030[2]. In Portugal, obesity costs have been steadily increasing since 1996 from 396.7 M to 497.3 M euros in 2002[3]. 4) Obesity is a major risk factor for cardiovascular diseases and is highly associated to sedentary lifestyle patterns. Portuguese citizens show the highest rate of sedentary lifestyle all over the European Union (70%[5]) and a high prevalence of overweight/obesity (OW/O) both in youth and adults. Adult obesity can be linked to early OW/O, 7) so primary prevention plays a central role in reducing the impact of this epidemics.

The purpose of this study was to assess the prevalence of overweight and obesity in Leiria’s 11-13-y-o. Data were collected in 2007 in 4 randomly chosen city’s 2nd grade schools, comprising 567 children. OW/O was based on Cole et al. [8] BMI classification and a simple questionnaire was given to the students focusing on 1) school transportation, and 2) physical activity over 20 min a day (PA20min). Waist circumference (WC) measurement and shuttle run aerobic power test (VO2) were performed.

The prevalence of OW/O was 28.0%, higher in boys than girls (31.1% vs. 24.9%). Most children use motorized transportation to school (85.8%). Boys were significantly more active than girls (47.6% vs. 29.7%). More PA20min children were normal weight (NW) than OW/O (boys: 72.4% vs. 59.5%, p=0.051; girls: 70.0% vs. 21.0%). OW/O boys and girls had a significantly higher WC than NW subjects (p=0.000). O girls showed a WC over 88cm, which is a cutoff point to define increased cardiovascular risk. Boys had a significantly better VO2 than girls (44.0±15.1 ml.kg.min vs. 40.6±3.71 ml.kg.min, p=0.000). NW children were the fittest [43.4ml.kg.min, 39.9ml.kg.min, 37.6ml.kg.min, p=0.05].

References.


EFFECT OF A SCHOOL-BASED INTERVENTION PROGRAM (KISS) ON CHILDREN’S PHYSICAL ACTIVITY IN DIFFERENT TIME PERIODS OF THE SCHOOL DAY

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Background: Physical inactivity is associated with decreased bone health, fitness and increased cardiovascular disease risk. The school provides an excellent setting to enhance levels of physical activity (PA) since school-based intervention programs can reach many children at early age. Several intervention trials used intervention programs to enhance children’s PA, but only a few of them were successful and assessed PA by objective methods. The aim of this study was to evaluate a school-based PA intervention program by assessing PA objectively during different time periods of the day. Method: 15 schools (n = 340 children) were randomized in the intervention (INT, n = 9) or the control (CON, n = 6) group, stratified by grade (1st vs. 5th grade), living area (urban vs. rural) and by ethnicity (10-30% migrants). The intervention during one academic year consisted of 1. two additional physical education (PE) classes per week adding up to five PE classes per week, 2. several short PA breaks per day during academic lessons, 3. PA homework, and 4. additional playing material for recess. Before, at midterm and at the end of the intervention, PA was assessed by accelerometers over 7 days. Total PA, PA during PE classes, recess, class-time and out-of-school was assessed as mean counts per minute (CPM), time in moderate-to-vigorous (MVPA, 2000-2999 counts) and vigorous PA (VPA, >3000 counts). Half and overall effects of the intervention were estimated using a mixed linear
model with random effects for school and subject and with adjustment for grade and gender. Results: Complete accelerometer data were available for 253 children. Mean CPM of total PA in INT and CON children decreased during the intervention period (CON: -6.4%, 95% CI, -14.7 to 2.7%, INT: -11.1%, CI -17.7 to -4.0%, Pgroup = ns). Before adjusting for school as random factor, there was a significant difference of PA in favour of the INT children for CPM in total PA (half time), during PE and class-time (half time and overall), during recess (overall), for MVPA during recess (half time and overall and class-time (half time) and for VPA during PE, class-time and recess (half time and overall). However, after adjusting for school, the intervention effect was only significantly different for CPM (only overall) and MVPA (half time and overall) during recess in favour of the INT children. Moreover, INT children showed a stronger decrease than CON children in MVPA and mean overall CPM of out-of-school time. Discussion/Conclusion: Before, but not after adjusting for school, the intervention program was effective in positively influencing children’s PA in several day segments which shows the important influence of the school environment and the teachers. Additionally, PA during the school days was compensated during leisure time. We suggest that future PA intervention projects should have a stronger focus on family and out-of-school activities.

COULD EXERCISE BECOME A MEANS TO CONTROL MATERNAL WEIGHT GAIN AND TO PREVENT MACROSOMIA IN WOMEN WITH GESTATIONAL DIABETES?

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Introduction.
Gestational diabetes mellitus is a common complication of pregnancy (represents nearly 90% of all pregnancies complicated by diabetes) (1) and in Spain its prevalence may range up to 12% (2). Gestational diabetes mellitus is associated with gestational and foetal complications. Infants of mother with gestational diabetes are at higher risk of macrosomia and women may suffer the complications associated with delivery of large babies (3).

Aim: Analyze the effect of exercise on maternal weight gain and birth weight in women with gestational diabetes. Analyze the influence of maternal weight gain on birth weight.

Methods.
24 gestational diabetic women participated in the study, 14 in the exercise group (age 33,43±4,33 kg/m^2, previous BMI 28,48±5,18 kg/m^2) and 10controls (34,60±2,84 kg/m^2 previous BMI 27,92±5,36 kg/m^2). The protocol consisted in 3 ses/wk, 35-40 minutes duration and intensity 50-60%HRRmax. Activities included aerobics, tonification, pelvic floor exercises, postural correction and relaxation. Diet treatment was based on pre-pregnancy BMI: BMI<20=38 cal/kg/day; BMI 20-26= 35 cal/kg/day and BMI>27=25 cal/kg/day. Diet included 5 meals a day. The distribution was 40% carbohydrates, 20% proteins and 40% lipids.

Results.
We did not find significant differences between exercise and control group in maternal weight gain (exercise 8,228±5,064 kg vs control 9,660±3,910 kg) nor birth weight (exercise 3060,79±335,029 g vs control 3397,30±297,242 g). In both cases, women from the exercise group presented lower values, but not statistically significant. We must remember the high previous BMI of both groups, and that a lower weight gain in these women is advised (circa 3kg/4). There was no case of macrosomia (>4000g) neither of low-birth-weight (<2500g) in the exercise group, nor in the control one. We did not find a positive correlation between maternal weight gain and birth weight (r= .179).

Conclusions.
Women who exercised had babies with lower birth weight, but always within the normal range; they also had a lower weight gain than the control group but this difference was not statistically significant. Exercise could be used as an adjunctive therapy for gestational diabetic women in order to prevent an excessive weight gain.

References.

HIGH AEROBIC PERFORMANCES MAY BE POSSIBLE PREDICTIVE FACTORS OF ENHANCED ANTIOXIDANT CAPACITIES IN ENDURANCE RUNNERS

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Intense and prolonged exercises may produce a dramatic elevation in reactive oxygen species (ROS) production; this could perturb the fine-controlled physiological balance between the oxidative reactions and antioxidant enzymatic and non-enzymatic cellular systems (König et al., 2001). High ROS levels can cause oxidative chemical attacks to biomolecules, such as membrane lipids and proteins, thus leading to impaired cell function (Halliwell and Whiteman, 2004).

Nevertheless, it is well known that antioxidant protection systems can be modulated by regular exercise, through the activation of redox-sensitive signalling pathways and that the aerobic performance is up-regulated as a function of the training program (Powers et al., 1999); hence, higher maximal oxygen uptake capacities (VO2max) may be a possible predictive factor of improved redox status and better resistance towards pro-oxidative challenges.

The aim of the present study was to analyze the possible correlations among the aerobic fitness and some of the major redox-related parameters in serum of regularly-trained male runners (n=37). In particular, indexes under observations were the total antioxidant capacity (TAC), which provides the overall cumulative effect of all antioxidants, and two of the most commonly used markers of oxidative molecular damage, such as thiobarbituric acid reactive substances (TBARS) and the protein carbonyl content (PCC).

We found that resistance runners with higher VO2max values showed increased total antioxidant capacities and reduced oxidatively-modified protein contents. This seems to suggest that training programs aimed at increasing aerobic performances might improve the antioxidant defences and help to attenuate the ROS-mediated damage to the plasmatic proteins, without affecting significantly lipid peroxidation processes.

Future research should address whether an antioxidant-supplemented diet may be a valid adjuvant in training programs to increase the aerobic fitness of endurance athletes.

References.
The maintenance of appropriate levels of range of motion (ROM) is crucial to the effectiveness in the implementation of the different movements involved in carrying out activities of daily living (Gonçalves, 2007) and consequently to maintain and develop the autonomy of the elderly. So its assessment becomes predominant in the control and evaluation of the programs of physical activity directed towards improving the autonomy of the elderly. The aims of the study were to evaluate lower and upper limb flexibility in aged women to investigate possible correlations between those measures and body mass index (BMI). The sample was integrated by 111 women (mean age = 67.36±5.21 years, weight = 64.45±10.05 Kg, height = 1.54±0.16 m and BMI = 27.28±4.18), performed the chair sit & reach (CSR) and the back scratch (BS) tests. Those tests were used as described by Jones & Rikli (2002). No correlation was found between age and the CSR test and BS tests and between the BMI and CSR test. However, we observed negative correlations between BMI and BS (r = -0.31, classified as medium low by Sigmound, 2004) and statistical significance (p = 0.001<0.05). The mean performance of the women in CSR and BS were 3.15±5.6 cm for CSR and -8.41±10.16cm for BS. We concluded that the subjects that were evaluated did presented a deficit of upper limbs flexibility. Moreover, this deficit increased with the BMI and was not influenced by the age. Therefore, engagement in physical activity programs that perform upper limbs flexibility was advised to the women that were evaluated.

USE OF DIETARY SUPPLEMENTS AND DIETARY BEHAVIOUR AMONG YOUNG PEOPLE WHO EXERCISE AT GYMS

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Background
People who frequent gyms may use particular supplements for many reasons. Differences may exist in the choice of supplement depending on age, gender, or reason for exercise. Moreover many people learn about supplements from unqualified sources. This study examines dietary habits and use of dietary supplements by people who exercise and determines also the source from which these people obtained information.

Methods
A structured questionnaire containing socio-demographic characteristics, questions about supplement types, frequency of their use, dietary behaviours and source of information about nutrient intake was self-administered to a convenience sample of people, 18 y and older, who met inclusion criteria, i.e. attending a gym and exercising at least 4 times per wk at 1 h per session. T-tests, 2 statistic, and ANOVA were used to assess differences. The statistical significance was set at P < 0.05.

Results
The questionnaire was completed by 207 subjects, aged 26.3 ± 9.1, of whom 38.6% were females and 61.4% males. 75.4% had a high education level (≥13 years). 30.1% of the respondents used dietary supplements, without significant differences between females -23.8% and males -34.1% (P=0.06). These persons had been taking them for a mean of 2.5 ± 3.3 years. The four supplements that were taken more frequently by the largest proportion of the participants included: proteins (32.2%), multivitamin and minerals (29.0%), multivitamin (16.1%) and creatine (12.6%). Only approximately a third of participants indicated adhering to a specific dietary regimen, but the weekly frequencies of some foods were analyzed for all respondents.

High-protein intake proved to be significantly associated to supplement use: in particular, eating three days/week fish, eggs, poultry, tuna, milk and dairy products, legumes and nuts was significantly associated with regular supplement use (P<0.01). On the contrary, supplement use was negatively associated with consumne of snacks and bakery products (P<0.01).

Conclusion
The use of dietary supplements was common in both genders. The finding that supplement need is most of ten self-assessed and health professionals are infrequently consulted for supplement information is of concern. Beyond the adoption of a well defined dietary regimen, many supplement users refer unwise and potentially unhealthy food choices.

Gyms, such as those included in this study, need to have available to members qualified health professionals, who can supply accurate and science-based information about dietary supplements and their positive as well as adverse health effects.

COPING AND HEALTH-RELATED QUALITY OF LIFE IN THE ONE-YEAR REHABILITATION PROCESS

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The aim of the present study was to investigate longitudinally the relationships between the self-reported use of different coping strategies and self-reported health-related quality of life (HRQL) in rehabilitators. In particular, we were interested in finding out whether the use of different coping strategies improved one's subsequent HRQL, or whether one's HRQL directed the subsequent choice of a particular coping strategy. The participants (n=116 females, 200 males) were working-aged clients from a rehabilitation centre situated in Central Finland, where they participated in an occupationally oriented medical rehabilitation. The procedure for the rehabilitation lasted one year, including three rehabilitation periods (5 + 12 + 5 days). Self-reported data on coping strategies and HRQL was gathered during the first (Time 1) and last (Time 2) rehabilitation periods. Four sum scores for coping, based on the Coping Inventory for Stressful Situations (CIS-S-21; Endler & Parker, 1990, 1999), were as follows: ‘Task-Oriented’, ‘Emotion-Focused’, ‘Treat oneself’, and ‘Contact a friend’. HRQL was measured using the RAND 36-item Health Survey (Sherbourne & Mazel 1993; Aalto, Aro, & Teperi 1999) where the sum score for ‘Physical HRQL’ included the sub scales of physical functioning, bodily pain, role limitations due to physical health problems, and general health
perceptions. The sum score for ‘Mental HRQL’ included the sub scales of role limitations due to personal or emotional health problems, emotional well-being, social functioning, and energy/fatigue. The path analysis revealed cross-legged associations between an Emotion-Focused coping strategy and Mental HRQL: a high Emotion-Focused coping strategy in Time 1 was linked to low Mental HRQL in Time 2, and low Mental HRQL in Time 1 to high Emotion-Focused strategy in Time 2. Low Mental HRQL in Time 1 also predicted a low tendency to treat oneself or contact a friend in Time 2. High Physical HRQL in Time 1 predicted a low tendency to treat oneself in Time 2. A high tendency to contact a friend in Time 1 predicted a higher Emotion-Focused strategy in Time 2. Thus, HRQL in the beginning of the rehabilitation process was more meaningful for the subsequent choice of coping strategy, than vice versa. An Emotion-Focused coping strategy and mental HRQL formed a vicious circle, which challenges the rehabilitation process to break this down.

References.


Poster presentations (PP)

PP-MB02 Molecular Biology 2

GENETIC TESTING OF CHILDREN FOR IMPROVEMENT OF PHYSICAL EDUCATION IN ELEMENTARY SCHOOLS

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Genetic studies may be applied to the study of factors that underlie human physical performance and are likely to prove very powerful in this regard. Testing of genetic variants can serve diverse purposes, including diagnostics, identification of future health risk, prediction of drug responses, personalized nutrition, and formation, development and manifestation of human physical qualities. It is now well established that regular physical activity reduces morbidity and mortality and exercise is, therefore, used for the prevention and treatment of diverse disease states (Williams et al., 2007). A considerable amount of data confirming the influence of genes on human health-related fitness and physical performance has been accumulated in the recent years (Rankinen et al., 2006, Rogozkin et al., 2007). As such, exploring the genetics of exercise-related traits will not only further develop sport but also allow improving physical education in elementary schools. The purpose of this study was to determine genetic predisposition to sports and to evaluate the risk for development of common complex diseases in pupils. The study involved 242 children (females, n=114, 12 ±0.2 yr; males, n=128, 10 ±0.1 yr) from 6 elementary schools of Surgut city (Siberia, Russia). ACE II/DI, ACTN3 R577X, HIFIA Pro582Ser, PCCIA Gly482Ser, PPARA G/C, PPARG Pro12Ala, PPARG +294T/C and VEGF G-634C gene polymorphisms were determined by PCR-RFLP. Determination of genetic predisposition to sports and risk for diseases’ development was based on the literature data in accordance with results of association studies. We found only 195 variants of genotype combinations (3% of possible 6551 combinations) in a whole cohort of children. In terms of genetic predisposition 39.2% of individuals had high endurance potential; 21.9% of pupils were predisposed to power/strength events; 9.1% of children had a very high risk for development of left ventricular hypertrophy; 24.4%, 22.7%, 13.2%, and 29.8% of children were highly predisposed to type II diabetes, obesity, atherosclerosis, and hypertension, respectively. In conclusion, combining information from several known common polymorphisms allows the identification of population subgroups with markedly differing genetic potentials for practicing sports and risks of developing common complex diseases. This approach may have a role in improvement of physical education in schools and in future preventative measures for polygenic diseases.

References.

EFFECT OF AN 85 KM MOUNTAIN BIKE RACE ON PLASMA C-REACTIVE PROTEIN, INTERLEUKIN-6 AND SOLUBLE INTERLEUKIN-6 CONCENTRATION IN TRAINED CYCLISTS


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Strenuous, prolonged exercise has consistently been shown to increase concentrations of interleukin-6 (IL-6). The effect of IL-6 on biological systems is dependent on the availability of IL-6 receptors, both membrane bound and soluble (sIL-6R) forms. Although much attention has been given to endogenous IL-6 production during strenuous exercise in healthy individuals, few studies have addressed the impact of exercise on sIL-6R levels. Furthermore, physiological concentrations of elevated C-reactive protein (CRP) can increase sIL-6R concentrations by inducing receptor shedding from neutrophils in vitro but this relationship has not been examined in vivo following prolonged exercise. The aim of the present study was to investigate changes in selected inflammatory biomarkers in response to a prolonged bout of mountain bike cycling. Thirteen healthy endurance trained male subjects (mean ±SD, mass 76 (6) kg, age 33 ± 4 years) partook in the study. The subjects cycled a total distance of 85 km over varied terrain with a total climb of 2.6 km. Mean time to complete the course was 375 (35) min and subjects cycled at a mean of 74 (15) % of maximum heart rate. Venous blood samples were obtained prior to, immediately post-race and the morning after the race. Blood samples were analysed for plasma CRP, IL-6 and sIL-6R concentrations. Plasma IL-6 was elevated immediately post-exercise but was unchanged the morning after the event (p<0.05). In contrast, sIL-6R and CRP levels were unchanged immediately post-exercise but were elevated the morning after (p<0.05). CRP was significantly correlated with sIL-6R (r = .80, p<0.05). In summary, we found that strenuous, prolonged mountain bike exercise stimulated a sustained inflammatory response. The novel finding of our study was that elevated CRP was positively related to plasma sIL-6R suggesting an exercise-induced mechanism for its release.
**STRENGTH TRAINING AND LEPTIN RECEPTOR EXPRESSION IN HUMAN SKELETAL MUSCLE**

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Purpose. The aim of this study was to determine if a physiological intervention causing a sustained reduction in plasma basal concentrations of leptin causes an alteration in the protein expression level of its receptors in human skeletal muscle. To achieve the reduction in serum leptin subjects were submitted to a weightlifting training program that reduced whole body fat mass.

Methods. Nine healthy untrained policemen [(mean ± SD), age: 34 ± 4.4 years, height: 176 ± 2.8 cm, body mass: 85 ± 12 kg and percentage of body fat: 23.8 ± 7.5% (DXA)] participated in a 12-week weightlifting training program (3 sessions/week). In each session subjects performed seven exercises (leg extension, press, half-squat, leg curl, bench press, seated rowing, cable triceps extension) in series of 10RM (1st week: 1-2, 2nd week: 2-3, 3rd week: 3-4, and then 4 series until the end of the training program) with 2 min resting periods between series. Prior to and at the end of the training program, muscle biopsies were taken from the middle portion of the musculus vastus lateralis. Serum leptin and serum leptin concentration. These findings are compatible with increased leptin sensitivity after strength training.

Supported by grants from Ministerio de Educación y Ciencia (BFU2006-13784/BFI, IBFU2006-56076-C06-04), and Gobierno de Canarias (PI042005/177).

**GENETIC PROGNOSIS OF CARDIOVASCULAR SYSTEM RESPONSE TO PHYSICAL EXERCISES**

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The renin-angiotensin system (RAS) plays an important role in mediating diverse physiological functions but major contributes to the maintenance of cardiovascular homeostasis in normal and after different stimuli including physical exercise. Angiotensin II (ANG II) considered the main effecter peptide of RAS is produced by angiotensin converting enzyme (ACE) and acts on specific receptors. Whereas most of well-known actions of ANG II such as vasoconstriction and aldosterone release are mediated by the AT1 receptor. ANG II mediates myocyte hypertrophy due to activation of the AT1 receptor as an adaptive response to increased myocardial function. While hypertrophy of cardiomyocytes for the initial as a compensatory mechanism to preserve cardiac function during physical exercise, it becomes a major risk factor for congestive heart failure and sudden cardiac death. AT2 is mediating the opposite effects of ANG II and plays an important role for the regulation of vascular tone and blood pressure. The activation of the nitric oxide (NO)-cGMP pathway via AT2 is less well established than activation via bradykinin and BK2 receptors. Experimental and clinical studies have suggested that D allele of ACE, A allele AGTR2, +9 allele BDKR2 and 4a allele NOS3 are associated with the risk of development of left ventricular hypertrophy (LVH). The purpose of this study was to determine genotype and allele frequencies of ACE (I/D), AGTR2 (C3123A), BDKR2 (-9/+9) and NOS3 (4a/b) alleles and NO3 NOS3 4a/b gene polymorphisms were determined by PCR-RFLP. Statistical analysis using InStat version 3 included the χ2 test for genotype and allele frequencies comparison between Athletes and control subjects. There was no significant difference in AGTR2 and BDKR2 genotype and allele frequencies between groups of athletes and controls. We found that the frequencies of ACE I1 genotype (27.9% vs. 24.2%, P=0.0413) and NOS3 4a/b genotype (32.8% vs. 24.5%, P=0.0013) were significantly higher in athletes than in controls, but the frequencies of ACE I/D genotype (44.7% vs. 49.0%, P=0.0414) and NOS3 4b/b genotype (62.7% vs. 73.1%, P<0.0001) were significantly lower. There was no significant difference in the risk of cardiovascular pathology between groups of athletes and controls. The genetic testing provides prognostic information identifying athletes with the risk of development of disease before the appearance of hypertrophy symptoms and the risk of sudden death. The ability to identify and separate individuals with high-risk LVH from those it provides further information for individual training program.

**NADPH OXIDASE P22PHOX POLYMORPHISM AND SYSTEMIC OXIDATIVE STRESS IN ENDURANCE ATHLETES**


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Even though several studies indicate that genetics may contribute to the systemic redox state, few data are still available on a genetic association between the systemic oxidative stress levels and the performance in aerobic training. An acute bout of exercise increases the production of reactive oxygen species (ROS) through a mechanism involving the NADPH oxidase system. We focused our attention on p22phox, a subunit of the NADPH oxidase that displays some allelic polymorphisms, one of the most important and frequent being the C242T. This polymorphism is known to affect functional activity of NADPH oxidase.

InStat version 3 included the χ2 test for genotype and allele frequencies comparison between athletes and control subjects. There was no significant difference in AGTR2 and BDKR2 genotype and allele frequencies between groups of athletes and controls. We found that the frequencies of ACE I1 genotype (27.9% vs. 24.2%, P=0.0413) and NOS3 4a/b genotype (32.8% vs. 24.5%, P=0.0013) were significantly higher in athletes than in controls, but the frequencies of ACE I/D genotype (44.7% vs. 49.0%, P=0.0414) and NOS3 4b/b genotype (62.7% vs. 73.1%, P<0.0001) were significantly lower. There was no significant difference in the risk of cardiovascular pathology between groups of athletes and controls. The genetic testing provides prognostic information identifying athletes with the risk of development of disease before the appearance of hypertrophy symptoms and the risk of sudden death. The ability to identify and separate individuals with high-risk LVH from those it provides further information for individual training program.
These results are in favour of PPAR-g implication in anti-atherogenic effects induced by physical exercise. Conversely, p<0.05; this response was less evident in the presence of the T allele, both in ethero- and homozygosis. CT response, indeed, was characterized by a two fold increase (mean 2.17 ± 0.35 fold, p<0.05) of urine MPO, whereas in TT genotype no differences or a decrease of the urine MPO concentration were observed (mean 83±33.5 % relative to the basal value). Our results support the influence of genetic component on the athletic performance. p22phox C242T polymorphism may influence both the cardio-respiratory fitness and the inflammatory response to the aerobic training, suggesting a strict association between systemic oxidative stress levels and performance.

**EFFECT OF EXERCISE TRAINING ON PPAR EXPRESSION IN APOE-/- DEFICIENT MICE**

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**Introduction:**

Atherosclerosis and its complications represent the leading cause of morbidity and mortality in the industrialised as well as in the developing countries. Atherosclerosis is a chronic inflammatory disease. Physical exercise significantly reduces atherosclerosis lesions and cardiovascular risk. However, the precise mechanisms are still unknown. Among potential molecules implicated into cardio-protection induced by physical exercise, Peroxosome Proliferator-Activated Receptor (PPARs) appears interest. Recent researches suggest PPAR vascular implication in anti-atherogenetic effects. Thus, it has been shown that PPAR-g ligands, such as Thaglitazone (TZDs) significantly inhibited fatty streak formation in ApoE-/- mice. We assessed the hypothesis that exercise training reduce atherosclerosis in ApoE-/- deficient mice by increased expression of PPAR-g in endothelial cells in response to shear stress exerted by increased fluid flow in response to exercise.

**Methods:**

Male mice for the distribution of ApoE gene (ApoE-/-) and normal C57Bl/6J mice as control, month of age, were used. ApoE-/- mice were fed with a high fat diet and were divided into three groups: the exercise group (ApoE-/-ex) underwent exercise training (60min swimming, 5 time/week) for 13 weeks, sedentary group (ApoE-/- sed) groups without exercise, and last group ApoE-/-ex + BADGE, this group were treated with exercise and an antagonist of PPAR-g Bisphenol A-diglycide ether. C57Bl/6J mice were used as control. They were divided into two groups control exercise and control sedentary.

**Results:**

Atherosclerotic lesions in ApoE-/- deficient mice were significantly decreased in ApoE-/- mice treated with swimming for 13 weeks compared to the group without the exercise. In contrast, exercise in ApoE-/- mice supplied with BADGE can't suppress atherosclerotic lesions. Moreover, exercise increase expression of PPAR-g in mice undertaken exercise. Interestingly, expression of PPAR-g in vascular wall is conversely correlated with wide lesions in ApoE-/- mice.

These results are in favour of PPAR-g implication in anti-atherogenic effects induced by physical exercise.

**MECHANICAL PRESSURE ACTIVATES THE GLUCOSE METABOLISM AND MAPK SIGNALING IN L6 SKELETAL MYOCYTES**

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**BACKGROUND:** When skeletal muscle contracts during exercise and/or physical activity, the inner pressure elevation is generated in muscular tissues. Ballard et al. reported that intramuscular pressure of soleus muscle during walking exhibited approximately 180 mmHg (1). In addition, we previously reported that pressure stimuli without deformation of cell shape enhanced glucose uptake and energy metabolism in L6 myoblasts (2). However, biochemical effects of pressure stimuli in skeletal muscle cells are not yet well characterized. The purpose of the present study was to examine the effects of mechanical pressure on regulatory factors for the glucose metabolism and on MAPK intracellular signaling in L6 skeletal myoblasts.

**METHODS:** L6 myoblasts were cultured in 10-cm dishes with Dulbecco’s modified Eagle’s medium containing 5% fetal bovine serum and 1% penicillin-streptomycin solution. The cells were incubated at 37°C in a humidified 5% CO2 atmosphere. Atmospheric pressure at 160 mmHg for 3 hours was applied to the cells by using an original pressure loading apparatus (2). To raise internal atmospheric pressure of the apparatus chamber, a humidified 5% CO2 atmosphere was pumped in until the pressure reached 160 mmHg. The L6 cells were maintained under this pressure at 37°C. Protein and mRNA expressions were analyzed by using immunoblotting and real-time RT-PCR, respectively.

**RESULTS:** Compared with the non-pressurized cells, phosphorylated AMPK and GLUT4 in the plasma membrane were increased approximately 1.6- (p<0.05) and 1.7-fold (p<0.001), respectively, in the pressurized cells. Although mRNA expression related to the glucose metabolism (PGC-1, NRF, mTFA, FAT/CD36) was not altered by pressure, GAPDH mRNA increased 1.6-fold in the pressurized cells compared to that in the non-pressurized cells. Pressure application increased phosphorylation of ERK (1.7-fold, p<0.001) and JNK (1.4-fold, p<0.05), but not that of p38 MAPK.

**CONCLUSION:** These findings demonstrated that transient mechanical pressure partially activates the glucose metabolism and that the effects of elevating pressure at 160 mmHg are attributed to ERK and JNK signaling in myoblasts. Moreover, it was suggested that mechanical pressure has some effect on adaptive cellular responses.

This research was supported by the Grant-in-Aid for Young Scientists (B) 17790165 and the Grant-in-Aid for Young Scientists (B) 19700525Sof the Ministry of Education, Culture, Sports, Science and Technology of Japan.

**References:**

ASSOCIATION OF MYF6 (MYOGENIC FACTOR 6) GENOTYPE WITH MUSCLE SIZE PHENOTYPE AND HYPERTROPHIC EFFECT IN MEN

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Myogenic factor myf6 belongs to the transcription factor family and regulates embryonic myogenesis. Myf6 plays an important role in the maintenance of fully-differentiated myofibers and in muscle regeneration in adults. Myf6 has been identified as an additional factor of potential importance for muscle hypertrophy and as a possible regulator of fiber type transitions [1]. We have previously shown the C964T MYF6 gene variant (rs3121) to be associated with elite athletic performance [2].

The purpose of our present investigation was to examine the association between C964T MYF6 polymorphism and muscle phenotype and changes in muscle size after 12 weeks of intensive physical training in Caucasian males.

Our study was designed within a large and detailed 'Lichfield Bone Study'. Magnetic resonance imaging (MRI) of skeletal and muscle phenotype of the lower limbs of young men aged between 17 and 22 years was performed. The measurements were repeated again at the end of a structured intensive twelve-week period of physical training involving mixed strength and endurance training. MRI image analysis was carried out using CMR-Tools. The data for baseline muscle cross-sectional area (CSA) of m. vastus lateralis of 550 subjects and muscle CSA of the 333 subjects who completed the training was obtained. Values are presented as average value of left and right leg. Genotyping was performed by polymerase chain reaction and restriction fragment length polymorphism analysis. Baseline CSA was significantly associated with MYF6 genotype. The CC homozygotes showed smaller muscle CSA compared with heterozygotes and TT homozygotes (CC: 1413.11±262.40 mm² vs. CT+TT: 1482.71±254.72 mm²; P=0.02).

In conclusion, our data in a large sample size show that men with the T allele in MYF6 have greater muscle size. These results suggest that polymorphism in MYF6 gene is one of the factors that contribute to observed variance in muscle phenotype. However further investigations on MYF6 genotype are advocated.

References.

Key words: gene polymorphism, MYF6, muscle phenotype

ACTN3 POLYMORPHISM AND MUSCLE SIZE PHENOTYPE IN MEN

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Alpha-actinin-3 (ACTN3) is a myofilament protein expressed in fast-twitch glycolytic muscle fibers, and an R577X polymorphism exists in its gene. It is reported that homozgyosity for the nonsense X allele results in loss of the protein expression [1] and impaired muscle performance, and that the X-allele may under-represent in elite sprint and strength athletes [2, 3].

The aim of the present study was to investigate the association of the ACTN3 R577X variant with muscle phenotype and changes in muscle size in a longitudinal study of male Caucasian army recruits with 12 weeks of intensive physical training.

Using magnetic resonance imaging (MRI), muscle cross-sectional area (CSA) of m. vastus lateralis was measured in 555 subjects prior to training, with repeat measures available in 338 (age 19.9±2.3; height 177.7±6.3; weight 73.2±9.8). Genotyping was performed by polymerase chain reaction and restriction fragment length polymorphism analysis. There was no significant association of ACTN3 R577X polymorphism with baseline muscle size but there was a non-significant trend for higher muscle CSA to be associated with the R-allele (RR - 1488.9±18.2 mm², RX - 1466.7±16.9 mm², XX - 1452.0±16.9 mm²; P=0.45).

In conclusion, ACTN3 genotype is not associated with skeletal muscle CSA in young males, nor with the scale of the hypertrophic response.

References.

THE POWER OF ACE DELETION (D) ALLELE TO THE CHARACTERISTICS OF PROFESSIONAL ATHLETES IN LITHUANIA

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Human angiotensin-1-converting enzyme (ACE) gene was one of the first genes to be associated with human physical performance. Alu insertion II and deletion (D) polymorphism (I/D polymorphism) in the ACE gene is involved in various pathophysiological conditions related to endurance. Nevertheless, the results of this I/D polymorphism are still inconsistent across studies and populations. In the present study, ACE gene I/D polymorphism was investigated in 561 Lithuanian professional athletes representing three functional groups (endurance (N=71), strength and speed (N=59), and team sports (N=431)), as well as in 174 samples from general population of Lithuania. Genomic DNA was extracted from peripheral blood leukocytes. Genotyping for ACE I/D polymorphism was performed using polymerase chain reaction (PCR) and genotypes were visualized on agarose 2% gel. Genotypes for athletes were identified as I/I (24.8%), I/D (47.2%) and D/D (28%) and in the population samples as I/I (24.1%), I/D 38.5% and 37.4% (P=0.004). Statistically significantly higher D allele frequency was found in endurance group (P=0.002), and in team sports group (P=0.002) in comparison to strength and speed group results, contrary to the prevailing data from other studies showing association of endurance with I allele. This might be as well due to the fact that D allele frequency appeared to be more frequent in the general population of Lithuania (60.4%), in comparison to the majority of other European populations (30-50%). The results of the present study imply that the role of ACE gene I/D polymorphism in athletic performance is not straightforward and can be masked by other genetic and non-genetic factors.
NO ASSOCIATION BETWEEN ACE INSERTION/DELETION POLYMORPHISM AND AEROBIC POWER IN BRAZILIAN WOMEN

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Aging is a dynamic and progressive process in which occurs physiologic modifications that induces a progressive loss in individual’s environment adaptation capacity. Among these modifications, there is a decrease in cardiorespiratory capacity, an increased risk of the development of cardiovascular diseases, and a decrease in quality of life. Aerobic power is influenced by environmental and genetic factors, and it could be associated to angiotensin converting-enzyme [ACE] gene, which codifies the ACE, a component of the rennin angiotensin system. Therefore, this study had the purpose of verifying the association between ACE genotype insertion/deletion IDI polymorphism and the phenotype of aerobic power (VO2peak) in 189 Brazilian elderly women [65,84 ± 4,94 yrs]. Physical activity level was assessed by the International Physical Activity Questionnaire (IPAQ). Also, a questionnaire was applied for sample characterization. Body composition was assessed by DXA and aerobic power was determined by indirect calorimetry during a maximal graded exercise test (GXT) using a ramp protocol with mean duration time of 9 minutes. Genomic DNA of high molecular weight was extracted from the blood leucocytes by salting out method and ID polymorphism was identified by PCR followed by a confirmatory-PCR. An ANCOVA was used to verify the differences on VO2peak among ACE genotype groups. Age, fat free mass, and percent body fat were used as covariates. The ID polymorphism genotype frequencies found were in agreement with the expected for Hardy-Weinberg’s equilibrium, although significant differences on aerobic power were not observed among II, ID and DD genotypes (p = 0,349). In conclusion, there is no association between ACE gene ID polymorphism and the phenotype of aerobic power (VO2peak).

ASSOCIATION BETWEEN APAI POLYMORPHISM OF THE IGF-2 GENE AND BONE MINERAL DENSITY IN ELDERLY BRAZILIAN WOMEN

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Bone mineral density (BMD) is a phenotype which undergoes variations with aging. One of the causes of these alteration is the decline of anabolic hormones such as insulin-like growth factor 2 (IGF2), hormone that influences muscular mass and BMD. Previous studies have reported that IGF-2 is associated with BMD, however, the findings was limited only to children and young adults. Thus, there is a lack of reports about the interactions of BMD with this polymorphism of the IGF-2 gene in elderly. Therefore, the aim of this study was to examine the association between the ApaI polymorphism of IGF-2 gene and BMD in Brazilian elderly women. This study was approved by the local institution committee board [proc. N. 014 2007] and after that, 252 women with mean of age 66,94 ± 5,59 yrs; 66,40 ± 13,24 kg of body mass, 153,21 ± 6,69 cm of height and 28,22 ± 4,85 body mass index (BMI) volunteered to participate in the present investigation. Assessment of femoral neck, trochanter, Ward’s triangle, lumbar spine (L2-L4), hip and whole body BMD was performed by Dual Energy X-ray Absorptiometry. High molecular weight DNA extraction was performed by Salting out method (Miller et al., 1998) and genotype was determined by polymerase chain reaction (PCR) and restriction fragment length polymorphism (RFLP). It was conducted an one-way analysis of variance to determine differences in BMD sites among genotype groups. The significance level was established at p < 0,05.

Replacement of androgens has been shown to significantly reduce the myosin heavy chain (MHC) IIB protein expression in skeletal muscle of orchiectomized male rats. Based on this finding, the aim of the current study was to investigate the expression of genes in skeletal muscle (M-gastronemius) of female ovariectomized rats (OVX) in response to the treatment with estrogen receptor (ER) agonists and to assess the combinatory effects of high intensity running exercise and hormonal status. The expression of MHC and insulin receptor substrate-1 (IRS-1), a protein involved in the regulation of glucose uptake in skeletal muscle, were analyzed as representatives of structural and metabolic genes. OVX Wistar rats were treated with estradiol (E2) and the phytoestrogen genistin (Gen) or were fed an isoflavone (Phyto) enriched diet. Silverstain and Western Blot analysis was used to determine protein expression levels of IRS-1 and MHC IIB. Results show that the absence of female sex hormones in OVX rats and the substitution with E2 both have the tendency to change the expression pattern of MHC IIB. However, a 3-week period of high intensity treadmill running exercise induced a shift in the expression of MHC IIB towards higher levels of expression in skeletal muscle of exercised SHAM, Phyto, E2 and Gen rats relative to OVX animals. In OVX rats, the expression levels of IRS-1 are repressed after application of E2 and GEN suggesting that parameters involved in the regulation of glucose uptake are affected by the hormonal status. The combined effect of training and hormonal status on IRS-1 expression is currently under investigation.

Collectively, results of the study suggest that female sex hormones affect gene expression patterns in female skeletal muscle. The expression patterns of structure-related genes like MHC and genes involved in glucose metabolism are regulated by E2, Gen and Phyto (ER-agonists). This finding may have relevance with respect to the question whether menopause and hormone replacement therapy affect functional and metabolic diseases like sarcopenia and the metabolic syndrome. In addition, a combination of training, hormone replacement and nutrition may be a functional prevention concept for post-menopausal women.
CHANGES IN SKELETAL MUSCLE GENE EXPRESSION AND PROTEOLYSIS ARE INDUCED BY THREE DAYS OF UNLOADING

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Skeletal muscle atrophy evident after muscle disuse, unloading or spaceflight, is the result of decreased protein content, as a consequence of decreased protein synthesis or increased protein breakdown or both. These processes require signalling through the PI3K-Akt-mTOR and ubiquitin-proteasome pathways. This particular study assessed the effects of short-term unloading on muscle contractile proteolysis rate, and further whether PI3K-Akt-mTOR and ubiquitin-proteasome pathways are activated soon after withdrawal of weight bearing.

Methods: Muscle biopsies were obtained from mm vastus lateralis and soleus of eight healthy men prior to and following three days unilateral lower limb suspension (ULLS). Samples were analyzed for mRNA levels of IGF1, Caspase-3, Calpain-2, Foxo1A, Foxo3A, Atrogin-1, MuRF-1 and 4E-BPI. Myostatin were quantified in combination with protein measurements of Akt, Foxo1 and 3, p38 and mTOR. Also, using microdialysis interstitial samples were taken from mm vastus and analyzed for levels of 3-methylhistidine (3-MH).

Results: The 3-MH concentration following ULLS was 44% higher (p<0.05) than before ULLS. Atrogin-1, MuRF-1 and 4E-BPI mRNA increased (p<0.05) after ULLS in mm vastus lateralis but not in mm soleus. Myostatin increased (p<0.05) in both muscles. Total amounts and phosphorylation of Akt, Foxo1 and 3, p38 and mTOR were unaltered (p>0.05).

Conclusion: These results suggest 1) that proteolysis of myosin and actin occurs and that Atrogin1, MuRF1, 4E-BPI and Myostatin are pretranscriptional regulated in human skeletal muscle within three days of ULLS. Given that neither signalling pathway was altered, it appears that other pathways stimulated Atrogin1 and MuRF1 transcription and 2) the difference in gene expression pattern across mm soleus and vastus lateralis infers that mechanisms controlling muscle size may differ between muscles depending on function and/or phenotype.

INCREASED LEVELS OF HSP27 IN SKELETAL MUSCLE AFTER STRENGTH TRAINING

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Introduction: Hsp27 is part of a diverse family of heat shock proteins (stress proteins) which are involved in cell protection and cell remodeling in response to high force exercise. High force exercise acutely increases HSP27 expression in muscles (2), but the HSP27 response to long-term regular exercise is less studied. However, increased levels of HSP27 are reported in human muscles after 5-8 weeks strength training (1). The purpose of this study was to examine the HSP27 response to 11 weeks of heavy strength training in a leg muscle and an upper body muscle.

Methods: Twenty-five untrained men were randomly assigned into two groups. One group performed 3 sets in leg exercises and 1 set in upper body exercises (3L-1UB), while the other group performed 1 set in leg exercise and 3 sets in upper body exercise (1L-3UB). The subjects performed 3 workouts per week during 11 weeks. Biopsies were obtained from mm vastus lateralis and the upper part of mm trapezius before, after 2 weeks and after the training intervention. After homogenization, the cytosolic fractions were analyzed by a home made ELISA for HSP27 (3). Values presented are means ± SEM, p<0.05.

Results: The levels of HSP27 were significantly increased in both mm vastus lateralis and mm trapezius after 2 weeks (43 ± 12% and 47 ± 11%, respectively). After 11 weeks of strength training HSP27 in mm. vastus lateralis was further increased to 77 ± 16%, while no further increase was observed in mm. trapezius (35 ± 18% over baseline levels). There were no significant differences in HSP27 response between the two training groups in neither mm. vastus lateralis nor mm. trapezius.

Discussion/Conclusion: The main findings were a rapid increase in HSP27 in both muscles. Thereafter, HSP27 levels stabilized with only minor changes observed between 2 and 11 weeks of training in mm. trapezius, but a further increase was observed in mm. vastus lateralis. Training with 3 sets per exercise did not result in a larger HSP27 response than training with only one set per exercise. The observation that the HSP27 response seemed to be larger and more prolonged in mm. vastus lateralis than in mm. trapezius, could be due to the fact that there were only one exercise involving upper part of trapezius (shoulder press) and two exercises involving mm. vastus lateralis (leg press and knee extensions). However, baseline levels of HSP27 tended to be higher in mm. trapezius than in mm. vastus lateralis (18%, p=0.13). Because high force exercise acutely causes an accumulation in HSP27 in the myofibrillar part of the muscle cell (2), we will now analyze the HSP27 changes in this fraction from the obtained biopsies.

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PROTEOMIC ANALYSIS ON BLOOD AND SKELETAL MUSCLE FOLLOWING SHORT-TERM INTENSIVE STRENGTH TRAINING IN HUMAN

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To investigate muscle proteome involved in exercise training type, we examined change of proteins expression in vastus lateralis by Two-dimensional gel electrophoresis and MALDI-TOF MS. Ten physically active young men (23.4±3.2yr, 179.2±3.5cm, 70.1±5.4kg) were trained in two types of exercise (aerobic; n=5/anaerobic; n=5) for 4 weeks. After the third week the exercise type was changed, and all volunteers performed 3 workouts per week during 11 weeks. Biopsies were obtained from mm vastus lateralis and the upper part of mm trapezius by a 10mm biopsy needle for proteomic analysis. The results showed differential pattern of muscle proteins expression to exercise type. Aerobic training changed ten proteins more than 200% from base line. Immunoglobulin heavy chain variable region, myosin heavy chain 1, carbonic anhydrase III, titin, chymosine 12, and fructose-1,6-bisphosphatase 2 were increased whereas pyruvate kinase 3 isofrom, ubiquitin carboxyl-terminal hydrolase, and phosphoglucomutase were decreased by aerobic training. On the other hand resistance training changed eight proteins, KIAA1529, apolipoprotein A-IV precursor, trabeculin-alpha, myosin light chain, and glyceraldehyde 3-phosphate dehydrogenase.

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The findings, therefore, allow to suggest a number of peculiarities of voluntary motor activity and, possibly, a change of inter and intra-muscular coordination on the background of the studied disease.

References.
NEUROPHYSIOLOGICAL MECHANISMS OF LEG MUSCLES EFFERENTS EXCITABILITY CONTROL

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Most researchers study the peculiarities of the spinal control of excitability of leg muscles in the athletes specializing in cyclic sports requiring endurance.

Skiracers and racing cyclists aged 20±0.9, with the height of 175±4.5 cm and weight 68±3.6 kg, who have achieved some results in sports, took part in the research. The used technique to eliciting multisegmental monosynaptic responses (MMRs) of the specified muscles was similar to that suggested, described and used by a group of authors (G. Courtine et al., 2007), with the only difference that in the present study the stimulation was carried out at the T12-L1 level. Reflex excitability of the motoneurons m. rectus femoris, m. gastrocnemius (caput mediale), m. tibialis anterior, m. soleus was investigated. Bipolar surface electrodes were mounted over 8 leg muscles bilaterally on the muscle belly. We placed the cathode over the skin between T12-L1 spinous processes and two large anodes bilaterally over the anterior spine of the iliac crest. Thresholds of each of the researched muscles and the maximal MMRs amplitude were registered.

It was established, that in the skiracers (n=9) reflex excitability of the low threshold efferents of the tested muscles is higher than that in the racing cyclists (n=8). The first MMRs were registered in these athletes at the strength of the current at the 20.1-26.5 V range, whereas in the cyclists the thresholds were revealed at the greater stimulating strength. The threshold reflex motor responses of the right leg muscles in the cyclists are comparable with the test results of the corresponding muscles of the skiracers and are registered at 24.9-26.8 V strength of the current. The threshold strength of the stimulation for the left leg muscles made 33.5-37.6 V, the differences of the results of the skiracers and the corresponding parameters of the right leg are reliable at p<0.05. We can suppose there's a functional asymmetry of working muscles in the racing riders.

The analysis of values of the reflex motor response maximal amplitudes, to a certain degree, specifies great reflex excitability of low threshold shin muscle efferents of the researched subjects. It is necessary to note, that the maximal MMRs amplitude bilaterally m. soleus, m. tibialis anterior and m. gastrocnemius is positively higher in the racing cyclists, than in the skiracers. Besides, it is the cyclists who have big maximal MMRs amplitudes of the left leg m. tibialis anterior, m. gastrocnemius. The results of multi-segmentary monosynaptic testing indicate great reflex excitability of high threshold motor units of m. soleus, m. tibialis anterior and m. gastrocnemius especially of the left leg.

References.

THE STUDY OF PRINCIPLES OF DRAWING MOVEMENT BASED ON THE HIERARCHICAL THEORY OF MOTOR CONTROL

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In motor control studies drawing and hand writing has been studied from many points of view, the main purpose of present study is concerned with an analysis of the rules which suggested by Goodnow and Levien to tested the hierarchy hypothesis. One hundred and fifteen individual's participated in this project. According to their age they were divided in to five groups (four consisted of children, the fifth was adult) and all subjects copied with their right hand. Fifteen designs were presented for each subject. Each subject being given as much time as he wished to draw. The practitioner recorded the direction and sequence of all strokes. Paths on correct copies were then analyzed for observance of rules. Of the seven principles suggested as rules, the fist two deal with starting points, the second two with starting strokes, and the final three with general progressions.

Summing up the observations showed that there has been a significant different between the observation frequencies with expected frequencies about comparison patterns of hand movement with principles has been suggested. In choosing direction hand movements to drawing symmetric shape with ball movement (a movement task for adult group) the result showed a significant statically correlation (r=0.62, p<.01) between the two performances.

In general results have shown that the pattern of hand movement may need to be changed across different configurations of the signs, direction of written(from left to right, or right to left, or even top to bottom) or shape.

LANDING SUCCESS IN FLOOR EXERCISE

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Results from some researches show a rather low successfulness of landings on the competitions (McNitt-Gray, Requejo, Costa and Mathiyakom, 2001; Prassas and Gianikellis, 2002). Subject of this research are salto landings in floor exercise. In our research we will try to describe landing characteristics and find out which characteristics differ successful and unsuccessful landings. We analyzed landings of saltos performed independent or at the end of acrobatic series of saltos (N= 344). Analyzed saltos were performed by all gymnasts (N=97) who were competing in qualifications of European Championships 2004 in Ljubljana. We defined variables according to a theoretical model for the evaluation of salto landings in floor exercise (Marinsek & Cuk, 2007). We found out that 52,4 % of all performed saltos were landing happened when saltos were extremely under rotated (less than 30 deg. before vertical). Even though the most of the saltos were without a landing mistake. Landings were mostly performed in soft landing (64,2 %). Less were performed in stiff landing (32,6 %) and into support on arms (4,1 %). 62,5 % of analyzed saltos were under- and 37,5 % over- rotated. The most large errors and falls at landing happened when saltos were extremely under rotated less than 30 deg. before vertical. Even though the most of the saltos were under rotated the direction of movement after landing was mostly forward (42,7 %) in the same direction as salto was performed. Backward movement was less frequent (16,0 %) and movement aside even less (11,3 %).

References.

INTERCEPTING MOVING TARGETS: USE OF VISUAL INFORMATION PROVIDED BY DIFFERENT VELOCITY DETECTION SYSTEMS

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Visual tracking is the most commonly used visual strategy to extract information from a moving target for interception. In this case, an individual uses the head-eyes system to estimate target velocity, and then organize movements on the basis of the anticipated time of target arrival at the interception point. In a previous investigation, however, Montagne presented preliminary evidence that in catching moving balls an alternative velocity detection system might lead to equivalent or even superior performance in interception. Namely, when their participants kept the eyes stable at the point of ball departure (image-retina system), the rate of successfully grasped balls was similar to that achieved under continuous visual tracking in longer periods of observation, and superior when shorter periods were imposed. These results suggest that different visual strategies could be used in a flexible manner in order to estimate time to arrival of a moving target. At the same time, the extent to which distinct visual strategies can be successfully used to intercept moving targets was evaluated. The results showed that the centrifugal image-retina and head-eyes conditions presented similar results leading to lower temporal errors in comparison to the centripetal image-retina condition. In the kinematic analysis, the same relationship was found, with similar pattern of movements between the former visual conditions - as indicated by initiation time, movement time, initial movement velocity, and frequency of movement corrections -, which differed from the latter visual condition. These results showed that the centrifugal motion of the image from the fovea to the peripheral field in the retina provides as accurate information on time to target arrival as that provided by the head-eyes system in interception tasks. As a conclusion, the visuomotor system seems to be able to successfully use peripheral vision when intercepting moving targets.

References:

FOOTEDNESS IN SOCCER PLAYER CHILDREN: PEDAL PREFERENCE AND PERFORMANCE ASYMMETRY

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Cumulating evidence has shown that functional lateralization is a dynamic component of human motor development, observed both in performance asymmetry and preference between homologous limbs to execute motor actions. An explanation for such a dynamic process of lateralization is that an intrinsic advantage in motor control of one limb over the contralateral one would lead to a seminal lateral preference of limbs use early in development. With further lateralized practice movement control would be improved in the preferred limb, increasing over years interlateral performance asymmetry observed early in motor development. Such an increased performance advantage of one limb would then enlarge its preference for performing motor tasks. As training of motor skills by naive children in the sport context is featured by an emphasis on improving performance with the preferred limb, this constitutes a particularly interesting situation to test this hypothesis. That is, the greater the practice using a single limb the greater the probability of performance asymmetry on a given task, a fact that has been demonstrated by many researchers. In order to test this hypothesis, we evaluated interlateral performance asymmetry in kinematics of kicking a ball for power and preference in children with different amounts of lateralized practice. We compared the following modes of visual behavior: (a) continuous foveal tracking, employing the head-eyes system; (b) stabilization of visual focus at the point of target departure, employing the image-retina system with centrifugal image motion in the retina; and (c) stabilization of visual focus at the point of target interception, employing the image-retina system with centripetal image motion in the retina. These visual conditions were compared in the performance of a task in which participants had to intercept a moving luminous target at the end of its displacement through an electronic trackway. Target velocity motion was varied between trials. The motor action was a 60-cm long forehand drive using a badminton racquet, hitting a ball-like transducer embedded at the end of the trackway. Hitting movements were filmed at the frequency of 240 Hz, and the trackway sets were filmed at a spatial accuracy of 1 cm. The results showed that the centrifugal image-retina and head-eyes conditions presented similar results leading to lower temporal errors in comparison to the centripetal image-retina condition. In the kinematic analysis, the same relationship was found, with similar pattern of movements between the former visual conditions - as indicated by initiation time, movement time, initial movement velocity, and frequency of movement corrections -, which differed from the latter visual condition. These results showed that the centrifugal motion of the image from the fovea to the peripheral field in the retina provides as accurate information on time to target arrival as that provided by the head-eyes system in interception tasks. As a conclusion, the visuomotor system seems to be able to successfully use peripheral vision when intercepting moving targets.

INTERACTIONS BETWEEN IMPLICIT/EXPLICIT LEARNING AND FUNDAMENTAL MOVEMENT ABILITY IN CHILDREN

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This experiment investigated the relationship between fundamental movement ability and implicit/explicit learning conditions in children. The experiment was conducted in two parts; the first consisted of assessing a large group of children with a battery of movement tests. For the second part of the experiment, children whose composite fundamental movement ability score fell in the upper or lower quartiles were invited to attend a laboratory session in which they learned a golf putting skill. A total of 261 primary school students (142 boys and 119 girls) aged 9-12 years (M = 9.74) from three Hong Kong primary schools were recruited for the first part of the study. Seventy-one children were subsequently asked to take part in the second part of the experiment, 45 agreed (25 boys, 20 girls, mean age = 9.80, SD = .59). Low and high ability children were assigned to either an implicit or explicit learning condition. Learning consisted of 300 shots follow-
ing errorless or errorful procedures validated by Maxwell, Masters, Kerr, and Weedon (2001). Following learning, all participants performed a 50 trial retention test, 50 trial secondary task transfer test, and a second 50 trial retention test. Based on previous research, it was predicted that errorful (explicit) learners would experience a drop in performance when required to perform a secondary task whilst concurrently performing the primary motor task. The performance of errorless (implicit) learners was expected to show no negative effects of secondary task load. Additionally, high ability learners were expected to outperform low ability learners in the errorful condition only, performance of high and low ability learners in the errorless condition was predicted to be equivalent. Finally, errorful (explicit) learners were expected to report more technical rules about how they performed the motor task than errorless learners.

The results supported these predictions, both low and high ability implicit learners were unaffected by the secondary task, as were high ability explicit learners. Low ability explicit learners suffered a drop in performance when required to perform the putting task and secondary task concurrently. The results suggest that implicit learning techniques should be applied to children, particularly those with low natural movement ability. Additionally, they suggest that the effectiveness of a variety of learning techniques may only be apparent when demands on attentional resources, particularly working memory, are at their greatest.

References

FREELY CHOSEN PEDAL RATE IS STEADY OVER MONTHS AND LARGELY INDIVIDUAL THAT CONTRIBUTES TO THE DESIGNATION AS A ROBUST INNATE VOLUNTARY MOTOR RHYTHM

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INTRODUCTION
Freely chosen pedalling during cycling represents a voluntary rhythmic movement as for example voluntary finger tapping. Suggestively, such rhythmic movements are largely influenced by central pattern generators that are rhythmically active neural networks located in the spinal cord (Zehr 2005). The steadiness of the freely chosen pedal rate over months is unknown. Therefore, the steadiness and individuality of the freely chosen pedal and finger tapping rates over 3 months was studied by comparing the inter- and intra-individual variation in these two diverse voluntary motor rhythms.

METHODS
Recrerationally active males (n=7, 29±3 years, 186±7 cm, 83±4 kg) who were accustomed to cycling, without being competitive cyclists, participated. All reported bimonthly, for 3 months. Each time, the participant with the index finger of the dominant hand performed 3 min unloaded tapping on the touch pad of a laptop PC and freely chosen tapping rate was calculated. Then, the participant performed a 5-min bout on an electromagnetically braked cycle ergometer. Work rate was 2 W/kg, which corresponds to about 60% of the maximal oxygen uptake. Freely chosen pedal rate was averaged over the last 2 min.

RESULTS
Average work rate during cycling was 167±8 W. Freely chosen pedal rate was constant over the 3 months (p>0.05), averaging 73±15 rpm. The degree of steadiness of each individual's pedal rate over the 3 months was indicated by an average 95% confidence interval (CI) across the participants of 8 rpm, ranging from 5-13 rpm. The individual pedal rates, averaged over the 3 months, ranged from 52-95 rpm. Expressed in percent of the overall average of 73 rpm, individual freely chosen pedal rates ranged from 71%-130%. Freely chosen finger tapping rate was also constant over the 3 months (p>0.05) with an average of 246±57 taps/min. The average CI across the participants was 13 taps/min, ranging from 8-16 taps/min. The individual finger tapping rates, averaged over the 3 months, ranged from 158-322 taps/min, corresponding to 64%-131% of the overall average of 245 taps/min. For both pedalling and tapping, the majority of the CI intervals did not overlap, underscoring the individuality of both motor rhythms.

DISCUSSION AND CONCLUSION
Freely chosen pedal rate was steady and at the same time largely individual over the 3 months, i.e. showing little variance within the participants while considerable variation between participants. This pattern was in striking resemblance to what was found for the freely chosen finger tapping rate. From this, and other results showing the freely chosen pedal rate to be unaffected by separate increases in cardiopulmonary and mechanical load (Hansen 2008), the freely chosen pedal rate is suggested to be a robust innate voluntary motor rhythm, likely under primary influence of central pattern generators.

References
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MOVEMENT TIMING CONTROL IN ADOLESCENTS: EFFECTS OF TASK COMPLEXITY

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Time to initiate movement (TIM) in a coincidence-anticipation task involving different levels of movement complexity was investigated. Two age groups (13-15, 16-18 years) of male and female adolescents performed two serial hand pressing buttons tasks (simple and complex) in a platform coupled to a Bassin Anticipation Timer device. Six trials were recorded for each task. The order of presentation of tasks was counterbalanced across subjects. TIM was analyzed through a 2 (sex) x 2 (age group) x 2 (task) ANOVA. Results demonstrated a sex by age interaction on the complex task. While males tended to initiate movements faster than females in the 13-15 years group the reverse was observed for the 16-18 years group. Results also indicated that subjects took less time to initiate the movement in the more complex task. Individuals anticipated that they would need extra time to perform the task in the more complex condition and consequently reduced the time to initiate the action.
THE RELATIONSHIP BETWEEN THE PREACTIVATION OF LEG MUSCLES AND DROPPING HEIGHT

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Previous studies about a drop jump or hopping reported that the preactivation (PA) of a leg muscle expresses before foot contacts in landing phase. In the movement such as a drop jump or hopping jump, muscle contraction before passive muscle stretch keep much energy to elastic element of muscle-tendon complex. Previous studies consider that PA makes element of preparation for foot contacts and makes a contribution to the next motion. We previously cleared that the electromyographic (EMG) activity of the PA at the time of second landing phase decreased than that of first landing phase in the drop jump (DJ) from 0.3 m. In addition, the EMG activity was same in case of the dropping height of the second landing phase in DJ and landing was the same. These results suggest that the regulation of PA depends on the dropping height. It can be speculated if the DJ height was higher, EMG activity of PA is regulated appropriate for the dropping height. The purpose of this study was to compare the EMG activity of PA in the second landing of DJ using the vaulting board and that in the landing from the same height. Seven healthy males volunteered to take part in the experiments. Subjects performed from a platform onto vaulting board of 0.2 m. They had 10 drop jumps consisted the first landing phase (phase 1) and the second landing phase (phase 2) from a platform of 0.5 m (i.e. drop height was 0.3 m), and 10 landings (L-condition) from the platform of DJ height which was obtained by flight duration. The EMG activities of the m. gastrocnemius, m. soleus and m. tibialis anterior of the right leg were recorded. The EMG signals were recorded using bipolar surface electrodes fixed with a constant interelectrode distance of 20 mm. Joint angle was measured at the ankle using an electromiometer. The time of foot contacts was calculated using footswitch which was placed at sole. All analog signals were converted to digital signals in 1kHz and analysis on a personal computer. After the full-wave rectification of an EMG wave, Root Mean Square (RMS) values 100 ms before landing were calculated among phase 2 and L-condition as the muscle activity of PA. As for the values of RMS, no significant difference was observed between the phase 2 and the L-condition. It is suggested that the preparation by the nervous system for the shock of foot contacts was regulated appropriate for the dropping height. However, the values of RMS in phase 2 showed lower than phase 1 irrespective of the dropping height. It is considered that EMG activity in phase 1 included not only preparation for the foot contacts but also performing the next jump effectively. We considered that the descending input from the upper motor centers involved the regulation of PA. These data suggests that the feedforward adjustments control from the central nervous system at the time of voluntary movements might depend on the dropping height without next motion.

TO SKI OR NOT TO SKI: IS PREVIOUS SKIING EXPERIENCE BENEFICIAL IN FIRST TIME SNOWBOARDERS, AND VICE VERSA?

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Skiing and snowboarding are two popular winter sports, but young people are more attracted by the challenging, dangerous nature of snowboarding (Edensor & Richards, 2007). Nevertheless, youngsters are often advised to learn to ski first, before learning how to snowboard. In literature, there are no experimental studies reported investigating if previous experience in one discipline is transferable to the other. Therefore, 18 physical education students (mean age = 20 yr.), who were naïve to skiing and snowboarding, were divided in a Ski First group (N=9) that learned to ski first and then learned to snowboard or in a Snowboard First group (N=9), that learned to snowboard first and then learned to ski. Six 2-hour sessions in 3 days for each discipline were performed by all participants and performance was measured by the instructor after each session, using a standardized form card. For ski performance, a 6 (sessions) x 2 (group) analysis of variance (ANOVA) with repeated measures on the first factor revealed a significant interaction between sessions and group (F(5,12) = 8.27, p = 0.001, 95% CI = 0.7) and a significant increase in performance during the learning period (F(5,12) = 52.64, p < 0.001, 95% CI = 0.96). Post hoc analysis revealed that skiing performance was significantly better (p < 0.01) in the Snowboard First group after the first session, but no further significant differences between the other sessions were found. For snowboard performance, a similar 6 (sessions) x 2 (group) ANOVA revealed also a significant interaction between sessions and group (F(5,12) = 7.73, p < 0.01, 95% CI = 0.76) and a significant increase in performance during the learning period (F(5,12) = 35.76, p < 0.001, 95% CI = 0.94). The post hoc analysis revealed that the Ski First group performed significantly better after the second session (p < 0.05), but again no significant differences between the other sessions were found.

In summary, previous experience of skiing is beneficial in learning how to snowboard. Similarly, previous experience of snowboarding is facilitative in learning how to ski. However, at the end of a 6 sessions learning period, no significant differences between groups were found, indicating that the experience effect is only applicable in early stages of learning and that participants without experience in the other discipline are able to catch up at the end of the learning period. Therefore, first time snowboarders should not be advised to learn to ski first and vice versa.

References.

TEACHING THE FRONT CRAWL STROKE BY KICKBOARD OR BY VARIOUS AIDS: A STUDY IN YOUNG CHILDREN

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INTRODUCTION
There are contrasting opinions about the suitability of aids in teaching swimming. Authors state that there is no evidence of their effectiveness (1) instead of their influence when new stroke elements are taught (2). But whether aids are used, what sort of them has to be preferred? The purpose of this study was to compare the results of teaching the front crawl stroke by a number of aids or by the only kickboard.

MATERIAL AND METHODS
Two groups of seven 10 years old children, whom equal swimming abilities were previously verified, were taught during nine swim classes program to learn the front crawl swimming. One group (=VAG, Mean±SD, weight 33.1±10.7 kg, high 121.2±6.8 cm) practiced with various aids, such as pull-buoy, kickboard, tubes, gloves. The other group (=KBG, Mean±SD, weight 32.7±8.7 kg, high 125.6±5.9 cm) practiced only with the aid of the kickboard.
THE EFFECT OF TRAINING IN BILATERAL AND UNILATERAL REACTION TIME TASKS ON THE MOTOR CORtical ACTIVITY DURING BILATERAL AND UNILATERAL REACTION TIME TASKS

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Introduction

When simultaneous bilateral movements are introduced in reaction time (RT) task or in strength exertion task, performances are reduced compared to that during single movement conditions. These phenomena were known as "bilateral deficit". The lateral specificity in the effect of bilateral and unilateral training is present in the resistance exercise (Taniguchi, 1997, 1998) but not in the RT task (Taniguchi, 1999). These mechanisms in the training have not yet been clarified. The purpose of this study was to investigate whether the cortical activity during the RT task would be changed with the effect of bilateral and unilateral training.

Methods

Before and after the training session, six right-handed subjects were measured simple RT tasks with isometric abduction of the index finger under three conditions: with the right hand, left hand, and both hands. Each response condition consisted of 2 blocks of 20 trials.

The order of the blocks was randomized. EEG activity was recorded on 21 locations using the 10-20 system. During the preparatory period, EEG was averaged, time-locked to the preparatory signal, under the three task conditions. Electromyographs (EMGs) were recorded with surface electrodes on the right and left first dorsal interosseous muscles. EMG-RTs were measured from the response signal to the onset of EMG. Isometric abduction forces were recorded by force transducers. Subjects were assigned to three groups: bilateral training group (BT), unilateral training group (UT), and control group (C). BT and UT continued the 2 blocks of 10 trials of each RT task, 3 days a week for 3 weeks. C did not train.

Results and Discussion

A two-factor analysis of variance, with two times (before and after) x two sides (right and left) demonstrated that significant reduce in EMG-RTs were found in UT subjects. No change was found in BT and C. It was concluded that the effect of training in RT was observed only for UT as shown in previous studies, but not for BT. The amplitude of contingent negative variation (CNV) on motor cortical area (C3 and C4) just before the response signal, as an index of motor preparation, tended to increase for UT but there are not consistent results. More studies are needed to clarify whether motor cortical activity during the RT task would be changed with the effect of bilateral and unilateral training.

References


IMPACT OF GUIDED AND OPEN LEARNING PROGRAMS ON MOTOR DEVELOPMENT OF MANIPULATIVE SKILLS

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The main objective of this research was to check the impact of guided teaching on the development and learning of manipulative skills (namely, throwing and kicking) in three- and four year old children attending preschool. The sample comprised 145 children, all attending preschool, who were divided into two groups: an experimental group and a control group. In the quasi experimental design that was used, both groups were subjected to a pre-test and a post-test. The experimental groups were subjected to experimental teaching units, aiming at the learning of manipulative skills with the ball, organized into 14 sessions of thirty minutes in two different learning contexts (guided and open), one lasting two months and the other one lasting four. The control group was subjected to no kind of teaching programme whatsoever. In order to compare the quantitative intra-group progress we used the t-test for independent paired samples. On the other hand, the Mann Whitney U-test was applied to compare the inter-group qualitative gains. For quantitative gains we used the t-test for independent samples. When the quantitative gains in both control and experimental groups were compared, no statistically significant differences were observed on throwing skill (t = 62; p = 0.532) and on kicking (t = 41; p = 0.158). Comparing the experimental groups qualitatively, there was progress in the three components of throwing: the actions of the foot; arm (anterior and posterior rotation); arm (humerus), as well as in the following components of kicking: torso and head; action of the leg and control. The results of this re-

References


IN ORDER TO VERIFY THE IMPROVEMENTS OF THE SUBJECTS, A COMPLETE FREE FRONT CRAWL STROKE IN THE FINAL PART OF EACH CLASS WAS VIDEO RECORDED AND SCORED THROUGH A MERS-F SCALE, JUDGING A NUMBER OF KEY ELEMENTS FOR THE STROKE. FOLLOWING ANALYSIS WERE CARRIED OUT: II INTRA-GROUP COMPARISON BETWEEN EACH CLASS AND THE NEXT; III INTRA-GROUP COMPARISON BETWEEN THE FIRST AND THE LAST CLASS; III COMPARISON BETWEEN VAG AND KBG IN EACH CLASS.

RESULTS

In each group significant improvements were found between the first and the last class: VAG, 2nd and 3rd (3.14±0.69 vs. 3.71±0.49 pts, p<0.05), 5th and 6th (4.34±1.27 vs. 7.03±0.85 pts, p<0.02), KBG, 1st and 2nd (2.57±0.53 vs. 3.43±0.53 pts, p=0.01), 2nd and 3rd (3.43±0.53 vs. 4.29±0.76 pts, p<0.03), 3rd and 4th (4.29±0.76 vs. 5.14±0.69 pts, p=0.03), 5th and 6th (5.57±0.79 vs. 6.83±1.44 pts, p<0.04).

In each group significant improvements were found between the first and the last class: VAG, 2nd and 3rd (3.71±0.49 vs. 7.63±0.44 pts, p<0.05), KBG 2.57±0.53 vs. 8.20±0.91 pts (p<0.05). No differences were found in the VAG - KBG comparison (iii) except after the 4th class (4.00±0.82 vs. 5.14±0.69 pts, p<0.05).

CONCLUSIONS

The main objective of this research was to check the impact of guided teaching on the development and learning of manipulative skills (namely, throwing and kicking) in three- and four year old children attending preschool. The sample comprised 145 children, all attending preschool, who were divided into two groups: an experimental group and a control group. In the quasi experimental design that was carried out: i) intra-group comparison between each class and the next; ii) intra-group comparison between the first and the last class; iii) comparison between VAG and KBG in each class.

REFERENCE

search show that the impact of guided teaching on the development and learning of the throwing and kicking skills differs according to the assessment criteria adopted, be it qualitative or quantitative.

**PP-NU03 Nutrition 3**

**THE INFLUENCE OF CAFFEINE AND CARBOHYDRATE CO-INGESTION ON SOCCER PERFORMANCE**

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Independently carbohydrate and caffeine are known to improve certain aspects of athletic performance when ingested before and during prolonged exercise. However, less is understood about physiological and performance outcomes when these compounds are co-ingested during exercise. It is possible that carbohydrate and caffeine may provide additive ergogenic effects. Conversely, this combination could counteract any glycogen sparing benefit or lowered perception of effort. The aim of this study was to examine the influence of carbohydrate–caffeine co-ingestion on the physiological and cognitive aspects of prolonged simulated soccer activity.

Fifteen male competitive soccer players performed two 90-min intermittent shuttle-running trials (LIST), separated by 7 days. Using a randomised crossover design, participants ingested a 6% carbohydrate-electrolyte solution (CES), or a similar solution with 160 mg/kg of added caffeine (CAF). A volume of solution equivalent to 8 ml/kg body mass (BM) was ingested 1 h before exercise and a further 3 ml/kg BM was provided every 15 min during the protocol, a total caffeine dose of 3.7 mg/kg BM. Soccer passing skill (LPST) and countermovement jump height (CMJ) were quantified prior to exercise and every 15 min during the LIST. Sprinting performance, heart rate (HR), blood lactate concentration and the subjective experiences of participants were measured routinely throughout the protocol.

Mean 15-m sprinting time was faster during the CAF trial (P=0.04), over the final 15 min of exercise mean sprint times were CAF 2.48 ± 0.15 s vs. CES 2.59 ± 0.2 s. Explosive leg power was improved during the CAF trial (P=0.03) with CMJ height higher in CAF 52.9 ± 5.8 cm vs. CES 51.7 ± 5.7 cm. HR was elevated throughout the CAF trial (P<0.01), mean HR during the final 15 min of exercise was CAF 170 ± 7 beats/min vs. CES 166 ± 7 beats/min. Ratings of pleasure were significantly enhanced during the CAF trial and no differences were detected in RPE, thirst drive or felt arousal. There were no significant differences in passing skill, blood lactate concentration or BM losses between trials.

The addition of caffeine to the CES improved sprinting performance, countermovement jump height and the subjective experiences of players during 90-min of soccer-related exercise. Differences in performance were apparent during the maximal, self-selected components of the exercise protocol, and the addition of caffeine appeared to offset the fatigue-induced decline in these variables over time. Performance enhancements may have been mediated through caffeine’s central influence on the perception of effort, fatigue and pleasure. Caffeine ingestion did not influence the various components of soccer passing skill that were measured during this study. The addition of 160 mg/kg of caffeine to a well formulated carbohydrate-electrolyte solution may improve soccer performance, without detrimental to fluid balance and other key physiological and perceptual parameters.

**EFFECT OF MILK-BASED PROTEIN/CHO SUPPLEMENT TIMING ON THE ATTENUATION OF EXERCISE-INDUCED MUSCLE DAMAGE**

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Exercise-induced muscle damage (EIMD) leads to decrements in muscle performance, increases in Creatine Kinase (CK) (Byrne and Eston, 2002), and delayed-onset muscle soreness (DOMS) (Nosaka et al., 2002). Protein/CHO supplements have been shown to attenuate EIMD (Byrne et al., 2007), possibly through changes in protein metabolism. The timing of protein/CHO ingestion is critical for changes in protein metabolism (Tipton et al., 2001). Therefore, the purpose of this study was to investigate the timing of milk-based protein/CHO supplementation on the attenuation of EIMD.

Four independent groups of 8 healthy males (age 20 ± 2 yrs, mass 78.5 ± 9.0 kg) ingested either a control (CON), milk-based protein/CHO immediately pre (PRE), immediately post (POST) or 24h post (P24) muscle damaging exercise. Participants completed 6 sets of 10 reps of eccentric/concentric leg flexions on each leg at 1.05 rad/s to induce hamstring muscle damage. Immediately prior and at 24h, 48h and 72h post EIMD participants completed a visual analogue scale to assess general and active DOMS, and performed 6 concentric knee extension/flexions. Venous blood samples were collected at the same time points for the analysis of CK concentrations. No significant differences were observed between groups for general DOMS, active DOMS, CK and peak torque (P>0.05). Effect sizes for DOMS and DOMS (non-dominant) effect sizes were 0.9, 1.6, 0.4, 0.5 and peak torque (non-dominant) effect sizes were 0.8, 0.6, 0.0 and 0.1, respectively.

The data indicates that although there were no significant differences, effect sizes demonstrated a trend towards the attenuation of EIMD with the consumption of milk-based protein/CHO immediately or 24h post muscle damaging exercise.

**References.**


EFFECT OF ESSENTIAL AMINO ACID AND CARBOHYDRATE SUPPLEMENTATION ON MUSCLE TORQUE AND HYPERTROPHY FOLLOWING RESISTANCE TRAINING IN YOUNG MEN

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Resistance training enhances muscle strength and power output in young individuals providing a sufficient nutritional supply of essential amino acids (EAA). In such condition, previous work pointed out an increase in muscle protein synthesis after training [1,2]. However, there is no data available on whole muscle mass increase under such conditions. The aim of the present investigation is to evaluate the increase in skeletal muscle mass and muscle strength following EAA supplementation combined to resistance training program. Twenty-five young active males (mean 24.6 ± 4) performed two sessions of resistance training per week during three months. They were divided into two groups, one group received placebo (PL) and the other group received an EAA supply (EAA). Both groups were further supplied with 15g and 30g of saccharose, respectively. Before training, food questionnaire was collected during 7 days, together with two 24h-urine collection. Maximal strength during squat and bench press exercise were tasked on an isotonic ergometer (Ariel CS 6000) before and by the end of training. Skeletal muscle mass was assessed by anthropometric measurements [3]. A linear regression was obtained between nutritional protein intake and nitrogen balance (P<0.001) together with a positive nitrogen balance of 1.09g protein intake per kg body weight. After training, the mean concentric strength for the two exercises increased by 9.8% (EAA group, p<0.05) and 8.9% (PL group, p<0.05), while the skeletal muscle mass increased by 2.9% and 1.7% respectively (p<0.05). No significant difference for the skeletal muscle mass but also for the strength (p>0.05) was showed between both groups When comparing the normalised strength (initial strength/skeletal muscle mass and the gain in strength, the EAA supplementation tend to be more effective in a “weaker” population [P =0.06]. Similarly, a linear regression tendency (P = 0.06) between the nitrogen balance (g/kg body weight) and the gain in skeletal muscle mass (%) increase was also observed in the PL group.

In conclusion, our study pointed out an increase in skeletal muscle mass in an PL and EAA groups, with no statistical difference between groups. However, the increase in skeletal muscle mass under EAA supplementation appears to be more effective in subjects with an lower initial muscle torque and a lower (or negative) nitrogen balance.

References.

ASSESSMENT OF SUPPLEMENTS INTAKE AMONG POLISH TRIATHLONISTS

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The aim of this study was to recognize the way of supplements and nutrients ingestion as well as drinks intake among triathletes.

Methods: The study was conducted in the north of Poland on the group of 34 triathletes (Athletes A) and 34 non-athletes (Control Ci. Both groups were characterized concerning subjects’ age and sex. The study was a case control study. In each group there were 7 females and 27 males aged 15-25 (average 20 ±5 ±4). Such information as amount and type of meals and supplements intake was collected with usage of questionnaire.

Results: The main reasons for physical activity among athletes were keeping the physical condition (71%) and remaining healthy and fit (44%), while non-athletes pointed physical fitness (67%) and health keeping (38%). Most of subjects used to have only two main meals during the day (A-53%, C-56%). 21% of triathletes and 27% of non-athletes used to have three meals during the day. 32% of athletes declared to have special diet and 57% of them consulted it with their coach. The rest of athletes compiled their diet on their own (29%) or with friends’ help (14%). The most common drink in gr. A was mineral water (86% of athletes drank 3-5 glasses/day), subjects from gr. C tended to drink one glass twice a day (57% of females and 58% of males) (p=0.0001). Subjects from gr. C used to drink much gaseous beverages than those from gr. A (p=0.004). 14% of females from gr. C admitted to drink about 3-5 glasses of gaseous beverages per day, while females from gr. A. A claimed to drink them occasionally (43%) or never (57%). Energetic drinks were more commonly drank by men from gr. A (1-2 glasses/day) comparing to non-training men, who drank them occasionally or rarely (p=0.0044). In gr. A the mostly used nutrients were muscle building nutrients - 52% of males and 29% of females athletes admitted to use supplements. Females intake mainly fat burning supplements, which were to help them in ideal silhouette achieving (71%) and only 29% of men did so as well (p=0.001). 80% of examined subjects from the gr. preferred to intake supplements twice or three times a week especially after the training (90%). Type of supplement was consulted with coach in 88%, 50% of subjects read about the supplement in different sources and 35% heard about it from friends or doctor. 71% of athletes have noticed supplements influence on their health, physical condition and endurance.

Conclusions: Supplements intake among the athletes is different and depends on athletes’ sex. With a view to frequency of supplements intake they should be considered while composing athletes’ diet, which should consist of four meals.

NSI CHECKLIST AND BMI IN THE ASSESSMENT OF THE NUTRITIONAL STATUS OF ALZHEIMER’S DISEASE PATIENTS

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Background. Alzheimer disease (AD) is commonly associated with nutritional disorders which may impair the general health. Efforts should be directed to understand, and assess the nutritional status of demented patients by using simple, non-invasive, easy to administer, patient-friendly, non-expensive screening tools. Objective. To evaluate the Nutrition Screening Initiative (NSI) checklist and body mass index (BMI) in the assessment of the nutritional status of AD patients. Methods. This study included 45 patients (64.4% women, mean age 75 ± 8 ±4 years and mean Mini-Mental State Examination (MMSE) score 12 ± 7 ± 5. Nutritional status was assessed by the NSI checklist and the age-related BMI. Dementia severity was assessed through Clinical Dementia Rating (CDR) and MMSE. Fisher’s exact test was performed to analyze differences among groups. Regarding to dementia severity, 42.2% of patients were rated as CDR 1, 33.3% as CDR 2 and 24.4% as CDR 3.
HYDRATION STRATEGY ON ROMANIAN NATIONAL FOOTBALL TEAM

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AIM
To evaluate the sweating rate and fluid intake habits of the Romanian Football Team players in order to know their hydration behaviors and helps their recovery and performance.

MATERIALS and METHODS
Eighteen players of the Romanian Soccer Team were evaluated by the Gatorade Sports Science Institute (GSSI) during training session before a match for 2008 Europe Championship qualification

Experimental design: The sweat test was performed on September 3 2007, in Bucharest. The average heat index stress (HIS), an indicator of environment stress (radiation, humidity and temperature) was moderate (19.9°C). The total time of testing was 75 minutes, but a group of 5 players finished earlier (45'). During training there was about 2-3 hydration breaks per player. Sweat loss was estimated considering body weight changes before and after training, monitoring fluid intake (Gatorade and water) from the bottles given to each player, and fluid loss through urine. Initial hydration status was tested through urine specific gravity of urine sample taken before exercise. Electrolytes loss in sweat was measure using specific patches.

RESULTS
Thirteen players provided urine samples to evaluate their urine specific gravity. On average the group evaluated presented USG values of 1.020. The sweat rate was 0.7 l per hour, considered a low sweat rate. The players replaced 57% of their fluid loss. Some do not drink and others over drink. In general, players finished their practice with a relative low level of dehydration (0 – 4%). It was also observed that fluid intake was bit higher during than after exercise (452 vs. 300 ml). This is a good hydration habit because potentially helps athletes perform better during training and they become used to drink during exercise. On average, Gatorade intake was higher than water fluid intake was bit higher during than after exercise (452 vs. 300 ml). This is a good hydration habit because potentially helps athletes perform better during training and they become used to drink during exercise. On average, Gatorade intake was higher than water.

EFFECT OF RADIX SALVIAE MILTIORRHIZAE (DANSHEN) ON CHANGES IN BONE FORMATION MARKERS AND HORMONE PROFILES DURING A 15-DAY CYCLING TOUR

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The potential functions of Radix salviae miltiorrhiza (Danshen) include to enhance procollagen synthesis and fracture healing. In addition, Danshen has been used as an alternative medicine in the treatment for various diseases such as cardiovascular diseases, acute pancreatitis, and cancer. Over the past two decades, multi-day cycling tour has become one of the most popular forms of physical activity. Long-term regular physical activity, especially weight-bearing types, has been shown to increase bone mass. On the other hand, acute unaccustomed exercise may have negative effect on bone metabolism. The information regarding multi-day endurance exercise on bone metabolism in previously untrained subjects is still lacking. In addition, it has been shown regular resistance training could increase testosterone and dehydroepiandrosterone sulfate (DHEAS). However, the changes of these hormones during endurance training are still unclear. The aims of this study were to investigate the effect of Danshen on bone formation markers, osteocalcin (OC) and amino-terminal propeptide of type I collagen (PINP), during a 15-day cycling tour in previously untrained subjects. In addition, the effect of Danshen on testosterone and DHEAS will also be examined. Twenty-eight male subjects who participated in Cycling Taiwan 2007 were randomly divided into placebo or Danshen group with 14 in each. The Danshen group consumed 4 pills containing Danshen extracts daily during the tour. The control group consumed the equal amount of pills containing starch. The 2 groups were similar in age, height, and body weight. The tour covered approximately 1100 km in 15 days with 80-120 km per day in most of the days. All subjects were in a free feeding style during the tour. Fasting blood samples were collected in the early morning on day 1 (D1), 5 (D5), 10 (D10), and 15 (D15) during the tour and 7 days after completing the tour (P7). The data was analyzed by 2-way repeated measurement ANOVA. There was significant time effect on testosterone and dehydroepiandrosterone sulfate (DHEAS). The results of this study indicated that Danshen may not have effect on the changes of bone metabolism, testosterone, and DHEAS in during a multi-day cycling tour in previously untrained subjects.
EFFECT OF RADIX SALVIAE MILTIORRHIZAE (DANSHEN) ON CHANGES OF ANTIOXIDANT STATUS DURING A 15-DAY CYCLING TOUR

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The potential functions of Radix salviae miltiorrhize (Danshen) include the elimination of oxygen free radicals and prevention of oxidative stress. It has been suggested that regular exercise could enhance antioxidant defense system. On the other hand, unaccustomed intensive exercise may increase free radical production. Multi-day cycling tours have been gaining significant popularity in recent years. However, changes in antioxidant status during multi-day endurance exercise were still unclear in untrained recreational participants. In addition, most studies on exercise effects only measured the parameters before and after exercise with little or no information on the changes during the training period. The aims of the present study were to investigate the effect of Danshen on changes in activities of antioxidant enzymes and total antioxidant status (TAS) during a 15-day cycling tour in untrained healthy subjects. Twenty-eight male subjects who participated in Cycling Taiwan 2007 were randomly divided into placebo or Danshen group with 14 in each. The Danshen group consumed 4 pills containing Danshen extracts daily during the tour. The control group consumed the equal amount of pills containing starch. The 2 groups were similar in age, height, and body weight. The tour covered approximately 1000 km in 15 days with 80-120 km per day in most of the days. All subjects were in a free feeding style during the tour. Fast blood samples were collected in the early morning on day 1 (D1), 5 (D5), 10 (D10), and 15 (D15) during the tour and 7 days after completing the tour (P7). The data was analyzed by 2-way repeated measurement ANOVA. There were significant time and group effects on glutathione peroxidase (GPX) activity. In the placebo group, GPX activity was significantly lower in D10 comparing to D1. GPX activities remained unchanged during the race in the Danshen group. Both groups showed a significant decrease in GPX activity in P7 comparing to D1. There was a significant time effect on glutathione reductase (GR) activity. In the placebo group, GR activities during and after the tour were similar to D1. In the Danshen group, GR activity was significantly higher in D5 comparing to D1, then return to basal level in D10 and P7. The time effect was also significant on TAS. TAS remained constant throughout the tour but was significantly increased in P7 comparing to D1 in both groups. The results of this study suggested that Danshen may help to prevent the decrease in GPX activity during the multi-day endurance exercise in previously untrained subjects. However, it may not have an effect on GR activity and TAS levels.

UTILISATION OF AN ARMBAND DEVICE FOR MONITORING OF ENERGY EXPENDITURE AND ACTIVITY IN RUNNING AND CYCLING ATHLETES

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INTRODUCTION: Correct quantification of energy expenditure (EE) is of essential importance in the evaluation of an athlete's nutrition status. In the laboratory setting, indirect calorimetry (IC) has been well established as the method of choice for determination of EE. However, portable IC and other methods have - in part severe - limitations regarding its applicability in field settings. The SenseWear Pro armband is a portable device, which combines biaxial accelerometer with measuring skin and near body temperature and galvanic skin response. Due to its simple and inexpensive usability, the armband seems well suited for high-resolution activity monitoring of athletes.

The aim of the present study was to compare the SenseWear armband to other measures of EE both in laboratory and field situations in well-trained athletes.

METHODS: Fifteen male triathletes (30 ± 6 y, 80.7 ± 6.2 kg) wore the SenseWear Pro3 armband (BodyMedia, Pittsburgh, USA) over a period of seven days. Within this time, the athletes performed two standardized exercise bouts, consisting of (a) a treadmill running test with increasing velocity until exhaustion, and (b) bicycle ergometry with increasing power output until exhaustion. During these exercise bouts, VO2 and VCO2 were measured with a Zan 600 (Oberthulba, Germany) spirometer. EE was calculated from IC data using standard equations. Besides these two controlled exercise bouts, athletes were free to train as they desired except for swimming.

Additionally, all subjects filled out a standardized activity protocol (AP) for assessing activity and sleep patterns and approximation of EE.

RESULTS & DISCUSSION: During the running exercise test, armband data was highly correlated to IC data in all subjects (mean r-squared = 0.87 ± 0.05). However, EE approximated by the armband was significantly lower for all running speeds (2.4 to 4.8 m/s; p < 0.01). During the stationary cycling test, there was also a high degree of correlation (mean r-squared = 0.84 ± 0.12), but armband EE was lower than IC data for all steps (140 to 380 W; p < 0.01). Overall daily EE measured with the armband (3607.2 ± 422.8 kcal/d) and calculated from AP data (3433.5 ± 298.9 kcal/d) did not differ (p = 0.21).

As indicated by the much lower EE values during the cycling exercise, the difference between armband and AP values was negatively associated with daily cycling time (p < 0.01). Both sleep and lying time as recorded by the armband were correlated with sleep time from AP (p < 0.01), but only lying time did not differ from self-recorded sleep time (p = 0.39).

The present data indicate that the armband is suitable for use in activity monitoring of athletes in in-field settings. However EE monitoring during exercise - especially with regard to running at great speed or cycling with high power output - seems to require exercise-specific calibration.

USE OF NUTRITIONAL SUPPLEMENTS BY GERMAN ELITE JUNIOR ATHLETES

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INTRODUCTION: Despite the fact that there is little to no scientific evidence on beneficial effects, the use of nutritional supplements (NS) is widespread in the athletic community. Among athletes, the prevalence of supplement use varies greatly depending on age, sport, and level of competition.

Data on NS use among adolescent athletes has been mostly assessed in high school and college athletes. However, this group is not comparable to elite junior athletes, who compete on national and/or international level. To our knowledge, scientific data on prevalence of and motives for NS use by elite junior athletes is lacking. Therefore, the present survey was designed to assess the rate of NS use among a wide spectrum of German elite junior athletes with respect to age, gender, and type of sport. Additionally, the motives for NS use and sources of information and products as well as the awareness of NS contaminations were asked for.

METHODS: A five-page questionnaire was used to assess information regarding the past and present use of NS. The listed supplements included vitamins, minerals, carbohydrate, protein, and fatty acid preparations, sport beverages, other ergogenic aids, isolated com-
pounds, and plant extracts. All junior athletes participating in the monitoring programme of the German Research Centre of Elite Sports were handed the questionnaire. Data from 167 athletes (16.5 ± 3.0 y) was included into the present data analysis.

RESULTS & DISCUSSION: Overall, 133 athletes (74 %) reported the use of at least one NS. Supplement use was significantly higher in older athletes (11-14 y: 75 %, 15-16 y: 76 %, 17-18 y: 75 %, 18-25 y: 97 %; p < 0.05). Among NS users, minerals (84 %), vitamins (75 %), sport and energy drinks (69 %), and carbohydrate preparations (64 %) were most frequently used. Only a small number of athletes reported the use of protein/amino acid preparations (29 %), caffeine (16 %), creatine (6 %), carnitine (6 %) or other ergogenic aids. Major reasons for NS use were health related (77 %), whereas performance enhancement (28 %) and recommendation by others (22 %) were less stated motives. Primarily supplements were obtained from parents (43 %) or by athletes themselves (34 %). NS were mainly purchased in drug-stores (62 %), supermarkets (18 %), and health food stores (17 %). Among all athletes, only 41 % were aware of the problem of supplement contaminations.

These figures demonstrate that NS use is common and widespread among German junior elite athletes, which strongly contradicts recommendations by leading sport federations against supplement use by athletes under 18 years of age. Identification of the spectrum of NS use and motives, and sources of products and information may be helpful in proper nutritional and medical education of these potential future elite senior athletes.

EFFECT OF CONJUGATED LINOLEIC ACID SUPPLEMENTATION ON BODY COMPOSITION IN WOMEN SUBMITTED TO AEROBIC TRAINING

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Conjugated linoleic acid (CLA) is a group of positional and geometric isomers of linoleic acid commonly found in beef, lamb and dairy products. Although recent studies with CLA have been reported to reduce adiposity in animal models, the effects of CLA on body composition in humans are still contradictory. The objective of the present study was to investigate the effects of CLA supplementation associated with aerobic training on body composition. The sample was constituted by 34 female university students, from 17 to 30 years old and BMI > 25 kg/m². Anthropometric measures of body mass, stature, waist and hip circumferences and body composition were obtained before and after eight weeks of conjugated linoleic acid supplementation (3,2g/d) or placebo (4g/d olive oil). The dual-energy X-ray absorptiometry was used to determine body composition and bioelectrical impedance was utilized to measure total body water. Aerobic training was performed in a treadmill, with a frequency of 3 times per week and duration of 30 minutes. For statistical treatment the analysis of variance (ANOVA two-way) for repeated measures was used followed by the post hoc of Scheffé when P < 0.05. There was no statistical significance in BMI, %body fat, fat free mass, bone mineral component and total body water between moments and groups. Both groups reduced significantly waist circumference and waist-to-hip ratio. Even though there was significant reduction of body mass (78,4±7,6 kg vs. 77,5±7,0 kg, P=0,048) and fat mass (34,8±4,9 kg vs. 33,8±4,81 kg, P=0,027) on the CLA group throughout time, there was no significant difference in the change of these parameters between groups. Thus, the supplementation of conjugated linoleic acid did not showed additional effects in the reduction of the body mass and fat mass in young women after eight weeks of study.

THE EFFECTS OF EASTER HOLIDAYS ON BODY COMPOSITION MEASURES IN OBESE GREEK WOMEN

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The purpose of this study was to assess possible body composition changes over a two weeks period during Easter holidays. Twenty five overweight and obese women (BMI = 30.1 ± 0.8 kg/m²) were assessed for body composition changes 5-7 days prior to and a week after Easter day. Body composition measures included body weight, body mass index (BMI), waist circumference, hip circumference, waist to hip ratio and percent body fat. Subjects reported to the lab in the morning, in a fasting state. The measurements were made with the subjects being lightly dressed and by the same trained technician. All measurements appeared elevated after Easter but significant increase (p<0.005) was found in waist (2.0± 2.73 cm) and hip circumferences (1.6± 2.39 cm). Body weight (0.280 ± 1.07 kg), BMI (0.104± 0.418 kg/m²), the percent body fat and the waist to hip ratio (0.140 ± 0.994 % and 0.0055 ± 0.0267) increased following the two weeks of holiday. Seventeen out of the twenty five women (68%) increased their body weight (1.0 3.3 kg), seven women (28%) decreased their body weight (-0.04 -0.85 kg/m²) whereas in one woman (4%) the body weight did not change. The mean increase in the body weight of the women who increased their body weight was 0.79 kg whereas nine of them (36% of the total population) increased their body weight by more than half a kilogram. The mean increase in women that gained more than half a kilogram was 1.23 kg. Seventeen out of the twenty five women (68%) increased their BMI (0.04 1.32 kg/m²), seven women (28%) decreased their BMI (-0.04 -0.85 kg/m²) whereas in one woman (4%) the BMI did not change. Eighteen out of the twenty five women (72%) increased their waist circumference (1 7 cm), three women (12 %) decreased their waist circumference (-1 -3 cm) whereas in four women (16%) the waist circumference did not change. Sixteen out of the twenty five women (64%) increased their hip circumference (1 8 cm), three women (12 %) decreased their hip circumference (-1 -2 cm) whereas in six women (24%) the hip circumference did not change. Fifteen out of the twenty five women (60%) increased their percent body fat (0.5 2 %), four women (16 %) decreased their percent body fat (-1 -2 kg) whereas in six women (24%) the percent body fat did not change. These results indicate that a short period of holidays can result in significant alterations in body composition. Taking into consideration that weight gains during holidays are normally retained [Yanovski et al. 2000], body-weight-control strategies should be introduced to prevent such unwelcome changes.

References.

MAGNESIUM DIETARY DEFICIENCY REDUCES ANTIOXIDANT ACTIVITY IN THE MUSCLE OF RATS UNDERGONE A MODERATE PHYSICAL TRAINING

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INTRODUCTION: Marginal magnesium (Mg) dietary deficiency is a common problem worldwide, mainly after the inclusion of industrialized foods in the diet. Many studies suggest the effect of Mg deficiency on the increased susceptibility to oxidative stress. However, there
is little information in literature about the antioxidant capacity of skeletal muscles in Mg deficient organisms doing regular physical exercise. OBJECTIVE: Evaluate the activity of antioxidant enzymes and the lipid peroxidation in the muscle tissue of animals undergone physical exercise and dietary Mg deficiency. MATERIALS AND METHODS: Male Wistar rats (initial weight of 280 g) were divided into control (CON, n=6), exercised control (CONEX, n=6), sedentary Mg deficient (DEF, n=6) and exercise Mg deficient (DEFEX, n=6). The control diet was prepared according to the recommendations of AlNRM (500 mg/Mg/kg of ration) and the Mg deficient diet contained 200 mg/Mg/kg of ration. The animals were fed ad libitum during 6 weeks of experiment and swam 1 hour per day during 5 days every week. The removal of the gastrocnemius muscle took place 24 hours after the last exercise session. The cytosolic and mitochondrial activities of superoxide dismutase (SOD), catalase (CAT) and glutathione peroxidase (GPx), besides the concentration of malondialdehyde (MDA) were determined in this muscle. RESULTS: in the cytosolic portion of the gastrocnemius muscle, SOD and CAT activities were significantly higher (p<0.05) in the EX group (10.3±.2.5 USOD/mg protein and 1.1±0.3 UCAT/mg protein) compared to the DEFEX group (5.8±0.8 USOD/mg protein and 0.6±0.1 UCAT/mg protein), whereas GPx activity presented no significant difference between the groups. In the mitochondrial portion, SOD and GPX activities were significantly higher (p<0.05) in the exercised animals compared to SED and MARG groups. No significant differences in MDA concentration in the gastrocnemius muscle of animals in the EX and DEFEX groups 10.07±0.01 and 0.6±0.02 μmol MDA/mg protein, respectively) were observed. CONCLUSIONS: the consumption of dietary Mg below the recommended levels reduced the antioxidant defenses of the studied muscle, although it did not increase the lipid peroxidation in the exercised animals.

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ENERGY INTAKE AND APPETITE FOLLOWING EXERCISE IN GIRLS

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Introduction
Recently, an elevation in hunger, fullness and desire to eat, immediately following exercise challenges at 75% peak oxygen uptake has been demonstrated in young girls (Dodd, 2007). This is in contrast to the acute 'exercise-induced-anorexia' commonly reported for adults immediately following similar exercise (King & Blundell, 1995). Enhanced appetite in the girls was not reflected by an elevation in energy intake (EI) at meals offered at least 30 min after exercise. This implies that any exercise-induced factors influencing subjective sensations of appetite in children, may be directly related to the period immediately following exercise. The present study aimed to examine the onset of food intake, EI and appetite immediately following exercise in 9-10 y girls.

Methods
Six girls (Age 10.4±0.4 years, BMI 19.6±3.5 kg/m2, 24.4±9.8% body fat) conducted an initial FLEX heart rate test to plot regression of HR vs VO2 and estimate subsequent energy expenditure (EE). This incremental cycle test was extended to peak oxygen uptake to predict HR intensities and exercise durations corresponding to 75% peak oxygen uptake and ~0.75 MJ EE. In a counterbalanced fashion, participants were then randomly assigned to a school-based treatment day, incorporating cycling at 75% peak oxygen uptake (EX), or sedentary activities (SED). A maintenance breakfast was served at 0830 and exercise commenced at 1200. An ad libitum lunch was provided in excess immediately following the exercise or control period and food was covertly weighed before and after meals. The girls were asked to eat whenever they felt hungry and onset of eating was recorded along with EI. Ratings of hunger, fullness and desire to eat were recorded using visual analogue scales immediately before, during and after exercise and then every 10 min for 60 min. EE was assessed from 0830 until the end of the hour-long lunch period. Lunch EI, EE (0830–13:55) and appetite ratings were compared using mANOVA.

Results
Energy expenditure was significantly higher (p<0.05) in EX compared to SED (2.2±0.7 MJ vs 1.8±0.7 MJ). Neither time of eating onset nor EI at lunch (4.1±1.2 MJ, EX vs 4.6±2.1 MJ, SED) were significantly different between conditions (p>0.05). For hunger, fullness and desire to eat, there was a main effect for time (p<0.001), but no interactions between time and condition (p>0.05).

Discussion/Conclusion
9-10 y girls did not increase their EI at an ad libitum lunch offered immediately following exercise. There was no impact of exercise on self-reported hunger, fullness and desire to eat during or after cycling, compared to a sedentary control period.

References

Poster presentations (PP)

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PEDAGOGIC EXPERIENCES IN THE INITIAL FORMATION INVOLVING SPORTING PROJECTS

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Introduction: Brazil develops countless sporting projects whose larger objective is to give conditions that kids of having opportunity their dreams of better times and be far away from the delinquency. Allied this search, it can stand out the subject that sport is directly related with a concept of health and quality of life. Specifically in the case of the State University of Maringá - UEM, several projects are developed in this extent, as the Project “Sporting Formation in the Handball” that counts with the partnerships of the General office of Sports, Leisure and Recreation of the state district of Maringá, the Handball Association of Maringá and with the patronage of Unimed/Maringá for the children’s service with age among 9 to 12 years, in state or public schools and sporting centers. Objective: this project has as objective stimulates the learning of this sport practice, besides making possible the academics of the Course of Physical education professional practices aiding their initial formation. Methodology: the methodology is divided in the organization and systemization of the contents and methodological strategies centered in global games and recreational activities under the teacher’s of the department orientation. They are also used support texts involving subjects of racism, individualism, and violence. Results: initially, in the year of 2003, 1 Center of
existsences was instituted, assisting 40 children approximately. During 2004 they were instituted more 5 Centers (150 children). In 2005 we elevated for 7 Centers (250 children) and in 2006 we arrived to 14 Centers that assist 440 children approximately.

**Perspectives:** The goal for 2008 is arrive to 20 Centers, and we are at this moment with lives 4 Centers in implantation. These new Centers will elevate the number of assisted children significantly. This project have discovered sporting talents and they plows directed goes specialized training centers and in conditions of supporting these children/athlete offering scholarship, feeding and plans of health.

**PHYSICAL EDUCATION TEACHERS, ATHLETES AND SPECTATORS’ OPINIONS ON DEVELOPMENT OF TURKISH HANDBALL: A CASE STUDY IN ESKİSEHIR**

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Handball is a popular sport which has a lot of spectators in many parts of the world. This popularity makes it an important part of physical education classes.

Although handball has been federated since 1976, it is one of the sport branches that has not been in a better position yet. Previously, handball had been in a good process but recently there have been appreciable decreases in every aspects (clubs, spectators, etc.) Some factors, such as decreasing of the number of supporters, being uninterested in handball, physical education teachers’ tendencies to other sport branches, not spreading the basic handball training, not giving news about handball in mass media sufficiently, can be seen as a handicap to develop handball.

In this research, the following question was considered. What are the individuals’ opinions about development of handball in Turkey? Hence, a survey was prepared by the specialist researchers and then a piloting was carried out on 15 individuals. In this process some items were revised and the duration of answering the items was fixed. Finally, the survey was carried on handball coaches, athletes, spectators and others (total 100) in 2006.

In analyzing process the demographic characteristics of the participants were evaluated as follow: % 50 of them were male, % 50 of them were female, % 74 of them were single, % 23 of them were secondary school students, % 77 of them were graduate students, % 55 of them were in 21-30 age group, % 47 of the individuals’ monthly incomes are 400 or under 400 dollars. According to demographic characteristics, a great many of participants are educated, more than half of them are young and single, nearly half of them have low incomes and many of them are students, teachers, and coaches.

Principal Component Factor was used in order to group, to classify and to deviate to main factors of the 24 variants. According to analysis of results, there were five factors which indicated restrictions in handball. The primary factor was mini handball which emphasized the importance of mini handball training, facilities, equipments and other factors were seen to have great effects for handball. As a result, it could be said that some factors such as mini handball training, media, institutionalization, advertisement and organization have great importance for the development of handball and several projects should be carried out urgently.

ANOVA test was used to reveal the differentiation of attitudes with regard to the factors affecting handball and demographic characteristics. The findings of the research revealed that there were significant differences between the institutionalization which was one of the factors affecting handball and profession groups. As a result, educators implied that General Directorate for Youth and Sports, province delegates, clubs and schools should consider club activities and provide sponsors’ support.

**DEVELOPMENT OF MOTIVATION IN THE CONTEXT OF SUSTAINABLE EDUCATION IN SPORT CLASSES IN BASIC SCHOOL**

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Economical, social and culturological mechanisms of a contemporary society significantly influence all spheres of person’s life and motivation as well. Significant attention needs to be paid to these mechanisms because motivation depends on these mechanisms.

In this article motivation is analyzed in basic school and in the context of education for sustainable education. The article analyzes factors with respect to their professional competence, their expectations for advancement opportunities and the ongoing development/recycling.
THE SCOPE OF THE PROFESSIONAL OCCUPATIONS IN THE OUTDOOR ACTIVITIES

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This study was carried-out, in the field of outdoor activities and the objective was to study the opinion of the technicians in Orienteering, Mountain-Bike, Climbing, Mountaineering, Canoeing, Diving and Paragliding with respect to their professional occupations carried out in the various sport organizations.

In agreement with some studies (Priest & Gass, 1997; Sarmento, Rosado & Rodrigues, 2000), it was possible to identify to the departure the following occupations: Manager, Instructor, Main Technician and Auxiliary Technician.

The sample was made-up of 830 individuals (149 Managers, 75 Instructors, 194 Main Technicians and 412 Auxiliary Technicians), divided according to their professional occupation.

To obtain the data we used a questionnaire [Carvalhinho, 2006], built and validated for the effect. In dealing with the data, we used descriptive statistics as well as comparative statistics to verify the significant differences among the various groups in the sample. In this case, we used the Kruskall-Wallis and Mann-Whitney U statistical techniques.

In the most of professional occupation we verified there are significant differences among the groups. The main results were: Manager (0,002«P«0,039); Main Technicians (0,014«P«0,025) and Auxiliary Technicians (0,002«P«0,011). However, in the occupation of ‘Instructor’, there are no significant differences among the groups in the study.

In general, it is possible to find quite different realities, with very own cultures of development and of values that constitute reference for its sport technicians, particularly for those that have the power of decision and the responsibility to develop this sport sector. On the other hand, the Instructors presented more consensual opinions, what can reveal some conscience and stability in the acting of the respective occupation.

In highest, the technicians of outdoor activities agree with the existence of different professional occupations, in that these should be associated to very defined attributions that allow to know them the context of the intervention, the competences and the autonomy in the professional field.

References:


THE E-LEARNING CHALLENGE FOR THE COACH EDUCATION: A PRELIMINARY STUDY ON HANDBALL COACH

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Introduction

Coaches play an important role in introducing people to sport and in helping children, players and athletes to improve and achieve success. Coach education programmes have the purpose to equip coaches with the competences (skills and expertise) to do the job. The formal of coach education programmes traditionally included theoretical and practical sessions. Some also included supervised practice and seminars. The Portuguese Handball coach education programs take place in specific dates (vacations, long weekends) with the consequence that they are usually very concentrated and take place only in one or two moments of the season. The main goal of e-learning is to overcome barriers of learning styles. Using video, audio, active learning, simulations, and electronic advances in the teaching-learning process can overcome problems encountered by learners who do not adapt to just one learning style. E-learning also helps to overcome barriers of place and time.

Aim of the study

The aim of this study is the validation of e-learning in the coach education.

Methods

Our sample was composed by 304 handball coaches (level 2) from the 2007/2008 season and 1 teacher. The coaches participated in a e-learning module of 50 hours. The subject of the course was: handball training processes. The learning management system that we used in this study was the STABOS e-learning platform. We used the forums, the SCORM reporting and the internal portal/course statistics to analyse the individual progress. We used the method of content analysis that allows inferences about the production conditions of the interactions, based on quantitative indicators and others.

Results

The teacher posted one topic of discussion in every forum (4 topics, in total). 109 new topics were created by the coaches. The 113 topics generated 1616 post messages. All the 304 coaches interacted between them through the forum and the different topics. Coaches average time online at the platform: 10h43m36sec. As result, 79,28% of the coaches were approved in this course. Only 21,72% weren't approved.

Discussion/Conclusion

Concerning the results we identified that the e-learning promoted and improved interactions between the coaches (among themselves, as well as with the teacher). We suggest research on this topic with the increase of the number of coaches, days of education, subjects and in other sports.

THE IMPORTANCE OF SOCIAL SUPPORT FOR THE ELDERLY: A STUDY OF THE PROJECT SEM FRONTEIRAS

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Demographic data points to a change in the population distribution. According to Garcia (2000), the twenty-first century may be considered as the century of the elderly. In this context, the physical education is understood as a fundamental field of knowledge able to pro-
vide a new way to face life in this population by the practice of physical activities, such as sports. The present study aims to describe the proposed theoretical methodology of the project Sem Fronteiras, that means No Frontiers, which is characterized by being a program of sports for the elderly that occurs in the facilities of the Federal University of Parana, and it shows clearly the importance of social support between the participants. The methodology of the study, qualitative in nature, occurred at two points: first, through the analysis of the documents containing the proposed project and annual reports for assessment of it, and a second time through interview applied to the elderly enrolled in the project. The researchers state that the project is supported theoretically on the principle of continuing education, which covers the education of adults and elderly, but is not limited to a specific period of life and aims to contribute to the cultural renewal, in order to bond personal satisfaction and social participation (Néri and Cachioni, 1999). Thus, the methodological procedures of the project do not support a program with leisure activities, which in most cases does not lead to greater reflection by the participants. So, too, away from the biomedical perspective, more widespread in physical education, and return to the reflection of how important we make, creative and meaningful, the years ahead. If the elderly are enrolled in creative activities, they are supposed to be more connected to the outside world, being more able to adapt to its changes.

There is also the idea that this project is considered a place where the elderly can enhance their network of relationships, which can lead to the well being of social support, as they have opportunity to share good and bad experiences and feelings.

References.

DIVERSIFIED PROFESSIONALISM OF PRIMARY SCHOOL PE TEACHERS IN HONG KONG
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This study set out to investigate the professional lives of primary school physical education teachers (PSPETs) in Hong Kong. It carried out through the inductive development of a theory, based on grounded theory methods, of how Hong Kong PSPETs manage their professional lives. The central objective of this study was to find out how PSPETs go through the socialisation and professionalisation process as they experience changes to their personal and professional identity in their work places and in society.

The researchers employed theoretical sampling in order that data collection be purposively directed towards informants and towards situations thought likely to provide data that promised to be relevant to and able to develop and build the emergent theory. PSPETs in Hong Kong have been defined by the researchers as professionals who specialize in teaching physical education in primary schools in Hong Kong. Through snowball sampling, the researchers identified suitable participants for study. Participants for this study were from a variety of backgrounds and were able to enrich the contexts for analysis. Eleven PSPETs were interviewed. Participants ranged in age from 25 to 59, with 6 males and 5 females. Their years of experience as PSPETs were between 2 and 30 years. The ratio of males to females varied slightly depending on the response and availability of the PSPETs: In addition, data collection ceased upon data saturation, which was when nothing new could be added to the data.

The researchers used semi-structured interviews, together with documentary sources (diaries) for conducting data collection. They were conducted over a 10-month period. The transcribed interviews were analysed using open coding, axial coding and selective coding procedures. Member checks, audit trails and triangulation were used to ensure trustworthiness.

With the ever switching work lives and interplaying identity which embedded into PSPETs’ profession and their socialization experiences, a main concern: diversified professionalism was discovered in this study with the following categories [criteria]:
1. Organizational sensitivity
2. Source of Satisfaction (from students’ achievement)
3. Critical incident and personnel
4. Organizational positioning (Marginalization of a subject, not a person)
5. Educational reforms as a significant factor of socialization
6. Preferred roles (not PE teacher)

The results revealed that PSPETs were not marginalised in terms of their multiple roles particularly in the organisational culture of Hong Kong primary school. On the contrary, PSPETs played major roles working as 1) various subjects teacher such as English, Mathematics, Chinese, Information Technology; 2) disciplinarian teacher; 3) coach; 4) administrator; and 5) manager of various sport teams as the same time which enabled them being organisational and professional socialized diversely.

PE TEACHERS’ PERCEPTION OF A GRADING SYSTEM AND THE NOTION OF ABILITY
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More than ten years ago now the Swedish school system underwent a comprehensive reform. At the core of this reform were a) a decentralisation of decision-making and responsibilities from the state to the municipalities and the local schools, b) a shift in the steering documents from regulation by content to regulation by goals, c) a greater emphasis on learning in all subjects, and d) an emphasis on issues of health and a physically active lifestyle in the subject of Physical Education. The new grading system is goal-related (in contrast to the former, norm-related system which means that student achievement is or should be assessed in relation to the goals stated in the course syllabi). The basic idea is that there should be a close relationship between the goals the pupils are supposed to reach, the knowledge they are expected to acquire and the assessment criteria used for grading.

The overall aim of the study is to investigate how teachers both perceive and use this new grading system. Central questions are: How do they feel about grading pupils in PE? Are they familiar with the criterion-referenced grading system? What kind of grading criteria are teachers guided by when assessing pupils? In the light of the teachers’ answers, one aim is to discuss the consequences that teachers’ grading criteria may have for pupils’ notions of ability and what seems to be important knowledge in PE. The study draws on empirical data from questionnaires answered by 61 PE teachers working in secondary school. The responses to the questions have been analysed in both a quantitative and a qualitative way. The results indicate that the majority of teachers either find it very difficult or difficult to grade their pupils. They state that they are familiar with the new grading system, but the analysis of the way they say they grade their pupils indicates that they do not seem to have grasped the assumptions underlying the grading system. Achieving a pass grade in PE is dependent on participation, being active and positive and doing one’s best, although these criteria are not acceptable in a criterion-referenced system according to the National Agency of Education, since grades should always be given in accordance with the stipulated
JOINT ACTIONS PROJECT: THE EUROPEAN MOVEMENT TOWARDS INCLUSIVE PHYSICAL ACTIVITY FOR CHILDREN AND YOUNGSTERS WITH DISABILITIES

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An educational kit and promotional CD-ROM, called Count Me In, were created in the framework of the European project Sports and Physical Activity for Persons with a Disability Awareness, Understanding and Action. In this project, a group of representatives from 17 European countries strived towards a common goal - to endorse the full inclusion and participation of children and youngsters with a disability into sport, leisure and physical activity.

The purpose of the products Count Me In is double: to educate teachers, parents, coaches and volunteers in the field of inclusive physical activity and secondly to promote sports, leisure and physical activity for children with a disability.

The educational kit is a practical guide for all people with little knowledge on inclusion, physical activity or disability that can be used as a first-line tool in the learning process. The kit consists of a book and a DVD. The user can find the basic information on the concepts of Adapted Physical Activity (APA) and inclusion. Furthermore, the guide outlines a series of practical and versatile adaptation/inclusion strategies. The user is stimulated to actively search for creative solutions with these basic information in mind, when organising inclusive settings. As an additional motivational tool, a series of examples of good practice are illustrated in the final chapter. These examples are also illustrated in the accompanying DVD. The educational kit is mainly distributed as a life-long learning and distance learning tool. The strength of this educational kit is that it combines visual material and a handbook.

Secondly, a promotional CD-ROM was created to stimulate children with a disability to take part in physical activity. The CD-ROM consists of 8 movie compilations in which a wide range of activities is presented. In each movie, children with different levels of abilities are presented, so every child watching the CD-ROM should be able to identify with one or more children in the videos. The CD-ROM can be explored in 16 different languages.

The CD-ROM is user-friendly and can also be used in schools, sports clubs and organisations as a tool to motivate children with disabilities to participate in sports and physical activity.

Both products were disseminated in 17 European partner countries through special schools, mainstream sports organisations and adapted sports organisations; disability support systems and universities.

PRIMARY SCHOOL PUPILS’ ATTITUDES TOWARDS SPORT HEALTH

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The aim of the research was to seek answers to 3 problem questions: 1) How does health oriented education affect the attitudes of school pupils towards health? 2) Is their knowledge about health care reflected in their choices and behavior conducing to health care? 3) What are the attitudes of school pupils towards sport as means providing a chance to sustain and improve health condition? A pedagogical experiment was the method of the research. The essence of the experiment was to compare, within the time span of 2 years, schools which carried out a programme of health oriented education with traditional schools and observe their attitudes towards health and sport. A PROZET scale and computer programme STATISTICA were used in the research. Pupils from 12 elementary schools, out of which 6 were experimental schools, were studied. A total of 1652 school children aged 11-13 were subject to the investigations. Girls accounted for 58% of them and boys accounted for 42% of the total.

The results demonstrated that the majority of school pupils had a positive attitude towards sport. 47,8% defined it as enthusiastic, 36,4% as moderate, 15,3% demonstrated an indifferent attitude and 0,5% were negative towards sport. The programme of Health oriented education and sex affect statistically significantly (p<0,05) the attitudes of school pupils. A higher level of attitudes is observed by pupils who are following a health oriented education and by boys. The place of living does not affect statistically the studied groups as far as the frequency of taking up sport activities. The statistic analysis demonstrated that girls prefer mainly esthetic forms of sports (p<0,01), whereas boys prefer sport games.

When analyzing the values of the calculated indexes for each of the components of health oriented attitudes, no statistically significant changes in them were observed. This means that in experimental schools pedagogical endeavors in the area of health oriented education do not as strong as to affect pupils’ attitudes towards health when comparing to pupils from traditional schools.

1. Attitudes of pupils towards sport undergo positive changes in the course of health oriented education.
2. Attitudes of pupils towards health do not undergo favorable changes as a result of school education.

In some communities even a fall in the index values of those attitudes, along with the extension of time spent in school, was observed. The knowledge possessed by school pupils regarding health and factors determining its condition, did not translate directly into the development of school pupils’ positive attitudes towards sport.

THE IMPROVEMENT OF THE STRATEGIES OF SELECTION AND ORIENTATION IN AEROBICS

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The aerobic gymnastics registers spectaculars evolutions reaching a high development level, having exercises that impresses by the difficulty of the elements, of the combinations and the virtuosity. This presumes in the same time a continuous activity for discovering new elements, new preparation and appreciation systems, a diversification of the approached methodology. Studying the present degree of the research development it finds out that the aerobic gymnastics, as a young branch in performance sport (1995), with some few bibliographical specialty resources, has no specific model of selection and orientation elaborated on scientific bases.

Research methods that were used are: the documentation, the observation, the experiment, the measurement and testing, the shaping method, the mathematic-statistic method and the graphic one.

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13TH ANNUAL CONGRESS OF THE EUROPEAN COLLEGE OF SPORT SCIENCE
The purpose of this research is to determine experimentally the model of selection for the performance aerobic gymnastics, which serves as a working instrument in this continuous process, to orientate the talented elements with a basic preparation from the artistic, guaranteed the development of the sports-life of those which, thanks to some psychometrical or medical factors, haven’t registered yet any progresses in the way to the great performance. This experiment identifies the essential elements the model of selection for the sportsmen with previous experience, being made up by important indicators in the selection of talents from the specific clubs from the country and their orientation, in the way of capitalization of the performance potential, to the aerobics.

Results and conclusions The elaboration of the selection model it’s an instrument with real diagnosis functions and also an instrument of prognosis of the sportsmen availabilities resulted from the artistic gymnastics for an fast evolution to the high performance in the aerobic gymnastics. We consider that the results obtained in this experiment constitute certainties to determine on the basic information’s, on the structure of the model of selection and orientation from the aerobic gymnastics, identified by the anthropometric, functional, psychological and performing parameters of the motor and psychomotor skill decade model at the old juniors.

IS IT ALWAYS THE RIGHT PERSON THAT WINS? RELIABILITY AND VALIDITY IN JUDGING SPORTS

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Is it always the right person that wins? In competitive sports the difference between winning and loosing can be very marginal but still the result will have a big impact. To finish second, even if it is an Olympic Game, can be felt like a failure for an athlete or team. Rules- and judging systems are defining who will be the winner and how well those measurements and judgements are defined and used has a big importance for the results and outcomes of games and competitions. In the light of this the quality of the measurements and the judgements in sports are an extremely important issue both for the individuals involved but also for the credibility of the sport. In order for the right person or team to be able to win it is important the measurements and judgements defining the results are of high quality. In my licentiate dissertation, consisting of two separate reports and one summary report, the freestyle discipline, acroski (Johansson, 1998) and the gymnastic discipline, rhythmic gymnastics, RG, (Johansson, 2001) where studied with a focus on the rules and judgements in the sports. The reliability and validity of the rule and judging systems were analysed together with changes in the rule and judging systems. Reliability as the judges ability to interpret the rules and judge in a consistent way, and validity of the judgements in the sense that the judges and the rules, where in accordance with the idea of the sport. Information was gathered from rulebooks, judging manuals, meeting protocols, historical documents and from interviews with two coaches, two judges and four athletes from each of the two sports. The studies showed both sports had gone through major changes in the rule and judging systems. Many of the changes were focused on increasing the reliability of the judgements and a problem could be seen when that the validity deficient. Reliability and validity interact with each other but validity is the most important of these factors. Finding the balance between making the judgements as objective as possible, without loosing the idea of the sport, together with the quick evolution of the sports, seemed to be the main challenges with the rule and judging systems of acroski and RG. This study clearly points at the importance of constant work with both reliability and validity questions in judgements and measurements if the results are going to be fair and the right person going to be able to win.

References

INNOVATIVE RESPONSE TO CURRENT EUROPEAN CHALLENGES - JOINT MASTER PROGRAMME IN ADAPTED PHYSICAL ACTIVITY FOR ELDERLY

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Numerous research projects have demonstrated that the health benefits of planned physical activities (PA) for elderly are indisputable. The number of ageing people and ageing people with a disability in Europe is rapidly increasing. Therefore the topic of ageing has been recognised, more than ever, as a top theme on the European agenda. The Eurostat data estimate that by the end of 2040 the severely impaired adults will be 6.5% of the total population in Europe, or 24.5 million people. Regular physical exercise is the best antidote to many of the effects of aging. As older adults are the fastest growing age group, attention needs to be given to them as a special population with specific needs in the area of exercise and sport. Qualified professionals in the area of adapted physical activity (APA) for the elderly have to be prepared now, so they can meet the new demands of the future.

The development of joint degrees was set as an aim for the European Higher Education Area in the Prague Declaration in May 2001. In the Berlin Communiqué of 19 September 2001, the ministers responsible for higher education in the countries participating in the Bologna Process decided ‘to actively support the development and adequate quality assurance of integrated curricula leading to joint degrees’. In response to these two perspectives, a multidisciplinary team from THENAPA II developed a European Joint Master programme APA for elderly. It aims achieving a common educational model in the domain of APA for elderly and at provoking educational changes and improvements in the area of APA, sport and exercise for the elderly. The methodology included a research aiming to identify the extend to which the topic of APA and sport for elderly is included in the academic curricula. The results show that only two universities provide a separate module that includes ageing, disability and PA. Ageing and PA were covered together in 45% of the European countries, and disability and physical activity in 39 %. In most countries ageing, disability and physical activity are presented as separate subjects. Qualitative approach was applied for defining the best practices in order to combine the existing knowledge in one master programme. The curriculum is developed following the guidelines of the International Society for Ageing and Physical Activity and consists of 14 modules, 11 theoretical, 2 practically oriented and one module related to the master thesis. It offers a state-of-the-art on research and teaching methodology in APA for elderly with a disability and the elderly persons in general, as well as comprehensive training and adequate knowledge in the many aspects of APA. The social, pedagogical and technical aspects of physical activity, disability and ageing are the theoretical foundation. This program is a response to the EU efforts of raising the qualification profile of physical activity service providers but more efforts in the educational field are necessary.
SURFING: DIDACTIC AND METHODOLOGICAL CONCEPTIONS

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The aim of this study was to determine specific features about the expert knowledge concerning coaches’ conceptions and didactic methodologies, as well as, the way they proceed when organizing curricular contents on surfing. The intent of the present investigation was to ask expert surfing coaches about the design of learning experiences and movement tasks related to specific content on surfing. According to Grossman (1990) and Rink’s (1993) model, this study was based in a qualitative methodology. A structured interview was used with eleven surfing expert coaches, with open-ended questions about content development on surfing. Content development on surfing was revealed, taking into consideration the progression (extension), depth and application dimensions of Rink’s Model.

The source of coaches’ specialized knowledge comes from the experience in competition and coaching, as well as, their academic education, judging courses and self-study. The practical experience as athletes (experience in competition) was the main source of the specialized knowledge named.

The coaches’ conception about the specific knowledge of an expert surfing coach is convergent, it should embrace knowledge, with special incidence in particular disciplines, such as, Pedagogy, Training Methodology, Psychology and Oceanography. The specific knowledge of surfing is also appointed as fundamental. This specific knowledge comes from the competitor’s and coach’s experience, conducting to a clear awareness of space and material arrangements to establish proper learning experiences.

The skills on each level of practice were established. Coaches distinguished 3 levels of practice: Introductory, Development and Competition level. There was no total agreement among coaches about the learning sequence of the skills, however they made a clear distinction between basic skills and advanced skills.

Organizational arrangements for tasks were described, with special emphasis on space and equipment arrangement. The choice of the location (beach) and the type of board, together with the specific conditions (wind and waves), decide the quality of the learning experience. The coaches integrate opportunities for their athletes to apply their skills (application) in meetings with other surf schools and competition simulations. This investigation, used to examine coaches’ expertise, lead to the characterization of the didactic-methodology conceptions on surfing.

References.

TEACHING INVASION GAMES IN PHYSICAL EDUCATION LESSONS: THE RELATIONSHIP BETWEEN TEACHER BELIEFS, AND TEACHING BEHAVIOUR

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In the past educational research studies could be catalogued as process-product studies (Brophy & Good, 1986). More recently the study of teacher behaviour has evolved toward a focus on teacher thinking and as a result teachers’ beliefs have become a central concept in research about teaching and teacher behaviour (Clark & Peterson, 1986). The present study was conducted to explore the nature of teaching and learning behaviour in invasion game lessons and the relationship with teachers’ beliefs and self-perceived behaviour. A sample of 241 physical education teachers (123 female, working in primary (n=78) and secondary education (n=163) in Flanders, the Dutch speaking region of Belgium participated in this study. Teaching experience ranged from 0 to 37 years within this group (Mean = 13.88, SD=10.42) and 72 % of the PE teachers attended in-service trainings about invasion games on a regular basis (on average 1.4 in-service trainings per school year). The participants completed a general educational beliefs scale, and a newly designed physical education related beliefs scale. A sub-sample (N=82) was involved in a semi-structured interview to obtain self-descriptions of their instructional approach during invasion game lessons. Further, the teaching and learning behaviour was observed during an invasion game lesson of these teachers. Descriptive results of the beliefs’ scales indicated that higher levels of constructivist beliefs are observed. The real time observations of the PE lessons revealed that the average distributions of percentages of time spent on either traditional cognitivist or constructivist teaching and learning behaviour were comparable. Further, a strong correlation was found between the general and the physical education related belief scale. The interviews revealed that most teachers described their teaching behaviour as rather traditional cognitivist oriented compared to the mixed cognitivist-constructivist orientation. Constructivist teaching approaches were according to the teachers adopted to a much lesser extent. Stepwise linear regressions revealed that constructivist beliefs predicted constructivist teaching and learning behaviour, while traditional physical education beliefs predicted cognitivist teaching and learning behaviour. In general, the results of this study point at the complex nature of the relationship between teacher beliefs and their teaching behaviour.

References.

POSTURAL CONTROL AND BALANCE ASSESSMENT IN CHILDREN WITH HEARING DEFICIENCY

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The balance is the process of maintenance the center of pressure (COP), projection of the gravity center in the soil, inside the base of support area of the body. This study describes the postural control in children with hearing deficiency and compares the results with the control group, using the displacement parameters of the COP. It is a transverse analytical study where forty children were distributed equally in two groups denominated study group (GE) with medium age of 8,88 ± 1,22 years, and control group (GC) with medium age 9,34 ±1,00 years old. All the individuals were submitted to the stabilometry and they accomplished four different static tests, with two feet support on the force platform, varying the base of support and the vision, for 25 seconds each. The parameters root mean square, mean velocity, sway area and mean frequency of COP were analyzed. For data treatment was used the inference statistics ANOVA (variance analysis) and the no-parametric test Kruskal-Wallis. The results showed that children with hearing loss presented more instability in the
orthostatic posture when compared to the control group in relation to the stabilometric parameters associated to the postural control efficiency. Like this, was observed that the parameter sway area of the COP, was the most sensitive to detect significant differences among children with hearing deficiency and the normal ones. Therefore, these results supported the idea that the children with hearing loss of this sample presented a deficit of sensorial organization that justifies future interventions.

PHYSICAL ACTIVITY, MOTOR COMPETENCE AND HEALTH STATUS OF CHILDREN IN DEPENDENCE OF SOCIAL STATUS
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Introduction
In the last years the health status of children in Germany declined and the number of psychologically conspicuousness children also increased. According to the KIGGS study children from socially deprived areas are hit from this development the most (compare Opper et. al, 2007). Holzweg (2006) and several other studies allocate a decline of the level of activity and the motor competence of young children in Germany (compare Woll, 2007 for an overview). In this study physical activity, motor competence and health status of children with different social backgrounds (privileged vs. deprived) are assessed.

Method
A sample of 172 3-5 year old children was included in this study. While 80 children lived in a deprived area 92 children lived in an affluent area. The children were testes with the KMS 3-6 and the MOT 4-6. Height, weight and Body Mass Index (BMI) were also assessed. In a questionnaire for the parents’ social status, activity level, television consumption, participation in sport clubs and sport activity of the family were assessed. The social status was collected by profession and income of both parents and according to the social structure atlas for Berlin. The analysis of the assessed data was carried out with SPSS 15 (ANOVAs).

Results
Regarding coordination (SHH: F(3,9)=16.51, p<.05; eta²=.085), TBT: F(3,9)=14.28, p<.05; eta²=.075) and flexibility (F(3,9)=20.14, p<.05; eta²=.102) significant differences between the two groups could be shown. With the data of the questionnaire significant differences between the two groups relating to television consumption (F(3,9)=44.87; p<.05; eta²=.238), participation in sport clubs (F(3,9)=22.6, p<.05; eta²=.132), outdoor activities (F(3,9)=6.37, p<.05; eta²=.041), as well as sport activity of the family (F(3,9)=17.35; p<.05; eta²=.104) could be identified.

Discussion / Conclusions
The study showed that comparable to obesity and health status also motor competence is decisively influenced by the social status of the children. The results of this study additionally indicated differences of the level of activity in dependence of the social background. Therefore it seems to be necessary to offer affirmative intervention programmes especially in Kindergartens and Primary Schools in socially deprived areas.

References.

MEANS AND PROCEDURES OF THE PEDAGOGY IN SPORT’S TAINING - AN EXAMPLE IN JUDO
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Centering the pedagogical procedure on the student / sportsman, favouring mainly learning, implies adjustments to the methodology used as well as the adoption of knowledge to the utilization form. The teacher / trainer has to help solve problems in this personalized training and therefore needs to know the variables and if possible, the indicators which allow the control of the evolution.

Our study falls upon the relation between procedure and means in the intervention using Judo grips as an example. The grip is a means: 1) of communication receiving and transmitting signals; 2) of attack applies force; 3) of defense limiting the opponent’s possibilities. There is interaction between Judo players, a dialogue which occurs in the grip through the force which is applied. A dialogue which (like any other type of dialogue) may be learnt by a) memorizing a pair of expression or with another strategy, b) learning to interpret the signals, consequently understanding the opponent’s intentions. In a) the widening of knowledge is through the rise in the number of controlled expressions. In b) through the capacity of generalizing knowledge (understanding the function) so as to adapt to new situations. In a) it is important to memorize many forms of doing, selecting the most favourable and repeating them to become stronger and quicker. It is automizing the gesture. The way it is done may be transmitted by the trainer and the sportsman will be the receptor / adaptor. No matter how wide the acting selection is, the number of answers will always be limited to some case.

In b) however, it will adapt the answer to the specified problem at hand. The training consists in optimizing the attack and not only its form of execution. How?

Just like x+y=z allows us to define z in the functions of the premises x and y, whatever the value of x or y, if the premises are controlled. In a Judo combat for example, it is possible to make various combinations but also verify which is the most favourable in relation to the situation. Instead of memorizing solutions, strategies are set up.

In relation to the grip which is used as an example, it is important to define the communication, the attacks and the defense which is desired and achieved. For this methodology to be possible the description of the doing is necessary to understand how it works, that is, having adequate knowledge of the acting form.

Our presentation will demonstrate how the training of a judo grip may be done in situations a) and b), and will analyze the advantages of each case.

It is evident that from a pedagogical point of view, we have two different procedures and results. In pedagogical terms the option is clear.
DANCE IN PHYSICAL EDUCATION AND TEACHER NEEDS
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Military College of Belo Horizonte, Brazil

The study has been framed under the perception of a small-minded on teaching Dance in the schools. Knowing that Dance is not an exclusive content of Physical Education (PE) cultural area, that was inserted and systematized in Brazilian curriculum and schools and present in PE teachers initial training, we consider meaningful: a) identify what are the needs of teachers to deal with this content; b) identify continued education that teachers have searched at the last three years. The sample is composed by 38 PE teachers of Belo Horizonte municipal net of education. The study is descriptive and exploratory, and data collection had two phases: a) we used a questionnaire about perceived needs and continued education searched; b) we used an interview to six teachers. Data from the questionnaires were submitted to statistical analysis and interviews explored by content analysis, enabling the identification of needs and recognized the main issues to be envisaged on the attempt to improve teaching Dance content into PE. From questionnaires was possible to extract that 95% of teachers had the content of Dance or similar in their initial training. Continued education is restricted to small extend courses and mostly on general educational area; only 7.9% of teachers sought some continued education in dance area. All training areas were considered necessary or very necessary for more than 60% of teachers. Content Knowledge, Development and Diversity, Management and Motivation, Communication, Planning and Instruction, Student Evaluation, Reflection, Technology, and Collaborative Work, with emphasis for Development and Diversity. From 42 functions or teaching skills presented in the questionnaire, only one function (F4) was considered as non important or less important by more than 50% of teachers. This function relates to know and to apply physiologic, biomechanics, anatomical and psychological contents for teach dance in schools, and it’s more a skill linked under ‘sportive orientations’. Data from the interviews were organized by three themes: 1 - Dance orientations, 2 - Dance in the context of initial training, 3 - Dance in the school context; and 4 - From education to practice. One of the conclusions that arise from crossing all data is that teacher needs are directly related to exposed PE ‘sportive orientations’, experienced by them at graduation. Another is that the initial training is more focused on learning to dance than how to teach this content in PE lessons.

TEACHERS’ VIEWS ABOUT SPORT EDUCATION WITHIN PHYSICAL EDUCATION PROGRAMS IN PUBLIC SCHOOLS OF ALAGOAS-BRAZIL
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This study analyzes the factors that guide the pedagogical practice of physical education teacher related to sports education in public school. Twelve physical education teachers from three basic public schools of Maceió, State of Alagoas, Brazil volunteered to participate in a semi-structured open-ended interview focused on the factors that favour and make difficult the development of sports education in the PE programs. Data resulting from the verbatim transcriptions of interviews were content analyzed based on descriptive, data-generated categories (Sousa, 2005). In teachers’ views sport constitutes the primary activity of physical education curriculum. Teachers acknowledge that indoor soccer is the students’ favourite activity. For the majority of the teachers, imparting information about the general risks and benefits of sport practice were a key element of their instruction. As such, they value theoretical lessons as a complement to practical activities. Teachers state that teachers and methods of sport instruction should promote cooperation and enduring commitment to sport practice. The good acceptance of sports education by teachers and pupils makes easier the attainment of the educational goals of the program.

PHYSICAL ACTIVITY AND MOTOR COMPETENCE OF CHILDREN IN DEPENDENCE OF SOCIAL STATUS
Holzweg, M., Ketelhut, K.
Humboldt University of Berlin, Germany

Introduction
In the last years the health status of children in Germany declined and the number of psychologically conscious children also increased. According to the KIGGS study children from socially deprived areas are hit from this development the most (compare Oppen et al, 2007). Holzweg (2006) and several other studies allocate a decline of the level of activity and the motor competence of young children in Germany (compare Woll, 2007 for an overview). In this paper we discuss factors that may influence the physical activity motor competence of children from different social backgrounds (privileged vs. deprived) are assessed.

Method
A sample of 172 3-5 year old children was included in this study. While 80 children lived in a deprived area 92 children lived in an affluent area. The children were tested with the KMS 3-6 and the MOT 4-6. Height, weight and Body Mass Index (BMI) were also assessed. In a questionnaire the children's social status, activity level, television consumption, participation in sport clubs and sport activity of the family were assessed. The social status was collected by profession and income of both parents and according to the social structure atlas for Berlin. The analysis of the assessed data was carried out with SPSS 15 (ANOVA).

Results
Regarding coordination (SHH: F(3,9)=16.51, p<.05; eta²=0.85), TBT: F(3,9)=14.28, p<.05, eta²=0.75 and flexibility (F(3,9)=20.94, p<.05, eta²=0.82) and flexibility (F(3,9)=20.94, p<.05, eta²=0.50) significant differences between the two groups could be shown. With the data of the questionnaire significant differences between the two groups relating to television consumption (F(3,9)=44.87, p<.05, eta²=0.88), participation in sport clubs (F(3,9)=22.6, p<.05, eta²=0.92), outdoor activities (F(3,9)=6.37, p<.05, eta²=0.41), as well as sport activity of the family (F(3,9)=17.35, p<.05, eta²=0.94) could be identified.

Discussion / Conclusions
The study showed that comparable to obesity and health status also motor competence is decisively influenced by the social status of the children. The results of this study additionally indicated differences of the level of activity in dependence of the social background. There-
fore it seems to be necessary to offer affirmative intervention programmes especially in Kindergartens and Primary Schools in socially deprived areas.

References.


THE PROFILE OF OUT-OF-SCHOOL PHYSICAL ACTIVITIES AMONG PRESCHOOL CHILDREN
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Introduction: Several studies (Cardon & De Bourdeaudhuij, 2007, Biddle et al, 2004) reveal that the majority of the population is not enough physical active. This inactive lifestyle can increase risk factors on several disorders, such as cardio-respiratory diseases, cancer, obesity and diabetes. Moreover, research results (Department of Health, 2004) show us that for example children who are highly engaged in physical activities, have more developmental potential of physical, psychological, social and health-related advantages. In view of national economic and social prosperity on the long-term, it is needed to set up physical interventions to increase the physical activity of those children. Recent studies suggest (Loucaides et al, 2003, Michaud-Tomson et al, 2003, Vincent & Pangrazi, 2002) that focusing on the out-of-school-environment to increase their own physical activity level, is effective.

Objectives: This study aims to look at the profile of out-of-school physical activities of preschool children between 4 and 6 years old.

Methods: Two rural and two urban preschools participated in the study. The study was conducted in Flanders, the Northern part of Belgium. 81 (53,3%) out of 152 parents provided informed consent for participation in the study. 32 preschool children in rural area preschools (16 boys and 16 girls) and 48 preschool children in urban area preschools (23 boys and 25 girls) participated in the study. Data is collected in autumn, winter and spring. Each period consists of four full days of follow up: two schooldays and two weekend days. Registering starts at waking up, step counts are recorded at the beginning and end of each school day and at bedtime. The Yamax Digiwalker pedometer type SW-200 was used to register step counts. Data are analyzed using SPSS for Windows.

Results and conclusions: Preliminary results on the first test period (autumn 2007) show that preschool children have comparable average step counts during week- (11 301 +/- 4016) and weekend days (10 563 +/- 3167). On weekdays average out-of-school physical activity step counts are 6312 +/- 2572. These results show that more than half of the physical activity among preschool children happens out of school. Recommended daily step counts of 12000 for girls and 15000 for boys (Tudor-Locke et al, 2004) are not met by most of the children.

References.

Poster presentations (PP)
PP-PM03 Physiology 3

INTRAMUSCULAR METABOLISM DURING LOW-INTENSITY RESISTANCE EXERCISE WITH BLOOD FLOW RESTRICTION
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Background: Muscle hypertrophy and strength gain can be achieved by high-intensity resistance training usually with greater load than 65% of one repetition maximum (IRM) (1). However, unconventional studies have reported that low-intensity resistance training with blood flow restriction could lead to marked increases in muscle size and strength, and result in adaptations equal to those of high-intensity resistance training (2,3). The researchers suggested that the supplementation of low-intensity training with blood flow restriction might have provided the intense stress in the skeletal muscle, but the exact scenarios were not clarified. In the present study, we investigated the intramuscular metabolism during a single bout of low-intensity resistance training with blood flow restriction and compared it with that of high- and low-intensity resistance exercise without blood flow restriction by 31P-magnetic resonance spectroscopy (31P-MRS).

Methods and Results: Twenty-six healthy subjects (men/women: 13/13, age: 22 ± 4 yr) participated in this study. Subjects performed dynamic plantar flexion exercise (30 times/min) for 2 min. Experimental protocols were as follows: low-intensity exercise condition (L) using the load of 20% of one-repetition maximal (IRM), L with blood flow restriction (LR), and high-intensity exercise using 65% of IRM (H). Intramuscular phosphocreatine (PCr), diaphragm inorganic phosphate (H2PO4) and pH during rest and exercise were obtained by 31P-MRS. The depletion of PCr, increase of H2PO4 and decrease of pH during LR were significantly greater than those in L (p<0.001); however those in LR were significantly lower than those in H (p<0.001). The recruitment of fast-twitch fiber evaluated by inorganic phosphate (Pi) splitting was only 31% of the subjects in LR, compared to 70% in H. No significant gender difference was found.

Conclusions: These results suggest that the metabolic stress in skeletal muscle during low-intensity resistance training was significantly increased by applying blood flow restriction, but did not generally reach that during high-intensity resistance training. This new method of resistance training needs to be further examined for optimization of the protocol.

References.
RESPONSES TO OVER-THE-COUNTER ANALGESIC CONSUMPTION ON TREADMILL RUNNING: A PILOT STUDY
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Analgesics are commonly consumed by athletes to prevent or better tolerate pain associated with training and/or competition (Wagner et al. 1989), particularly runners due to the large eccentric component involved. Perceived exertion at lactate threshold appears to be lower during track-running (Garcin et al. 2005) as does muscle soreness and decline in muscle function following eccentric exercise (Hasson et al. 1993) following consumption of analgesics.

The aim of the present study was to compare consumption of two commonly available analgesics with a placebo prior to treadmill running in order to identify any possible physiological or perceptual effects.

Eight trained male runners [mean values ± SD, Age = 28 ± 8 yrs; VO2peak = 60 ± 7 ml/kg-1/min-1] completed 5-minute stages on a treadmill corresponding to 30, 60 and 80% velocity at VO2peak. Measures of heart rate, ventilation, lactate and perceived exertion were recorded during the final minute of each stage. On the day of their trial, subjects consumed Paracetamol (PAR), Ibuprofen (IBU) or placebo (PLA, calcium carbonate) equal to the manufacturer’s recommended limit at 4-hourly intervals prior to treadmill running. Trials took place at 18:00h, were randomized, administered in a double-blind fashion and separated by at least 7 days for wash-out.

Heart rate, ventilation, O2 uptake, lactate concentration and perceived exertion increased with an increased running velocity (all P < 0.05), however there were no effects of treatment on any of the variables measured.

We conclude that consumption of analgesics per se has no effect on physiological or perceptual responses to treadmill running at or below the anaerobic threshold.

References.

EFFECT OF HYPOXIA ON THE INDICATORS OF COMPUTERIZED ELECTRIC - PUNCTURE DIAGNOSTICS
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Introduction
At examining athletes in the conditions of mountain elevations one should take in account the fact that the findings may differ from the standards used on flat country. Goal of the study was to assess the effect of hypoxia on the indicators of computerized electric-puncture diagnostics.

Methods
To register electric - physiological characteristics of biologically active points (BAPs), there was used the Electric-Puncture Diagnostic System (EDS) developed as a set of hard- and software. EDS allows measuring in several algorithms. The study findings were expressed in conventional units (c.u). There were taken measures at 40 control (c) BAPs of all arm and leg meridians on both sides of the body. Along with measuring individual BAPs, there were determined the indicators proposed by us: sum of all BAPs, sum of arm meridians cBAPs, sum of leg meridians cBAPs, sum of heart and lung meridians’ cBAPs, sum of cBAPs of meridians of nervous and endocrine systems, and the ”upper/lower” ratio which reflects the balance between the upper and lower parts of the body. Ten mountain - climbers (of age 19.5±0.2 body mass 69.5±2.5 kg, height 176.3±1.7cm, VC 5.0±0.2 l) were examined twice, with one day interval. During the first examination the athletes breathed atmospheric air, while in the second one, there was used gas mixture with 11.2% of oxygen that corresponds to the altitude of 5,000 m. Examination was performed in the rest and after a maximum aerobic load.

Results
It was established that at breathing of ambient air the physical load resulted in a slight growth of the sum of cBAPs of all meridians, sum of cBAPs of arm meridians, and led to significant increase of the sum of cBAPs of meridians of heart and lungs (356±5 and 377±4, respectively, P<0.05) and the sum of cBAPs of nervous and endocrine systems (355±5 and 382±5, respectively, P<0.05). There was mentioned significant growth of the ”upper/lower” ratio in comparison with the resting state (0.93±0.01 and 0.96±0.009, respectively, P<0.05) that evidenced to the improvement of balance between arm and leg meridians, and is considered as a favorable factor. At breathing the hypoxic mixture, there was noted just a slight increase of the sum of cBAPs of heart and lung and the ”upper/lower” ratio. All the rest indicators did not change. Thus, hypoxia in the physical load causes unidirectional change of all indicators of electric-puncture diagnostics towards their reduction. Such reaction demonstrates its substantial effect on the results of the given type of diagnostics.

Conclusion
At using computerized electric-puncture diagnostics in the conditions of decreased partial pressure of oxygen, there is no clear reaction of electric-puncture diagnostic indicators to the physical load, the fact which should be taken into consideration at interpreting the data collected in such conditions.

CHANGE OF AUTOGENIC INHIBITION AT LONG ISOMETRIC CONTRACTION
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At studying of physiological mechanisms of regulation of person’s voluntary movements the principles attention is given to processes of fatigue of those or others neuronal networks of the central nervous system. Only few works are directed on revealing of participation of different kinds of inhibition on management of motor activity (T. Robertson, D.M. Koceja, 2007). In this connection the purpose of our research was to study the role of autogenic inhibition of a spinal - motoneurons in regulation of isometric contraction of different size.
18 long-distance runners aged 19 to 22 years took part in the research. The subjects carried out the isometric muscular contraction (plantar foot bending) size in 25, 50, 75 and 100 % of maximum voluntary load (IV) within 30 seconds (except for 100 % of load) in sitting position in dynamographic system Biodex (Biodex Medical System, USA). In a special series of researches they kept a static load in 75 % MVC before voluntary refusal. The expressiveness of autogenic inhibition of a spinal - motoneurons was estimated indirectly on duration of the silent period in m.gastrocnemius medialis and m. tibialis anterior, caused by electrostimulus to the field of a popliteal fossa (R. Person, 1985). The EMG investigated muscles was registered by superficial bipolar electrodes with the help of electromyograph Neuro-MEP-8® (Neurosoft, Russia, 2006).

It is revealed, that duration of the silent period of m.gastrocnemius medialis decreases with 79.9±6.5 ms (25 % of MVC) to 11.3±3.4 ms (100 % of MVC), with the increase of force of isometric contraction and the amplitude of the H - reflex has increased from 1.3 to 4.4 mV correspondingly. There were no reliable changes of duration of the silent period during 30 seconds of keeping load, i.e. the expressiveness of autogenic inhibition practically remained invariable at this period.

It is revealed, that duration of the silent period increased a little more in m. tibialis anterior. These changes were accompanied by decreasing of amplitude of H-reflex. Thus, autogenic inhibition participates in regulation of isometric muscular contraction. The expressiveness of autogenic inhibition of a spinal - motoneurons at the person increases at fatigue development.

STUDYING OF MOTOR-EVOKED POTENTIALS PARAMETERS OF SKELETAL MUSCLES DURING ISOMETRIC CONTRACTIONS

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Motor-evoked potentials (MEP) parameters of skeletal muscles under transcranial magnetic stimulation (TMS) characterize changes in functioning of control structures of the nervous system during muscular contractions and allow to study adaptive cortico-spinal mechanisms at sustained isometric efforts (Taylor et al, 1996, 2007; Gandevia, 2001; Enoka).

The purpose of the present research was to study motor-evoked potentials parameters and the EMG silent period of skeletal muscles under transcranial magnetic stimulation (TMS) in the process of isometric muscle contraction (IMC), and revealing of differences of MEP parameters in athletes adapted to work of a different specialization.

7 ski-racers and 7 sprinters took part in researches. All the subjects were informed about conditions of the research and gave a written consent to participation, and it conformed to the Helsinki Declaration.

The subjects performed 10 isometric contractions (plantar dorsiflexion), making 80 % of maximal voluntary contraction (MVC) to task failure. The interval of rest made 1 minute between contractions. Contralateral MEP of m. gastrocnemius med., m. soleus and m. tibialis anterior were registered.

It was established, that during 10-fold performance of isometric effort excitability of cortical neurons in the investigated groups of athletes increased. So, MEP threshold of m. soleus in rest made 60 % of the magnetic stimulator output, after the 1st attempt - 56 % (p<0.05), and after the 10th - 54 % (p<0.05) in the ski-racers.

It was revealed that the MEP amplitude of the skeletal muscles is higher at the end of contraction in comparison with that at the beginning and it is significantly higher than that at rest. The MEP amplitude of m. gastrocnemius med. in the group of ski-racers in 10th attempt at the beginning of contraction made 3.9, in the end - 4.6, which is by 279.3 % (p<0.000) and 348.3 % (p<0.000) higher than that at rest.

It was determined, that the duration of the EMG silent period at the end of a single isometric effort was longer, than that at the beginning of performance. Furthermore, the researched parameter decreased during 10-fold sustained contractions. So, the EMG silent period of m. soleus in the group of ski-racers in 1st attempt made 177.7±7.1 ms at the beginning of effort, it was 198.5±5.5 ms at the end, in 10th - 165.5±5.1 ms (p<0.05) and 180.4±5.3 ms (p<0.05), correspondingly.

The received results can possibly be explained by a change of cortical neurons' properties and their increased influence on the spinal structures, that provide more powerful current of efferent impulses to the skeletal muscles, and also by a modification of intracortical inhibition processes.

BLOOD PRESSURE RESPONSES AFTER REPEATED SPRINT CYCLING: DIFFERENCES BETWEEN BOYS AND MEN

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Repeated high intensity exercise, in the form of five 30 s bouts results in an increase in systolic blood pressure (DBP) during recovery in men (1). However, little is known about the possible differences in hemodynamic changes after repeated sprint exercise between adults and children. The purpose of this study was to compare the blood pressure responses after ten maximal cycling sprints between boys and men. Twelve preadolescent boys (age: 11.8±0.2 y, height: 152±2 cm, body mass: 44±2 kg) and nine men (age: 21.7±0.8 y, height: 175±2 cm, body mass: 74±2 kg) performed ten 6s sprints separated by 24s of passive recovery on a modified friction-loaded cycle ergometer, against a load corresponding to 50% of the optimal resistance as determined by a force-velocity test. SBP and DBP were measured before and for 12 minutes after the test (3, 4, 6, 9.5, 12 min) while the participants remained seated. Differences between the two groups were analyzed using two-way ANOVA with repeated measures on one factor. Results are presented as mean ± SE. Post warm-up SBP was higher in men compared to boys (135±4 mmHg vs 123±3 mmHg, p<0.05) and peaked on the 3rd min of recovery, with the increase being greater in men than in boys (45 vs 16 mmHg, reaching 181±8 and 139±5 mmHg, respectively, P<0.05). SBP in boys returned to pre-exercise levels on the 4th min and fell below that on the 12th min of recovery (112±2 mmHg, p<0.05). However SBP in men was elevated until 9.5 min into recovery, when SBP returned to the resting value and remained unchanged thereafter. The pattern of DBP changes was similar in boys and men. DBP was higher than the resting value on the 3rd min of recovery, while a drop below the resting value was observed after the 6th min (men: 56±2, boys 57±2 mmHg) and was maintained until the end of the recovery period. It is concluded that repeated short sprints on a cycle ergometer cause an increase in SBP during the recovery period that is almost 3 times higher and lasts longer in men compared to boys. However, DBP drops below the resting value after 6 min of recovery, with changes being similar in boys and men. The different changes of SBP in boys and men may be explained by the combination of a higher cardiac output and a greater peripheral resistance in men compared to boys. This may be related to a higher metaboreflex due to the greater metabolic disturbances in men than in boys.

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FATIGUE AND STEADINESS OF DOMINANT AND NON-DOMINANT HUMAN QUADRICEPS FEMORIS MUSCLES DURING VOLUNTARY ISOMETRIC CONTRACTIONS

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BACKGROUND: Dominant and non-dominant legs have been investigated with respect to unilateral postural control (Hoffman et al. 1998), torque of quadriceps muscles (Guette et al. 2005) and muscle fatigue (Martin & Rattey, 2007). Fatiguing isometric contractions at low intensities are characterized by a progressive increase in amplitude of the force fluctuations (i.e. deterioration of muscle steadiness). PURPOSE: To examine fatigue and steadiness of dominant (D) and non-dominant (ND) quadriceps during voluntary isometric contractions. METHODS: Leg dominance was based on the subject’s preferred kicking leg. Subjects were 13 healthy, physically active, subjects (3 females, 10 males; age: 20±2 yr; body mass: 73.3±11.6 kg; height: 1.76±0.11 m; mean ± SD). Subject’s upper body was firmly restrained and hip and knee joint angles kept at 90°. Subject’s ankle was connected with a chain to a force transducer (model 616, Tedea-Huntleigh, Cardiff, UK) sampling frequency 1000Hz. Maximal voluntary isometric force (MVIF), steadiness during 20%MVIF until task failure and MVIF 20 seconds after completion of the 20%MVIF, for calculation of the fatigue index, were measured. Steadiness or amplitude of the force fluctuations was calculated as the coefficient of variation (CV)=SD/mean x 100) during the first (0-10%), middle (45-55%) and last (90-100%) time period of total endurance time. RESULTS: Dominant and non-dominant quadriceps had similar MVIF. D: 655.8±162.5 N; ND: 637.1±156.0 Nl and similar endurance times during 20%MVIF: D: 374.8±174.2 s; ND 384.5±149.3 s. However, dominant quadriceps had a 7.8% higher fatigue index than non-dominant quadriceps (D: 38.6±16.7%; ND: 30.8±16.5%; Student t-test, P=0.007). Steadiness increased over time (two-way ANOVA, P<0.05) but there were no differences in similar time periods of endurance time for dominant and non-dominant quadriceps (0-10%; D: 2.63±0.68%, ND: 2.68±0.61%; 45-55%; D: 4.06±1.71%, ND: 4.00±1.46%; 90-100%; D: 10.71±4.91% ND: 9.97±2.96%). CONCLUSIONS: Dominant quadriceps femoris muscles experienced larger fatigue from submaximal 20% sustained isometric contractions suggesting that the occurrence of central fatigue may be related to leg dominance. However, differences in fatigue were not associated with differences in muscle steadiness in dominant and non-dominant quadriceps femoris muscles.

References.

THE EFFECTS OF RESISTANCE TRAINING ON SYMPATHETIC NEURAL ACTIVITY RESPONSE DURING FATIGUING STATIC HANDGIP EXERCISE

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Muscle contraction elicits increased muscle sympathetic nerve activity (MSNA) caused by central neural activity (central command) and muscle reflex. The MSNA response during muscle contraction is reduced after endurance training. However, there has been inconsistent results of the MSNA response after resistance training; the response was attenuated(1) or not changed(2) during isometric handgrip. On the other hand, an increase in muscle strength after short-term resistance training is due to an improvement of neural drive from higher center to the muscle rather than the alteration of muscle properties(3). Thus, we hypothesized that if central neural drive to the muscle increased after resistance training, this may influence the autonomic nervous system. The aim of the study was to investigate if resistance training influenced the MSNA response during muscular contraction. MSNA, heart rate (HR) and blood pressure (BP) response to two-min isometric handgrip (IHG) and fatiguing isometric handgrip exercise (FTG) at 33% of maximal voluntary contraction, followed by post-exercise circulatory occlusion (PECO) were compared before and after resistance training. MSNA was recorded from the tibial nerve and represented as burst frequency per min. HR counted from ECG and BP from Finapres were determined. Eighteen healthy subjects, with mean age of 23 years, took part in this study. All subjects gave informed written consent and the study had TTI Ethical Committee approval. Ten subjects were assigned to training group (TG) and other nine subjects were allocated to control group (CG). TG trained a non-dominant arm. The training regimen was consisted of three sets of ten maximal 10-s static handgrip repeated 10 s interval, 4 days per week for four weeks. Maximal handgrip force increased by 23% in TG after training but remained constant in CG. MSNA increased during handgrip and PECO from the resting control in IHG as well as FTG. MSNA response during handgrip and PECO in IHG presented no significant change after training. During fatiguing handgrip, extent of MSNA response during handgrip increased by 29% was greater after training compared to before training while unchanged during PECO. In CG no significant difference in MSNA response during IHG as well as FTG between before and after training was found. HR and BP response in IHG and FTG were unchanged after training. This study demonstrated that short-term strength training may influence on MSNA response during fatiguing muscle contraction, while MSNA response during PECO was obtained insignificant effects. These different responses may be related to volitional factor rather than muscle reflex.

References.
Glucagon growth hormone and insulin-like growth factor-1 responses to two heavy resistance training with different rest intervals between sets

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Resistance training is a powerful stimulus for acute increase in the concentration of anabolic hormone. At present, little data are available on changes in the levels of IGF-I and GH following different rest intervals between sets in resistance training. Therefore, in order to examine the effects of different rest intervals on the sets on acute GH and IGF-I responses, different rest intervals resistance trained men served as subjects (Mean SD, age=22 ± 2 years, body mass=84 ± 8 kg). Subjects performed two heavy-resistance training protocols that were similar with regard to the total volume of work (1), but differed with regard the length of rest between sets (1 vs. 3-minutes). Both protocols included 5 sets of 10 RM bench press and squat that performed on two randomized separate sessions. Blood samples were collected before immediately and 1-hour after the protocols for determination GH, IGF-I and blood lactate concentration. Two way analysis of variance with repeated measures demonstrated that both protocols led to the greater acute increases (P<0.05) in serum GH concentrations. However, the GH response was significantly larger in short rest than long rest interval between sets protocol, and IGF-I didn’t significantly change between protocols. Blood lactate concentrations increased more in short rest than long rest interval between sets protocol (P<0.05). Results of this study support rest interval length as a strategy for increasing GH and IGF-I serum concentrations, which is believed to enhance and stimulate greater strength and hypertrophy adaptations.

Decrease in running economy following downhill running

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Several studies have investigated the effects of exercise-induced muscle damage (EIMD) on running economy (RE), but controversy exists whether EIMD affects RE significantly. Some studies reported no significant effect of EIMD on oxygen consumption (VO2) during sub-maximal treadmill running (55-75% VO2max) following lower body resistance exercises with free-weight (Scott et al. J Strength Cond Res 2003), a downhill running (DHR) (Harmill et al. Int J Sports Biomech 1991), or a maximal eccentric exercise of the knee extensors on an isokinetic dynamometer (Paschalis et al. Int J Sports Med 2005). On the other hand, Braun & Dutto (Eur J Appl Physiol, 2003) and Chen et al. J Sports Sci, 2007) showed that RE during sub-maximal treadmill running (65, 75, and 85% VO2peak) was significantly reduced for 3 days following DHR. It appears that exercise and the level of muscle damage, characteristics of subjects, and protocol to assess RE are factors contributing the different findings. To confirm the findings of our previous study (Chen et al. 2007), this study used untrained subjects to induce greater muscle damage than the previous study, and included a higher intensity of running to assess RE. Twelve untrained male students (19-23 yrs) performed a 30-minute DHR at a gradient of -16% at the intensity of their pre-determined 70% VO2max. Maximal isokinetic concentric strength at 30°/s, isometric strength of the knee extensors, muscle soreness (SOR), and plasma creatine kinase (CK) activity were measured before, immediately after, and for 5 consecutive days after DHR. RE was assessed by VO2, minute ventilation (VE), respiratory exchange ratio (RER), heart rate (HR), ratings of perceived exertion (RPE), and blood lactate concentration (LACT) during a 5-minute running on a treadmill at the intensities of 70%, 80%, and 90% VO2max (randomized order, 10 min between the intensities) before, and 2 and 5 days after DHR. Changes in the measures following DHR from baseline were analysed by a one-way ANOVA, and changes in the RE measures following DHR were compared amongst the intensities using a two-way repeated measure ANOVA. DHR resulted in significant (P<0.05) development of SOR, decreases in muscle strength (17-22%), and increases in plasma CK activity (390-660%), which lasted for 5 days after DHR. All RE parameters showed significant (P<0.05) increases from baseline for 5 days following DHR at the 80% and 90% running intensities, but this was not the case for the 70% intensity. The results of the present study confirmed that RE is reduced after DHR. It appears that the magnitude of muscle damage induced by the DHR in the present study was greater than that of the previous study (Chen et al. 2007), and the effect of EIMD on RE was also greater for the present study. It may be that the greater decrease in RE at the high intensity running was associated with the damage to fast twitch fibers, which might have been occurred to a greater extent for the untrained subjects.

Physiological and metabolic characteristics associated with the preferred transition speed in trained racewalkers

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Purpose: Human terrestrial locomotion is characterized by either walking or running. The preferred transition speed (PTS) at which humans change their gait was found to be lower than their energetically optimal transition speed (EOTS). However, this phenomenon was not examined in racewalkers. The purpose of this study was to evaluate the PTS and EOTS in trained racewalkers compared to a control group. Methods: Eleven racewalkers and thirteen control subjects participated in this study. Subjects arrived at the lab on three separate occasions. Visit I: walk-run PTS determination: subjects were required to walk at a slow walking speed and the treadmill’s speed was increased by 0.2 km/hr every 30 s until the subject felt it was easier to walk. Run-walk PTS determination: subjects were required to run at a speed which was above their ability to walk and the treadmill’s speed was reduced by 0.2 km/hr every 30 s until the subject felt it was easier to run. PTS was defined as the average of the walk-run PTS and the run-walk PTS. Plantar and dorsi flexion isokinetic dynamometer (Paschalis et al. Int J Sports Med 2005). On the other hand, Braun & Dutto (Eur J Appl Physiol, 2003) and Chen et al. J Sports Sci, 2007) showed that RE during sub-maximal treadmill running (65, 75, and 85% VO2peak) was significantly reduced for 3 days following DHR. It appears that exercise and the level of muscle damage, characteristics of subjects, and protocol to assess RE are factors contributing the different findings. To confirm the findings of our previous study (Chen et al. 2007), this study used untrained subjects to induce greater muscle damage than the previous study, and included a higher intensity of running to assess RE. Twelve untrained male students (19-23 yrs) performed a 30-minute DHR at a gradient of -16% at the intensity of their pre-determined 70% VO2max. Maximal isokinetic concentric strength at 30°/s, isometric strength of the knee extensors, muscle soreness (SOR), and plasma creatine kinase (CK) activity were measured before, immediately after, and for 5 consecutive days after DHR. RE was assessed by VO2, minute ventilation (VE), respiratory exchange ratio (RER), heart rate (HR), ratings of perceived exertion (RPE), and blood lactate concentration (LACT) during a 5-minute running on a treadmill at the intensities of 70%, 80%, and 90% VO2max (randomized order, 10 min between the intensities) before, and 2 and 5 days after DHR. Changes in the measures following DHR from baseline were analysed by a one-way ANOVA, and changes in the RE measures following DHR were compared amongst the intensities using a two-way repeated measure ANOVA. DHR resulted in significant (P<0.05) development of SOR, decreases in muscle strength (17-22%), and increases in plasma CK activity (390-660%), which lasted for 5 days after DHR. All RE parameters showed significant (P<0.05) increases from baseline for 5 days following DHR at the 80% and 90% running intensities, but this was not the case for the 70% intensity. The results of the present study confirmed that RE is reduced after DHR. It appears that the magnitude of muscle damage induced by the DHR in the present study was greater than that of the previous study (Chen et al. 2007), and the effect of EIMD on RE was also greater for the present study. It may be that the greater decrease in RE at the high intensity running was associated with the damage to fast twitch fibers, which might have been occurred to a greater extent for the untrained subjects.
EFFECTS OF MODERATE ALTITUDE ON PULMONARY FUNCTION OF PHYSICAL EDUCATION STUDENTS

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INTRODUCTION: The effects of different altitudes (low, moderate or extreme) on vital functions are well documented. Again, it's known by the recent researches that no statistically meaningful changes occur on pulmonary functions up to 1500m although there may be changes at velocity of air currents, and again it's adaption ratio to the altitude differs according to sex. The purpose of this study is to determine the effects of moderate altitude (1800m) on pulmonary functions among PE students.

METHOD: In the study, 19 apparently healthy subjects (10 male, 9 female) from Gazi University School of Physical Education and Sports students voluntarily participated. The age, height and weight measurements (mean±SD) of the male and female subjects are 21.22±1.71 year, 167.11±4.96 cm, 53.77±4.89 kg and 22.20±1.75 year, 175.00±4.38 cm, 71.00±10.48 kg respectively. COSMED PFX desktop Spirometer used in this study. All pulmonary tests which are FVC, FEV, FEF, VC and MVV measured 3 times: First day(I) and after 5 days(II) at altitude(1800m Ilgaz Mountains). The last one(III) applied in city 10 days later(850m). The data were analyzed with Repeated Measure Analysis of Variance (ANOVA) by SPSS statistical software.

RESULTS: According to the results, there is no significant differences within the groups both female and male students in all tests. However, as compare the male and female student groups, the results showed that FVC, FEV, PEF, VC and MVV were significantly different (P<0.05 P<0.01).

DISCUSSION & CONCLUSION: Muza et al; reported that; women, who stayed at 4300m for two weeks, showed faster adaptation than men. Forte et al; determined that increasing at the FEV1 and a little decreasing of the FVC and 20% increasing at the MVV at high altitude. On the other hand, we found on the moderate altitude, pulmonary functions did not significantly effect within all groups. Although, as compare female and male subjects pulmonary functions parameters were significantly different in all tests.

References

EFFECT OF EXERCISE AND DIET MODIFICATION INTERVENTION ON ENDOTHELIAL DYSFUNCTION AND INSULIN RESISTANCE IN A RAT MODEL OF DIET-INDUCED OBESITY

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This study was designed to examine whether abnormalities that comprise the metabolic syndrome (obesity, insulin resistance, hyperlipidemia, endothelial dysfunction and hypertension) are reversible by physical exercise with/o without diet modification in a rat model of diet-induced obesity.

Male Sprague-Dawley rats were placed on either a high fat (HF) or control diet (CI). After 12 weeks, HF rats were separated into 4 groups: sedentary obese group (OB), exercise trained (motor treadmill 5 days/week, 60 min/day for 12 weeks) obese group (OB/EX), modified diet (high fat to control diet) group (HF/C) and exercise trained with modified diet group (HF/C/EX). Body weight and blood pressure were measured weekly. Retropertioneal and epididymal fat mass, plasma lipids and glucose levels, and vasorelaxant response in isolated aorta were measured in all groups after 24 weeks.

Body weight, retropertioneal and epididymal fat mass were significantly higher in OB rats. Exercise significantly decreased these parameters in OB/EX and HF/C/EX rats. Plasma total and LDL-cholesterol and glucose levels were significantly higher in OB rats while plasma HDL-cholesterol was significantly lower than control group. Exercise improved lipids and glucose concentrations in the OB/EX and HF/C/EX rats. The vasorelaxation response to acetylcholine was significantly impaired in the aorta from the OB rats compared with the control rats. However, the endothelium-dependent response to acetylcholine was restored in aorta from the OB/EX and HF/C/EX rats. There were no differences in the vasorelaxation response to sodium nitroprusside between groups. The relaxation responses to insulin were significantly attenuated in the OB group compared to the control group. In the same manner than acetylcholine, the endothelium-dependent relaxation to insulin was markedly restored in aorta from the OB/EX and HF/C/EX groups.

Our findings suggest that exercise is able to reverse the metabolic syndrome in rat fed a high fat diet, to improve the cellular response to insulin and to restore the endothelium- and NO-dependent vasorelaxation. These results demonstrate that metabolic syndrome induced by an inappropriate diet is reversed by exercise without necessary diet modification. Finally, it is concluded that exercise may be a potential non-pharmacological treatment for multiple simultaneous cardiovascular risk factors.

EFFECTS OF EXERCISE TRAINING AT DIFFERENT HYPOBARIC HYPOXIC CONDITIONS ON CARDIOVASCULAR ADAPTATIONS

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Introduction
Recently, we have reported that aerobic exercise under a hypobaric hypoxic condition could more effectively reduce total peripheral resistance (TPR) and blood pressure (BP), compared to the exercise under a normal condition (Ogita 2007). The reduction of TPR was partly attributed to an enhancement of vasodilative capacity. Furthermore, the adaptation seemed to be brought by a hypoxic stimulus which cause vasodilation through several metabolites such as nitric oxide and adenosine. In this study, we therefore examined the effects of exercise training at different hypobaric hypoxic conditions on cardiovascular adaptations, especially during exercise.

Methods
The subjects were 22 healthy adults (25±4 yrs). They were matched for physical fitness level into three groups and then randomized to normobaric normoxic exercise group (N; n=6) and 2 hypobaric hypoxic exercise groups (H1; n=10, H2; n=6). The aquatic exercise training was done in swimming pool located in a chamber where atmospheric pressure could be regulated. The exercise was performed at the intensity of around 50%VO2max for 30 minutes/training session, 4 days/week, for 4 weeks. H1 and H2 had the exercise in the hypobaric conditions corresponded to 1200m and 2000m above sea level, respectively, and were exposed to the hypoxic condition for 2 hours/session. Before and after the training period, VO2max and cardiovascular responses, such as heart rate (HR), stroke volume (SV), cardiac output (CO), and systolic (SBP), diastolic (DBP) and mean blood pressure (MBP) during cycling exercise at the intensity of 50%VO2max, which was determined before the training, were measured. In addition, the diameter of the popliteal artery was measured at rest and during reactive hyperemia after release of 5-minute arterial occlusion.

Results
After the 4 weeks of training, VO2max did not change significantly in all groups. In cardiovascular responses during the moderate exercise, no significant changes were observed in N, and only DBP significantly decreased in H1. On the other hand, SV and CO in H2 significantly increased. Furthermore, DBP (pre: 68±8; post: 55±4 mmHg) and MBP (pre: 94±4; post: 91±4 mmHg) significantly decreased (P<0.05). The diameter of popliteal artery at rest did not change significantly in all groups, however, peak diameter during reactive hyperemia significantly increased only in H2 (pre: 6.6±0.6; post: 7.0±0.8 mm) (P<0.05).

Discussion/Conclusion
These findings suggest that exercise in hypobaric hypoxic condition more effectively reduces TPR and BP with an increase in SV compared to the exercise under normal condition but that hypoxic stimulus corresponding to 1200 m above sea level would not be strong enough to induce such cardiovascular adaptations.

References

COMPARISON OF ELECTRICAL AND MAGNETIC STIMULATIONS TO ASSESS KNEE EXTENSOR MUSCLE FUNCTION

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This study aimed at (i) comparing electrical and magnetic stimulations to assess knee extensor (KE) muscle function and (ii) assessing whether the ratio of the second twitch of paired stimulations at 10 and 100 Hz (T210:100, Yan et al. 1993) is equivalent to the low-to-high frequency force ratio obtained during tetanic contractions (F10:100). Twenty-two healthy subjects performed i) supramaximal electrical femoral nerve stimulation (ENS), ii) supramaximal magnetic femoral nerve stimulation (MNS) and iii) submaximal transcutaneous electrical knee muscle stimulation (EMS) in a random order at 1 Hz (single stimulation), 10 Hz and 100 Hz (paired stimulations), followed by 0-5 s tetani at 10 and 100 Hz with EMS. KE force and electromyographic responses were recorded during each stimulation. For 10 subjects, measurements were also performed before and after a 30-min downhill run (slope -20%, speed 10kmh-1) on a motorized treadmill. Peak forces during single and paired stimulations were comparable with EMS and MNS, but smaller with EMS (H1: 151±25 N vs. 147±26 N; H2: 129±19 N vs. 127±21 N, P<0.05), and MNS (H1: 133±12 N vs. 129±16 N; H2: 121±15 N vs. 118±17 N, P<0.05). M-wave characteristics were similar with EMS and MNS. F10:100 did not correlate with T210:100 measured with EMS (r²=0.19), MNS (r²=0.01) or EMS (r²=0.18) before exercise. We conclude that electrical and magnetic stimulations of the femoral nerve provide similar neuromuscular assessment of the KE. However, T210:100 and F10:100 ratios are not equivalent to assess low-to-high frequency force of the KE muscle in vivo.

References

ELECTRICAL STIMULATION SENSORY THRESHOLD IS RELATED TO SUBCUTANEOUS FAT THICKNESS

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We recently demonstrated lower electrical sensory thresholds in women than in men (1), i.e., female subjects perceived electrical stimulation with lower current amplitudes than their male counterparts (r=-43%). Interestingly, the lowest sensory currents were observed in those subjects with the largest skinfold thicknesses (women), therefore suggesting a link between subcutaneous adipose tissue mass and sensory excitability. To confirm these observations, in this study we compared detection-threshold stimulation levels between men and women having wide ranges of subcutaneous fat (i.e., obese individuals). Moreover, since skinfold thickness does not provide an accurate assessment of the quantity of subcutaneous fat, we quantified thigh subcutaneous fat thickness using B-mode ultrasound (2), and attempted to relate this parameter to sensory threshold.

Thirty adult obese individuals (15 men and 15 women; BMI: 41±6 and 42±8 kg/m², respectively) were enrolled in this study. B-mode ultrasound images were obtained from the lateral aspect of the vastus lateralis muscle at half of femur length, while the subject was seated with an angle of 90° at the hip and knee joints. In the same position, the quadriceps femoris muscle was stimulated at 50 Hz with a portable electrical stimulation unit and two surface electrodes. Electrodes were placed 5 cm below the femoral triangle and at half of femur length, over the vastus lateralis muscle belly. The investigator progressively increased current amplitude (mA) from zero to sensory threshold, i.e., when the subject indicated initial lowest perception of stimulus sensation. Subcutaneous fat thickness and sensory threshold data were the average of 2-3 trials per thigh (both thighs were tested).

Subcutaneous fat thickness was significantly larger in women (24.8±7.5 mm) than in men (12.7±3.6 mm). Sensory threshold was significantly lower in women (2.33±0.75 mA) than in men (3.80±0.70 mA). The lowest sensory thresholds were observed in those subjects with the largest fat thicknesses and vice versa (r²=-0.77, P<0.001; fat thickness=0.58×sensory threshold+3.62).

In line with our previous investigation, the present findings allow us to speculate that the number and/or sensitivity of cutaneous and subcutaneous receptors activated by detection-threshold current could differ between men, both obese (this study) and nonobese (1). Considering that these low electrical stimulation levels would predominantly activate large-diameter A-beta afferents, sex differences could exist in the properties of encapsulated nerve endings (such as Pacinian corpuscles and Merkel disc). The choice of optimal current amplitudes is paramount to the effectiveness of electrical stimulation treatments (e.g., for TENS). We therefore recommend that practitioners consider that women may present lower sensory thresholds than men.
ALTERATION OF NEUROMUSCULAR FUNCTION IN SQUASH

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Introduction: Racquet sports are increasingly popular, but in these sports, exercise-induced neuromuscular fatigue has received little attention until recently (Girard and Millet, 2008) and has been limited to the game of tennis (Girard et al. 2007). The aim of this study was therefore to identify the central (i.e., reduction in motor units recruitment; decreased central drive) and peripheral (i.e., decrease in muscle fiber contractility) mechanisms that contribute to the decline in muscle strength (i.e., knee extensors) after a squash match play.

Methods: Before and immediately after a 1-h squash match, maximal percutaneous electrical stimulations (model DS-7, Digitimer Stimulator, UK) were applied to the femoral nerve of 10 trained squash players. To examine potential impairment in central drive, changes in EMG activity of vastus lateralis (VL) and vastus medialis (VM) muscles normalized to M-wave amplitude (RMS/M) as well as muscle activation (VA) were quantified during maximal voluntary contraction (MVC) of knee extensors. Peripheral fatigue was assessed by examining the characteristics of the M-wave and twitch contractile properties following single stimuli. The torque and EMG data (MP30, Biopac, CA) were recorded (2000 Hz).

Results: MVC declined (280.5 ± 46.8 vs. 233.6 ± 35.4 Nm, -16%; P< 0.001) and this was accompanied by an impairment of central activation, as attested by decline in VA (76.7 ± 10.4 vs. 71.3 ± 9.6%, -7%; P< 0.05) and raw EMG activity of the two vasti (-17%; P< 0.05), whereas RMS/M decrease was lesser (VL: -5%; NS and VM: -12%; P= 0.10). In the fatigued state, no significant change in M-wave amplitude (VL: 11.6 ± 4.6 vs. 10.6 ± 4.9 mV, -9%; VM: 8.8 ± 4.0 vs. 8.2 ± 3.3 mV, -5%) or duration were observed. Following exercise, the single twitch was characterized by lower peak torque -20%; P < 0.001 as well as shorter half-relaxation time -15%; P < 0.001 and reduced maximal rate of twitch tension development -23%; P < 0.001 and relaxation 17%; P < 0.05. Finally, handgrip force did not change (28.2 ± 6.2 vs. 28.7 ± 6.3 kg).

Discussion/Conclusions: A 1-h squash match play caused peripheral fatigue higher than the one observed after 3-h of tennis (MVC: -9%; Girard et al. 2007) by impairing excitation-contraction coupling, whereas sarcolemmal excitability seems well preserved. Our results also emphasize the role of central activation failure as a possible origin of the alterations in neuromuscular function observed. The highly intermittent nature of squash and the high effective playing time (squad: 50-70% vs. tennis: 20-30%, Girard and Millet, 2008) explain the differences observed with tennis.

References

EFFECT OF TWO DIFFERENT EXERCISE INTENSITIES ON THE CONCENTRATION OF STEROID HORMONS IN THE SALVIA OF HIGH SCHOOL STUDENTS

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Introduction
In young individuals few data are available on hormonal response to exercise-related stress (Boisseau & Delamarche 2000). It is well known that physical activity can influence the secretory processes of many endocrine tissues, and, in particular, acute physical exercise is known that physical activity can influence the secretory processes of many endocrine tissues, and, in particular, acute physical exercise is able to also sharply increase the serum concentrations of steroid hormones (SH) (Smilios et al., 2003). These responses are influenced by sexual steroids. It is well

Results revealed that the cortisol level of the high intensity group was significantly increased after training (T2) and still elevated after heavy-intensity training. After a high intensively exercise the levels of both SHs rose compared to the control and the low intensity group.

References
CAN OBESITY AFFECT DAILY LIVING ACTIVITIES ENERGY EXPENDITURE IN CHILDREN?

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Differences between obese and non-obese children have been already measured by indirect calorimetry for resting energy expenditure (REE). On the contrary no study investigated on the variation of activity energy expenditure (AEE) other than walking and running. The aim of the present study was to determine the REE and the AEE of 11 common physical activities in overweight or obese (OI) and non-obese (CG) children.

21 volunteer children participated in the study (G1: N=10, age, 9.5±1.6 yr; BMI, 23.6±1.7 kg/m2; VO2max, 33.6±1.6 ml/kg/min; G2: N=11, age, 9.4±1.6 yr; BMI, 16.5±1.6 kg/m2; VO2max, 45.6±1.6 ml/kg/min). Subjects were classified as overweight, obese and non-obese according to international reference values (Cole, 2000). Two sets of activities were performed in two separate days by each subject. Activities ranged from cruyoning to running and rope skipping and were divided according to the actual intensity (<3 METS, 3-6 METS, >6 METS). Oxygen consumpation was measured continuously with a portable metabolic system (K4b2, Cosmed, Italy).

REE was higher, even if not significantly, in G1 in comparison with G2 (REE: G1 1204.7±549.8 kcal/d, G2 1046.3±303.2 kcal/d). No significant differences were detected between G1 and G2 in AEE, even if the same trend that REE was observed for moderate and vigorous activities (AEE <3 METS: G1 58.5±23.5 kcal/d, G2 63.2±22.3 kcal/d, AEE 3-6 METS: G1 180.8±65.2 kcal/d, G2 170.1±54.9, AEE >6 METS: G1 353.7±101.6 kcal/d, G2 312.9±97.3 kcal/d).

These data indicate that REE and moderate and vigorous AEE are energetically more expensive for overweight and obese children than for non-obese children, even if this difference is not statistically significant. These data confirm that obese children show a trend to a higher energy expenditure, the mechanical power being equal. Devising a physical activity program in which children train together with non-obese children could be useful and effective in the treatment of overweight or obesity.

References.


MORPHOLOGICAL AND FUNCTIONAL CHANGES OF THE HEART DURING DETRAINING PERIOD IN MALE ATHLETES

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In order to evaluate the influence of detraining on cardiovascular re-adaptations, 43 male (22.5 ± 6.8 years) athletes were examined during the training and within 2 months of detraining period (usually caused different kind of injuries). We used two dimensionally guided M-mode picture to detect the morphological changes (left ventricular wall thickness, end-diastolic diameter, left ventricular muscle mass) and used Doppler echocardiography to detect functional changes (cardiac output, stroke volume, VCF). For data analysis we used t-test for dependent samples with help of STATISTICA for Windows 8.0 program. After the detraining period the wall thickness decreased by 3.1% (14.47 vs. 14.02 p<0.0065), left ventricular mass decreased 3.23% (88.07 vs. 85.22 p<0.05), but the end-diastolic diameter did not reduce significantly. However, functional changes showed stronger difference between the active and the non-active period as the cardiac output value elevated by 16.3% (1.92 vs. 2.23 p<0.0012), the stroke volume value high by 5.52% (33.63 vs. 35.49 p<0.024), in the VCF value increased by 6.73% (1.13 vs. 1.2 p<0.008) and the resting heart rate by 7.1% (57.88 vs. 61.99 p<0.03). In accordance with other authors it seems that morphological changes appear markedly only after 60 days detraining. Functional characteristics of the heart are dominancy causes higher values in the functional characteristics of the heart.

STUDY OF VALIDITY AND RELIABILITY OF NON-EXERCISE TEST & GAS ANALYSIS TO ESTIMATE VO2MAX IN FEMALE BASKETBALL PLAYERS

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The purpose of this study was to investigate the validity and reliability of Houston non-exercise test & gas analysis for estimating vo2max in female basketball players. For this reason, 30 female basketball players (age 21±3.33 yr old, height 167±3.5 cm, weight 60±7.72 kg) who experienced in super league competition in Tehran were selected.

For estimating vo2max, subjects were invited to physical fitness assessment center of national Olympic academy. Their vo2max were measured by gas analysis using Brouce protocol on treadmill (vo2max 41.21±3.8 ml.kg⁻¹.min⁻¹). The Houston non-exercise test included first measuring body fat percent (%BF) and second measuring body mass in dex. The subject's body fat percent was measured by skin fold method with caliper and the body mass index was measured by body mass analyzer (in body).

To determine physical activity rate a questionnaire were developed and distributed among subjects. Then the intended variables were put in equation of Houston non-exercise test, and estimated of vo2max and the subject's vo2max was predicted in an indirect way (vo2max = 0.76, SEE = 3.75, P = 0.00).

Further, the result showed that proved the reliability of vo2max obtained from non -exercise test and gas analysis system. Ir = 0.76, SEE = 3.75, P = 0.00).

We concluded that the N-EX models provided an accurate estimate of vo2max for female basketball players who had a vo2max less than 55 ml/kg·1·min⁻¹.

Key words:
Non-exercise test, gas analysis, Vo2max

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References.

It has been shown that an acute unfamiliar bout of downhill running (DHR) may induce delayed onset muscle soreness (DOMS) and decrease running economy (RE). Eighteen physically active subjects (9 men, 9 women) were divided into two groups based on their maximal oxygen consumption (VO₂max) and gender (equal number of both sexes in both groups). The downhill group (DHG; n = 10, age 26 ± 4 years and VO₂max 49 ± 10 ml/kg/min) and the control group (CG, n = 8, 29 ± 5 years and 51 ± 9 ml/kg/min) both performed two 30 min treadmill exercise bouts (E₁ and E₂, respectively) with 48 h recovery in between. In DHG the first 5 min was run on a level treadmill, then 20 min with 10 % downhill (DHR-phase) and again the last 5 min on level treadmill (both in E₁ and E₂). In CG both exercise bouts were performed on level treadmill. Treadmill velocity in both groups was 70 % of that attained in a progressive VO₂max-test (performed 2-4 weeks earlier). Oxygen consumption (VO₂) and heart rate (HR) were measured continuously during E₁ and E₂. Step length (SL) and frequency were determined after 4, 14, 24 and 29 min of running. Blood samples were taken for blood lactate and serum creatine kinase activity (CK). Squat jump, counter movement jump and maximal hopping power were measured before and after the bouts. The subjects also evaluated DOMS of their thigh muscles daily for 7 days after E₁ (scale 0-6). The results showed a decrease in RE in DHG during E₁ (VO₂ increased from the first 5 min to the last 5 min; 34 ±/− 5 vs. 38 ±/− 5 ml/kg/min, 9.2 ±/− 4.7 %, p < 0.01). VO₂ also increased from the first 5 min in E₁ to the first 5 min in E₂ (36 ±/− 4 ml/kg/min) and the control group (CG) increased VO₂ by 4.7 ±/− 5.5 % in DHG (p < 0.05), but no increase in DHG or in the last 5 min was observed. During E₂, and in CG at any phase of the study, no changes in RE were observed. HR was higher in DHG during the first 5 min in E₂ (154 ±/− 11 bpm) than in E₁ (150 ±/− 11 bpm, 3.1 ±/− 4.0 %, p < 0.05). SL was longer in DHG during DHR-phase (1.18 ±/− 0.21 m) than in level running (1.13 ±/− 0.18 m, p < 0.05) and also longer than during DHR-phase in E₂ (1.14 ±/− 0.19 m, p < 0.05). No changes in the jumping performance were observed in either group. Significant increases in CK and DOMS were only found in DHG. The results of this study suggest that unfamiliar DHR may induce muscle damage that decreases RE, especially in level running. The absence of decrease in RE during the second DHR bout may be explained, at least in part, by the ‘repeated bout effect’, i.e. fast adaptation to eccentric exercise resulting in less muscle damage in the second exercise bout (McHugh et al. 1999).

**References.**


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**Comparisons of VO₂ Kinetics in Walking and Running at the Gait Transition Speed**

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**Background**

Walking and running, as two distinct patterns of locomotion, may be considered as the most natural forms of physical activity in humans. It is surprising, therefore, that no attempts have been made, to our knowledge, to compare the VO₂ kinetics in walking and running. The aim of this study was to examine VO₂ kinetics during walking and running at the preferred gait transition speed (PTS).

**Methods**

Twenty-two physical education students (21.4 ± 2.4 y, 182 ± 7 cm), performed treadmill tests for determination of the aerobic gas exchange thresholds for walking, ATw, and running, ATr, VO₂max and PTS. Thereafter, they completed two square-wave 30-minute walking (W30) and running (R30) tests at the PTS, VO₂ was determined breath-by-breath, and computerised non-linear regression techniques were used to describe either a mono-, bi-, or exponential or exponential-linear VO₂ response. ANOVA for repeated measurements was used to test for differences between walking and running parameters.

**Results**

The PTS had the same average value as ATw and ATr (7.1 ± 0.4 km/h). The time constant for the fast VO₂ component (" tau") in the 30-minute tests was significantly smaller for running than for walking (29 ± 8 ± 4 s vs 33.0 ± 8 ± 2 s, p < 0.01), while the amplitude of the primary VO₂ response (A1) was smaller in the walking test (10.9 ± 1.6 vs 15.7 ± 2.1 ml O₂/min/kg). The parameters of the VO₂ slow component did not differ significantly between tests, although the VO₂ slow component was greater (170 ± 94 ml/min vs 132 ± 25 ml/min) and more often present (19/22 vs 6/22) during running. The time delay for the slow component (t2) was greater for walking (343 ± 220 s vs 194 ± 116 s, p < 0.05). The mean time to achieve stable state (tss) and the aerobic energy cost (Css) were significantly lower for walking (tss = 316 ± 306 s and 586 ± 419 s, Css = 157 ± 20 ml O₂/kg/km and 218 ± 20 ml O₂/kg/km, for W30 and R30, respectively). In W30, the aerobic energy cost centered at the 3rd minute of exercise (C3 = 153 ± 18 ml O₂/kg/km) and Css did not differ significantly (p > 0.05), while in the R30 test, C3 was significantly lower than Css (C3 = 197 ± 21 ml O₂/kg/km, p < 0.05), although explaining effectively the variability of Css (r² = 0.93).

**Conclusions**

Oxygen uptake kinetics (" tau") are significantly faster in running compared to walking at the preferred gait transition speed in young healthy subjects. Although all tests were equally distributed within the moderate and heavy intensity domains, walking at the PTS is characterized by a monoexponential VO₂ response, while a VO₂ slow component is present during running at the PTS, in most subjects.

**References.**


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**The Effects of Two Consecutive Downhill Running Exercise Bouts on Running Economy**

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The aim of this study was to examine VO₂ kinetics during walking and running at the preferred gait transition speed (PTS). Thereafter, they completed two square-wave 30-minute walking (W30) and running (R30) tests at the PTS; VO₂ was determined breath-by-breath, and computerised non-linear regression techniques were used to describe either a mono-, bi-, or exponential or exponential-linear VO₂ response. ANOVA for repeated measurements was used to test for differences between walking and running parameters.

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**Conclusions**

Oxygen uptake kinetics (" tau") are significantly faster in running compared to walking at the preferred gait transition speed in young healthy subjects. Although all tests were equally distributed within the moderate and heavy intensity domains, walking at the PTS is characterized by a monoexponential VO₂ response, while a VO₂ slow component is present during running at the PTS, in most subjects.

**References.**

EFFECTS OF CARDIAC RESPIRATORY RHYTHM INDUCED BY DIFFERENT EXERCISE PATTERNS IN HUMANS

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Purpose: Cardiac respiratory coupling (CRC) is defined as a temporal proportion between cardiac and respiratory frequency (f). Several studies have reported that cardiac (HR) and respiratory frequency ratio (CR-ratio) appears at 3:1 and 4:1 at rest in humans. However, the physiological role of CRC during exercise is unknown. The aim of this study was to test the effects of CR-ratio induced by different patterns of exercise in humans.

Methods: Eighty healthy subjects (30.9 ± 10.4 yrs) participated in this study. Pedaling exercise was carried out on a ramp and at two constant loads. The work-load was fixed at 90 % of AT level and was kept constant at 60 rev/min. The pattern of exercise was step exercise (SE) and ramp exercise (RE) for 4 minutes, and interval exercise (IE) with three repetitions for a minute. Subjects repeated each protocol two times. Measurement items were gas, ECG, and EMG at rest and during pedaling exercise.

Before the experiment subjects performed an incremental test using a bicycle ergometer to determine the anaerobic threshold (AT) level. For the results, CR-ratio was calculated for different types of trends with a time course of response in heartbeats and respiratory frequency.

Results: In the incremental test, the average f was smaller in INC than that in STE at rest and AT (p<0.05). CR-ratio was lower in INC than in STE at AT (p<0.05). However, HR, VO2, VCO2, and VE were not significantly different. The intensity of 90 % AT level was 103.8 ± 28.68 w in INC and 93.7 ± 30.7 w in STE and both loads were not significantly different.

CR-ratio during SE and IE showed different responses, compared with INC and STE. This change of CR-ratio depended on f response during both exercises in INC group. In contrast, CR-ratio in STE was not changed by means of gradual increase with f response. However, VO2, VCO2, and mV-EMG in INC were lower than in STE.

Discussion: In the present study we might be able to classify two types of CR-ratio from cardiac and respiratory frequency components.

Change of the gradual CR-ratio with exercise could be related the decline of CRC since respiratory sinus arrhythmia (RSA) appears to be a strong modulatory effect of HR due to respiratory rhythm. These results in the responses of INC suggest that efficiency of pulmonary gas exchange is increased due to the decline of CRC. CRC could be changed by the control of neural adaptation including some outputted central command during exercise. In contrast, STE group showed lower efficiency of gas exchange while CRC increased due to high neural drive.

We conclude that the role of coupling in cardiac and respiratory control (CRC-ratio) needs to be more widely investigated during different patterns of exercise.

References.


DEVELOPMENT OF A MEASURING SYSTEM FOR PERFORMANCE DIAGNOSTIC IN SCUBA DIVING

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Physical fitness in sport scuba divers is a necessary requirement for safe diving. However, at this point in time, classical standardised procedures such as cycle ergometer tests only provide an assessment of general physical performance levels, whereas a special test of performance capacity with regard to the particular environmental conditions of diving does not exist. We therefore developed a new measuring system to examine scuba divers in their specific underwater environment. In the present work we utilised this system in a first field test, to investigate the validation of the recorded data.

Material and Methods: The developed measuring system included a swimboard with a commercial datalogger, an impeller sensor and a telemetric system to detect heart rate (HR). Moreover, the oxygen uptake (VO2) ventilation and airway resistance were recorded with pressure differential sensors inside the breathing loop of a closed circuit diving apparatus. In this first field test, subjects performed a swim step-test with a speed of 0.4 and 0.6 m/s and duration of 4 minutes each in 5m depth. Thereby, we recorded HR and VO2 [n=5], and the ventilation and airway resistance (n=9). The inspiratory and expiratory phases were recorded separately.

Results: Increasing physical strain during the step test was reflected by all measured parameters. HR increased from 116 ± 20 b/min to 152 ± 15 b/min, the oxygen uptake from 1.65 ± 0.37 l/min to 2.8 ± 0.42 l/min. Similarly, the expiratory volume heightened from 1592 ± 188 ml to 2624 ± 573 ml, and the inspiratory volume from 1765 ± 295 ml to 3013 ± 691 ml (all mean ± SD).

Conclusions: Results of this first standardized field test prove, that our new measuring system is able to validly record parameters like HR, VO2, and VE during scuba diving.

USE OF RUNNING COMPUTER AND STRIDE SENSOR IN 12-HOUR HALL RUN COMPETITION

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K-clymphak12-hour running competition was held in February 11th, 2007 in Lohja, Finland. Measurements were done in 3 male runners before and during the running. The mean age (+/-SD) of the group was 46.0(6.1) years, body weight 66.4(4.6) kg, height 177.8(6.1) cm and body mass index 21.0(1.1) kg/m². The aim of this study was to investigate the feasibility and accuracy of Polar RS800sd Running Computer and WearLink® textile transmitter in long-lasting running competition and to validate Polar s3 stride sensorTM W.I.N.D. speed, running cadence (RC), stride length (SL) and distance measurements during the race.

The s3 sensor was calibrated before the race on 1000 meter distance. The running competition took place in an indoor parking hall on 200 meter long concrete covered track. During the race the runners did change their running direction every 2 hours. Temperature during the competition was 12 °C. Heart rate (HR), speed, RC, SL and distance measurements were evaluated at 2 hours intervals.

The group mean (+/SD) of maximum oxygen uptake predicted with Polar Fitness Test with RS800sd before the race was 53.8 (7.8) ml/kg/min, the resting HR 58(6) bpm and the predicted maximum HR 174(14) bpm. The mean HR (% maximum HR) during the 12-hours race was 84.3 % (148 bpm). Both the HR as well as running velocity did decline during the race linearly from 89.4 % (145bpm) to 81.6 % (140bpm) and 10.5 km/h to 9.8 km/h, respectively. The mean speed did also decline from 5.18 min/km to 6.06 min/km. Compared to the values taken at 0-2 h to those taken at 10-12 hours RC did decline -1.1 % (from 90 to 89 rpm) and SL did decline -9.4 % (from 102 cm to 93 cm).
The group mean of official distance achieved during the race was 113,440 km (range 98,991-132,876 km) and the distance measured by Polar s3 was 116,470km (range 102,717-134,344 km). The winner of the race did run 146,296 km. The mean difference in the distances was 2.7% (3,026 km). Statistically the distances did not differ (t = 0.996 p< 0.001). In 2 hours lap times the mean error in the running distance measurement by Polar s3 compared to the official distance was 3.5% (range 0.7-5.6%) corresponding to 0.636km (0.149-0.990km) with high agreement (r = 0.990 p< 0.01). Distances measured by Polar s3-sensor were longer than official running distances. This difference is explained by the fact that movements during the running brakes (e.g. eating and toilet-visit) are included into Polar distance figures.

According to the subjects the s3 sensor was easy to calibrate, unnoticeable to wear and did not disturb running. The transmitter was evaluated to be comfortable and it did not cause any skin abrasions. Based on the study we conclude that the Polar RS800sd Running Computer and its s3 stride sensorTM W.I.N.D. accessory are feasible and valid to be used in ultra-long running performance.

THE EFFECTS OF A 12 WEEK WALKING INTERVENTION ON HEALTH IN ADULTS NOT MEETING THE PHYSICAL ACTIVITY RECOMMENDATIONS

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Purpose
Thirty minutes of moderate intensity physical activity (PA) on 5 days of the week is a major component of current physical activity recommendations. Recent evidence has suggested that motivated individuals can be encouraged to increase PA, specifically walking, via targeted interventions (Ogilvie et al, 2007) yet many of the approaches investigated in the review remain to be convincingly demonstrated. The aim of the current study, therefore, is to investigate if a 12 week walking intervention results in any health benefit in an adult population currently not achieving the minimum recommended levels of PA.

Methods
Recruited from the West of Scotland community 79 volunteers (63 females and 16 males) were randomised to either a control (n=40) or intervention group (n=39). The control group were instructed to maintain their normal walking for the 12 week study period. The intervention group received a PA consultation and pedometer feedback with individualised step-count goals graduated to achieving an additional 3,000 steps/day, 5 days/week from week 7 onwards. In 76 volunteers (63 females and 13 males) health outcomes were measured (n=59 in the control group and 37 in the intervention group) at baseline and 12 weeks, were body mass, waist:hip ratio, percentage body fat, blood pressure and resting heart rate in 66 volunteers (55 females and 11 males) a fasting blood sample also taken (n=34 in the control group and 32 in the intervention group) at both time points was analysed for glucose, insulin, total cholesterol and HDL-cholesterol. The Homeostasis model assessment for insulin resistance was calculated as fasting plasma insulin (mU.l-1)*fasting plasma glucose (mmol.l-1)/22.5. Analysis was performed on intention to treat basis, using 2(group) by 2(time) mixed factorial repeated measures ANOVAs. Data are presented as mean (S.D.)

Results
In the intervention group, average daily step count increased (P<0.001) from 6802 (3212) steps/day at baseline to 9977 (4669) steps/day at 12 weeks. The average daily step count of the control group at baseline was 6924 (3201) steps/day and did not change (P=0.618) during the 12 week period. None of the health outcomes measured changed (P>0.05) between baseline and 12 weeks for the intervention group.

Conclusion
A progressive increase in walking, in this population, over a total of 12 weeks had no effect on any of the anthropometric and metabolic health outcomes measured in the present study.

References

ALTRATION OF SERUM LIPOPROTEINS AFTER AEROBIC AND ANAEROBIC ACTIVITY IN MALE ATHLETES

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Several long-term, aerobic exercise and anaerobic exercise, studies have been conducted with healthy individuals to measure the effect of increased physical activity on serum lipoprotein concentrations. Lipoproteins are transport vehicles in the circulation plasma that are composed of various lipids such as cholesterol, phospholipids, triglycerides and proteins known as apoproteins. Since fat can’t mix with water, which is the main ingredient of blood, cholesterol's most important job is to help carry fat through your blood vessels. Before cholesterol can enter the bloodstream it is coated with a protein. These cholesterol-protein packages are referred to as lipoproteins. Triglyceride is the most common type of fat in the body. Many people who have heart disease or diabetes have high triglyceride levels. Normal triglyceride levels vary by age and sex. A high triglyceride level combined with low HDL cholesterol or high LDL cholesterol seems to speed up atherosclerosis, which is the buildup of fatty deposits in artery walls that increase the risk.

In this research we use scientific and experimental methods. In this study, 14 students were participated. They were students of physical education. The means and standard deviations of their height, weight, age and body mass index (BMI) were respectively: 175±5.9, (68.27±9.89), (20.07±1.44), (22.11±2.47). The purpose of this study was to find out changes of cholesterol and triglyceride in their blood serum after aerobic and anaerobic activities. Blood samples were used to measure cholesterol and triglyceride, one sample before the activity and the other after it. The analysis of data by SPSS software and paired-sample t-test showed that the decrease in the cholesterol level and increase in the triglyceride level of their blood.

The observed difference between the two samples for triglyceride were significant (p = 0.045). However, this difference for cholesterol was non-significant (p = 0.88). This shows that aerobic and anaerobic activities do influence level of triglyceride.

This can be due to the time of physical exercise secretion of catecholamine which facilitates release of free fatty acid (FFA) from body tissues. Also the result indicated that aerobic and anaerobic activities have no influence on the cholesterol in the blood. This can be explained in terms of the normal of cholesterol of the participants.
HORMONAL RESPONSE TO A CONCENTRIC AND ECCENTRIC STRENGTH TRAINING SESSION

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High intensity strength training provokes changes in steroid hormones concentrations. It could be altered by the kind of muscle contractions: eccentric or concentric.

Purpose. The aim of this study is to compare the urinary steroid profile after two different strength training sessions: eccentric or concentric, both of them with same total work.

Methods. 17 males (mean SD years: 24.1 [8.6]; height: 1.75 [0.6]; weight: 72.05 [8.3]) performed two different trials on an isokinetic dynamometer (BIODEX III) training both quadriceps muscles, right and left, in different days. Trial 1(CON-CON): 4x10 Concentric knee extension + relax knee flexion, speed 60°/sec; rest 90 seconds between each series and 4 minutes between each leg. Trial 2(CON-EXC): 4x5 Concentric knee extension - Eccentric knee flexion in similar conditions. Urine samples were taken before the exercise and one hour after finishing it. Testosterone, DHEA, Androstenedione, Androsterone, Etoiocholanolone, Cortisol, Cortisone, Tetrahydrocortisol and Tetrahydrocortisone values were determined by using GC/MS/MS techniques.

Results: No significant differences were achieved in the following strength parameters: Total Work Concentric (mean SD) right knee extensors: 6345.2 [587.3] J; left knee extensors 6303.2 [620.5] J. Eccentric right knee extensors: 6297.2 [620.5] J; left knee extensors 6553.8 [701.5] J and Average Peak Torque Concentric right knee extensors: 199.95 [31.2] Nm, left knee extensors: 196.75 [27.4] Nm; Eccentric right knee extensors: 249.4 [58.3] Nm, left knee extensors 224.8 [63.5] Nm. This was in accordance with no changes in steroid profile before and after trials or comparing CON-CON and CON - EXC trials.

Conclusions. Strength training sessions similar to those performed in this study, are not as intense in order to produce urinary hormonal alterations. As well, in these kind of exercises, eccentric contractions do not provoke different hormonal changes than concentric contractions.

References.


EFFECTS ON THE H-M RECRUITMENT CURVE AT REST AND V-WAVE RESPONSES DURING INCREASED %MVC WITH SKIN COLD STIMULATION

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(Introduction) We have demonstrated that the decrease in skin temperature with skin cold stimulation effects motor units (MUs). This result suggests that the cutaneous afferent of cold receptor has connections with the MUs in the spinal cord. However, there are few studies on the effects on the motoneuron with cooling by using electrical stimulation. The purpose of this study was to investigate the effects of skin cold stimulation on the motoneuron in the spinal cord using electrical stimulation. (Methods) Eleven healthy adults who volunteered for this study. All measurements were taken from right leg muscles. Subjects were examined in the sit position with the hip, knee and ankle joints at 90 degrees. Measurement muscle was used m. soleus. The electric signals were picked up by surface electrodes (a diameter of 5mm) on the belly of the right SOL. The force of the isometric contraction and twitch were established by a force transducer attached to the apparatus. The EMG and mechanical signals were digitized on-line and stored for analysis. This experiment was performed under two conditions that consisted of control (skin temperature about 33 degrees), Control and skin cold stimulation (skin temperature 26 degrees, cooling). The skin temperature was reduced gradually from control temperature to 26 degrees with a cold pack for 5min. Before each trial, 2 maximal voluntary isometric contractions (MVC) for 2 seconds were performed at the control temperature. The force of every 10%MVC was calculated using control MVC. H-M recruitment curve was taken at rest under both conditions. V-wave responses of every 10%MVC were obtained using a supramaximal stimulus under both conditions. (Results and Discussion). There was no significant difference in Mmax and M-superimpose between the conditions. Cooling did not induced significant changes in the H-M recruitment curve. Four subjects showed clear increases H-M recruitment curve with skin cold stimulation, five subjects showed obvious decreases, whereas no clear change was observed in the remaining two subjects. The amplitude of V-wave increased gradually with increased %MVC in both conditions. With skin cold stimulation the amplitude of V-wave increased in the latter half of the %MVC more than control. The present study found that there was no significant difference between control and cooling in the faster half of the %MVC. Furthermore, the silent period in skin cold stimulation after superimposed stimulation was shorter than that in control in the later half of the %MVC. Twitch force during %MVC in cooling decreased in the faster half of the %MVC more than control. These results suggest that the increased V-wave and reduced silent period in skin cold stimulation might be related to the elevated motoneuron excitability and an enhanced neural drive.

EFFECTS OF SINGLE DOSE ARGinine SUPPLEMENTATION ON LACTate THRESHOLD AND PERFORMANCE

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This study has been designed to investigate the possible effects of pre-exercise acute arginine supplementation on lactate threshold and lactate metabolism in male wrestlers. Nine volunteer male wrestlers who were wrestling in Turkatish Greco-roman 1st league participated to the study. Test- retest protocol was done on the same subjects. After 12 hours fasting (during the night) venous blood samples were taken before the exercise protocol for determining the plasma amino acid profiles and arginine levels. Incremental exercise protocol was applied and oxygen consumption was measured during the exercise, heart rate and plasma lactate levels were measured during the exercise and recovery. Exercise protocol started at 90 watts on bicycle ergometry and the load was increased 30 watts in every 3 minutes. Exercise was continued till the subjects can not go on cycling at the desired working loads or the subjects wanted to stop. Plasma amino acid profiles were also determined after the exercise protocol. Study has been conducted by using cross over design. Half of the subject took 1.5 gram /10 kg body weight L-arginine while other half were taking same amount of wheat bran before the first exercise.
and same amount of L-arginine before the second exercise protocol. Results showed that in the same working loads there was no difference for the mean lactate levels between arginine and placebo groups (p>0.05) while there was a right shift on working load-lactate graphic. There was no difference for maximum oxygen consumption (arginine 52.47±4.01, placebo 52.07±5.21) and maximum heart rates (arginine 181.09±13.37, placebo 185.89±7.38) (p>0.05). Time to exhaustion was longer with L-arginine supplementation (1368.8±59.8 sec) compared to placebo (1315±90.8 sec). Plasma arginine, ornithine and citrulline levels before and after the exercise were found higher with L-arginine supplementation. These results suggest that L-arginine supplementation can have beneficial effects on exercise performance but can not explain the metabolic pathways which are responsible for these effects.

**BREATHING STRATEGY DURING HEAVY CONSTANT LOAD EXERCISE IN YOUNG AND MASTER ATHLETES WITH EXPIRATORY FLOW LIMITATION**

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Significant limitation of expiratory flow has been observed in highly fit healthy individuals at maximal exercise. The presence of flow limitation may cause reflex inhibition of the hyperventilatory response and/or an alteration in operational lung volumes (1,2). This study examined whether differences in breathing strategy exist between young flow-limited and non-flow-limited athletes during heavy constant load exercise. As the age-related decline in lung elastic recoil increases the likelihood for flow limitation (3) master athletes were studied as well.

20 young endurance athletes (28+/−6yr, VO2max 60+/−5 ml/kg/min) and 10 master athletes (57+/−5yr, VO2max 50+/−5 ml/kg/min) performed an 8min treadmill test at 90% of maximal aerobic speed. Throughout the test cardio-respiratory parameters were continuously monitored and tidal volume (Vt) loops were plotted into the maximal flow-volume loop measured at rest. End-expiratory lung volume (EELV) was estimated at the end of each minute by measuring expiratory reserve volume relative to forced vital capacity (ERV/FVC). All young athletes showed greater than 10% of flow limitation (FL, 48+/−18 %) and the remaining 10 constituted a non-flow limited group (NFL, 14+/−11%). All master athletes (MA) presented moderate-to-severe flow limitation (50+/−19%). Expiratory flow limitation rose in all subjects from the first to the final minute (P<0.01): the mean increase was 24% in FL, 10% in NFL and 15% in MA, with a plateau reached at mid point. Ventilation also rose significantly, reaching a value of 127+/−15L/min in NFL, 129+/−20L/min in FL and 122+/−12L/min in MA at 8min (time effect P<0.001; group effect NS). This was due to an increase in both breathing rate and Vt up to the third minute of the test. Therefore the increase in VE was exclusively explained by an increased breathing rate. EELV significantly increased in the first half of the run in all athletes (P<0.001). However all values remained well below baseline, even in MA who breathed at slightly higher lung volumes (P<0.05).

We conclude that young and master healthy athletes adopt very similar breathing strategies whilst performing at a constant workload near maximal intensity regardless of their degree of expiratory flow limitation.

**REFERENCES**


**EFFECTS OF PALATINOSE VS. HIGH FRUCTOSE CORN SYRUP-INDUCED SUBSTRATE AND METABOLITE AFTER SUBMAXIMAL EXERCISE IN OBESE MEN**

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Background: Palatinose (PAL) which are composed of glucose and fructose is a disaccharide present in hone, which is slowly digested, resulting in a slow availability for absorption. These different patterns of digestion and absorption may affect substrate and metabolic changes from ingestion after exercise in human. Objective: The present study was to determine whether dietary PAL vs. high fructose corn syrup (HFCS) intake after submaximal exercise would affect substrate and metabolic changes in obese men. Methods: Ten obese middle-aged men (age 46.0 ± 2.3; weight 79.4 ± 2.8 kg, body mass index 27.1 ± 1.0; peak oxygen consumption 32.0 ± 1.2 ml/kg/min, mean ± SDI participated in a randomized, double-blind, cross-over study. After an overnight fast, participants were performed with a cycle ergometer for 60 min at 50 % VO2peak and then consumed HFCS-55 (55 % fructose, 1.0 g/kg body mass, 500 ml) or Non-Calorie diet (sweet placebo, 500 ml) respectively. Substrate utilization with rates of fat and carbohydrate oxidation was measured by indirect calorimetry and blood samples were simultaneously obtained from an antecubital vein before exercise and 0, 10, 20, 30, 60, 90, and 120 minutes after consuming the carbohydrates. Results: During exercise, energy expenditure was not different among 3 experimental condition. The concentration of plasma glucose, insulin and C-peptide following PAL and Non-Calorie ingestion markedly were lower than those of HFCS (P < 0.05). The non-esterified fatty acids were higher with PAL and Non-Calorie diet (sweet placebo) compared with HFCS (P < 0.05). However, plasma epinephrine and norepinephrine concentrations were not significantly different across three trials. PAL and Non-Calorie ingestion markedly showed increased fat oxidation compared with HFCS (P < 0.05). Conclusions: The impaired effect of suppressed fat oxidation of HFCS is more than those of PAL ingestion without reference to changes of circulating catecholamine. The present data suggests that the use of HFCS as beverage of postexercise may be undesirable, particularly for obese men. PAL may be a suitable replacement sugar in terms of substrate utilization in postexercise recovery (i.e., negative energy balance).

**CARDIOVASCULAR RESPONSES TO PROLONGED APNEA IN RESTING IMMERSED BREATH-HOLD DIVERS**

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The cardiovascular responses to prolonged immersed apnoea were evaluated in 7 breath-hold divers (mean age: 31±4 yrs). The subject rested head-out immersed in a pool (water temperature: 27 °C) for some minutes for control measurements, then he/she held the breath and immersed the face assuming a prone position below the surface of the water up to volitional end. Blood pressure profile was continuously recorded (Portapres) from the hand kept outside the water on the edge of the pool. Beat to beat values of systolic and dia-
stolic pressures (Ps and Pd), heart rate (HR) and stroke volume (SV) were obtained (Beatscope®). Mean pressure (Pm), cardiac output (Q') and total peripheral resistance (TPR) were calculated. Apnoea ranged from 166 s to 299 s (mean: 236.8±50.8 s). In all subjects HR decreased from 81±9.8 to 59.5±9.8 bpm within the initial 30 s of apnoea (phase I). No further change in HR occurred throughout the apnoea. PS decreased in the initial 5 s of apnoea by 20 mmHg (p<0.05), then returned to control (137±25 mmHg) at the end of phase I. No change in Pd occurred in phase I. Both Ps and Pd remained unchanged in the following 92±29.8 s (phase II), then linearly increased in the successive 122±45.8 s (phase III). At the end of apnoea Ps and Pd were, respectively, 224±50 mmHg and 117±23 mmHg. Pm was significantly increased by 18 mmHg above control (95.1±12.7 mmHg) at the end of phase II and further increased to 152±30.2 mmHg during phase III. For the entire apnoea, SV was unchanged compared to control (93.0±32.7 ml), whereas Q' was 30% lower (p<0.05) than control (7.7±3.1 L/min). TPR doubled compared to control value (13±5.4 mmHg/L/min) at the end of phase II (p<0.05) and further increased by 50% at the end of phase III. Holding the breath while resting water immersed induced a rapid bradycardia, that corresponds to that described as diving reflex, but was not associated with changes in Ps II till the end of phase II. We conclude that: a) cardiac and vascular responses during immersed apnoea are distinct; b) bradycardia is not compensated for by an increase in SV; c) chemoreceptor stimulation may induce the vascular responses observed in phase III.

PROLONGED ENDURANCE EXERCISE IS ASSOCIATED WITH A REDUCTION IN FEMORAL, BUT NOT BRACHIAL, FLOW-MEDIATED VASODILATION

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Repetitive increases in shear stress on the vessel wall (endothelium) are associated with exercise training as an established stimulus for significant and positive adaptations in endothelial function and vascular health. Despite this, surprisingly little is known about the acute effects of exercise and associated shear stress elevation on endothelial function. Specifically there are no data describing endothelial function in different arterial beds after prolonged intensive exercise.

PURPOSE: To measure superficial femoral and brachial artery flow mediated dilatation (FMD) in healthy male runners before and after the completion of the 2007 London marathon.

METHODS: After ethical approval and provision of written informed consent, 11 male subjects (29±4 years, mean±SD) were studied before and within 1 hour of completion of the London marathon. High resolution B-mode ultrasound assessment of the diameter of the common femoral and brachial arteries was assessed simultaneously with pulsed-wave Doppler velocity measurement of blood flow. Post-hoc analysis from rest to the maximal dilation recorded in the three minutes immediately after cuff occlusion.

RESULTS: From rest to the maximal dilation recorded in the three minutes immediately after cuff occlusion. FMD of the brachial artery did not change following exercise (5.2±2.1 to 5.2±2.0%, p>0.05), whereas femoral FMD was significantly reduced (6.9±3.5 to 4.4±3.8%, p<0.05). Resting femoral artery diameters were similar pre and post race (72.6±11.1 to 76.7±4.3 mm, p>0.05) whilst femoral FMD was significantly reduced (6.9±3.5 to 4.4±3.8%, p<0.05).

CONCLUSIONS: A single bout of prolonged intense exercise resulted in a reduction in femoral, but not brachial, vascular endothelial function, as assessed by FMD. The short and long-term consequences of these acute changes have yet to be established. The data suggest that prolonged intensive exercise can impair endothelial function, which may theoretically lead to transient increases in cardiovascular risk. The mechanisms responsible for the regionally specific impairment in function require further investigation.

ANAEROBIC PERFORMANCE IN TAEKWONDO ATHLETES DURING ENTIRE SEASON

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A few studies showed that fitness level, mostly related to anaerobic power, might influence Taekwondo performance. The purpose of this study was to explore the Taekwondo athletes’ anaerobic power of lower limbs through the entire training programs. Training program consists of three periods, the preparation period, the competition period, and the transition period. Twenty two male college Taekwondo athletes with an average age of 20.6±1.6 years old, and an average Taekwondo history of 10.6±1.5 years participated in this study. A 30 second of the Wingate anaerobic test (0.1 kp/kg) and intermittent anaerobic test (0.1 kp/kg, one cycle · active for 15 seconds and then rest for 15 seconds) were performed on a cycle ergometer at each stage of training program. Intermittent anaerobic test cycle was simulated the characteristics of intermittent attacks of Taekwondo competition. Peak power, mean power and power index of the Wingate test showed no significant differences during three periods. The peak power fatigue index and average power fatigue index during the intermittent anaerobic test of the transition period was significantly lower than those of the competition period and the preparation period (p<0.05). It is suggested that the intermittent anaerobic power peaked at preparation period and competition period during entire season.

EMG RESPONSES TO MULTIPLE-SPRINT EXERCISE: A SEX DIFFERENCE?

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It has been demonstrated that men and women display different performance and fatigability during multiple-sprint exercise [1,2]. While part of this sex difference may be attributed to muscle metabolism [2], a difference in the neural drive to the muscle may also contribute [3], but has not yet been explored during MS. The aim of the present study was therefore to analyse the impact of sex on electromyographic EMG responses to MS. Fourteen men and fourteen women performed a MS consisting of twenty, 5-s cycle sprints, separated by 25-s rest. Surface EMG of the vastus lateralis muscle was recorded during each sprint and processed to obtain one value of integrated EMG (iEMG) and median frequency (MF) for each sprint. In addition, arterial oxygen saturation was estimated (SpO2) via pulse oximetry and the rate of perceived exertion (RPE) recorded throughout the MS. Statistical analysis revealed that both relative work (96±9
The relationship between wrist angle and MGF presented like a parabola. The peak was in medium position at extension 13.1 ± 8.1 vs. women: -11.9 ± 5.2%, p=NS). No sex difference was observed for SpO2 and RPE. This is the first study to explore muscle activation pattern in sexes during MSE. While the results agree with previous data on mechanical output, they highlight that the sex-related muscle fatigue induced by MSE may also be explained by the net motor unit activity.

References

THE POINT OF MAXIMUM CURVATURE AS A MARKER FOR HEART RATE AND OXYGEN UPTAKE TIME SERIES

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We present a method [1] for determining the time and heart rate (or oxygen uptake) after which a plateau or a slow component in the heart rate or oxygen uptake kinetics is achieved. This method is used to find the point after which the heart rate no longer continues to rapidly rise and instead follows either a steady state or slow rise (i.e. the slow component). This point corresponds mathematically to the point of maximum curvature and is found via an analysis of the curvature of a heart rate or oxygen uptake time series in response to a step like increment in the exercise intensity.

Our method is applied to the mono exponential model which is commonly used in the literature to model the response to short duration moderate exercise intensity. We then use the method to find numerical solutions for higher exercise intensities inclusive of those containing a slow component, for the model presented in [1-6].

We explain how our method will be of much use and will provide new information regarding understanding the heart rate kinetics (and oxygen uptake) in response to constant intensity short duration exercise. Finally we show how to use the point of maximum curvature to understand speeded heart rate and oxygen uptake kinetics following training.

References

THE EFFECTS OF GRIPPING FORCE GAIN AND EMG RESPONSES IN THE ISOMETRIC WRIST EXTENSION TRAINING

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[PURPOSE] Gripping force is not only dependent on the activation of forearm flexors but also role of extensors becomes important due to optimal-length of the flexors. Gripping force is also affected by coupling of the forearm and wrist position because of changing suboptimal-length of finger flexors. The activation of extensors as a synergist is important in maintaining optimum balance of tension in extrinsic finger flexors[1], and it has been reported that the excitability of extensor motor units was higher than that of flexors during gripping[2]. We hypothesized that a gain in forearm extensor force would lead to an increase maximal gripping force (MGF), because training produces higher excitability of extensors and simultaneously leads to the excitability of flexors. The purpose of this study was to investigate whether a gain in forearm extensor force induced by training affects MGF. [METHODS] Thirteen healthy adults (30±12yrs) participated in this study. We measured MGF after isometric wrist extension training for 8 weeks. Training consisted of exercise 30 times equal to 70% maximal voluntary contraction with subjects' fingers relaxed. To evaluate the effect of this training, we measured MGF and electromyographic (EMG) activity simultaneously during maximal effort with each wrist angle before and after 4 and 8weeks training. Subjects sat in an adjustable chair and put their forearm on the device with forearm neutral. They gripped the force-transducer in the right hand. Wrist angles were set every 10 degrees in flexion and extension plane. EMG activity was recorded from six forearm muscles (FCR, FCU, FDS, ECRL, ECUL, and EDC). EMG signals were calculated by root mean square EMG (rms-EMG) and mean power frequency (MPF) using a computer. [RESULTS] The relationship between wrist angle and MGF presented like a parabola. The peak was in medium position at extension and after 4 and 8weeks training. Maximum force of wrist extension increased from 123N to 236N by 110% (p<0.01), and MGF also increased from 0.46mV to 0.56mV (p<0.01). The wrist angle at the peak MGF shifted the flexed direction by approximately 6 degrees but not significantly. The rms-EMG of extensors increased from 0.46mV to 0.56mV (p<0.01), however, that of flexors tended to decrease from 0.29mV to 0.26mV (p<0.01). In contrary, MPF of flexors increased from 64 4Hz to 66 4Hz after 8 weeks, but that of extensors did not change. [DISCUSSIONS] The rms-EMG of extensors and MPF of flexors increased markedly after training of wrist extension. Consequently, MGF increased significantly by means of neural adaptation. These results suggest that gripping efficiency increased because a smaller number of flexor motor units were needed to increase gripping force. We suggest this training method as a new approach to increase gripping force.

References
FITNESS PROFILE BEFORE AND AFTER 15 DAYS CYCLING TOUR IN COLLEGE STUDENTS

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Long haul cycling tours have been gaining significant popularity in recent years. The aim of the present study was to examine the fitness profile before and after 15 days 1000km cycling tour in college students. Nineteen college students (13 males, 6 female) were recruited from a cycling tour group. Subjects voluntarily participated in fitness tests included body composition, grip strength, back strength, and maximal oxygen uptake (VO2max) test within one week before and after the cycling tour. VO2max was tested using a graded cycle ergometer starting at 75W for male and 50 W for female and increased 25W every 3 min until volitional fatigue. Results showed that VO2max (41.3±4.9ml/kg/min, post: 46.8±3.9ml/kg/min for male; pre: 33.5±1.9ml/kg/min, post: 38.0±1.8 ml/kg/min for female), time to exhaustion (increased male: 17.8±9.9 min, female: 31.7±13.9 min), maximal output (increased male: 11.8±4.9 min, female: 24.6±12.1 %).
and fat free mass (increased male: 1.2±1.97%, female: 3.1±2.85%) were significantly increased in both genders (p<0.05). Female subjects showed decreased body weight and male showed decreased in body fat percentage (p<0.05). There were no differences in grip strength, back strength, maximal heart rate. The current study suggested that 15 day cycling tour resulted in a better aerobic related fitness in both genders.

**EFFECTS OF FREQUENCY AND DURATION OF THE VOLUNTARY WHEEL RUNNING EXERCISE ON CELLULARITY OF ADIPOCYTE AND SECRETION OF ADIPOCYTOKINES IN HYPERPHAGIC AND OBESO OLETF RATS**

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The purpose of this study was to investigate the optimal weight reduction program for the dietary and exercise therapy. We tested about the rate of weight reduction arranged by the voluntary wheel running exercise protocol that will effect on the cellularity of adipocyte and secretion of adipocytokines.

Otsuka Long-Evans Tokushima Fatty (OLETF) rats, an animal model of hyperphagia and obesity, was used in this study (n=12, 19-week-old at the end of experiment). The rats were randomly assigned to either the 2 (17 to 19-week-old, everyday, n=4) or 4 (13 to 19-week-old, about every two day, n=4) weeks voluntary wheel running exercise or sedentary control group (n=4). The cages of both exercise groups attached freely accessible running wheels with digital revolution counters, but access to the wheel was prohibited during the sedentary period. The exercise frequency and duration were arranged and all rats weighed about 85% of control rats at the end of experimental period. The rats were provided with water and standard chow food ad libitum.

At the end of experimental period, the rats were anesthetized with pentobarbital sodium. Blood samples were collected from carotid artery. Plasma concentrations of adipocytokines and other hormonal factors were determined using ELISA kits. Adipocal fibrin samples were collected and weighed immediately after death. For the quantification of number and size of adipocyte, adipose tissue were fixed with 10% formalin phosphate buffer, and embedded in paraffin. The sectional cell diameter of adipocyte were analyzed in the hematoxylin and eosin stained tissue preparations.

Compared to control group, both exercise groups exhibited the remarkable reduction in body weight, abdominal fat pad weight, and blood leptin concentration. Compared to 2 weeks exercise, 4 weeks exercise promoted the downsizing of adipocyte in abdominal fat pads and provided the weak reduction in the value of the blood adipocytokine concentration. These results suggested that the low frequency and long duration exercise therapy is more effective for the cellularity of adipocyte and maintenance of blood adiponectin concentration compared to the high frequency and short duration exercise therapy.

**LOCAL MUSCLE ACTIVATION AND OXYGEN CONSUMPTION DURING WHOLE-BODY VIBRATION EXERCISE**

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Introduction : Whole-body vibration (WBV) has been suggested to activate muscle spindles and elicit a reflex contraction[1]. WBV has been shown to increase local muscle activation as measured by surface EMG[2] and whole body oxygen uptake[3] as compared with control condition, suggesting an increased muscle oxygen uptake. However, no previous study has examined the local muscle oxygen consumption during WBV. The rate of hemoglobin and myoglobin deoxygenation by near-infrared spectroscopy(NIRS) immediately after a cuff induced ischemia to reflect muscle O2 consumption[VO2mus] has been used as a quantitative measure of muscle oxidative metabolism[4]. Therefore, the aim of this study was to investigate the effects of WBV on VO2mus and EMG of vastus lateralis (VL) muscles during static squatting exercise to examine the extent of muscle activation and muscle oxygen consumption.

METHODS : Seven volunteers (age: 25 ± 3.4 years, body mass: 67.7±10.6kg, height: 172.4±5.6 cm) participated in this study. Each subject performed static squatting exercise (knee angle at 130°) on vibration platform for 210 sec with WBV and without(CON) vibration. The vibration frequency was set to 31Hz, and amplitude of vibration was 2.5mm. Last 30 sec, blood flow to a leg was occluded by inflating a cuff on the thigh to a pressure of 300 mmHg for 30 sec. VO2mus was determined by the slope of a regression line of oxygenated hemoglobin(O2Hb) immediately after the initiation of ischemia[10sec]. Muscle oxygenation status by NIRS and surface EMG[1][2][4][8] was attached freely accessible running wheels with digital revolution counters, but access to the wheel was prohibited during the sedentary period. The exercise frequency and duration were arranged and all rats weighed about 85% of control rats at the end of experimental period. The rats were provided with water and standard chow food ad libitum.

At the end of experimental period, the rats were anesthetized with pentobarbital sodium. Blood samples were collected from carotid artery. Plasma concentrations of adipocytokines and other hormonal factors were determined using ELISA kits. Adipocal fibrin samples were collected and weighed immediately after death. For the quantification of number and size of adipocyte, adipose tissue were fixed with 10% formalin phosphate buffer, and embedded in paraffin. The sectional cell diameter of adipocyte were analyzed in the hematoxylin and eosin stained tissue preparations.

Compared to control group, both exercise groups exhibited the remarkable reduction in body weight, abdominal fat pad weight, and blood leptin concentration. Compared to 2 weeks exercise, 4 weeks exercise promoted the downsizing of adipocyte in abdominal fat pads and provided the weak reduction in the value of the blood adipocytokine concentration. These results suggested that the low frequency and long duration exercise therapy is more effective for the cellularity of adipocyte and maintenance of blood adiponectin concentration compared to the high frequency and short duration exercise therapy.

**INFLUENCE OF DIFFERENT RAMP TEST PROTOCOLS ON PEAK BLOOD LACTATE PARAMETERS IN RUNNERS**

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INTRODUCTION: Peak blood lactate concentration (peak) after exhausting exercise is often considered as a measure of the anaerobic glycolytic capacity. The aim of this study was to compare peak and recovery blood lactate parameters, measured in runners of diverse running disciplines, after performing two all-out treadmill ramp tests of different duration.

METHODS: The sample consisted of 48 male runners: 10 sprinters (S, 20.5±3.0 yrs, 184.9±4.8 cm, 76.6±4.4 kg), 15 400m runners (400R, 20.0±3.5 yrs, 180.9±4.2 cm, 73.0±6.3 kg), 10 middle distance runners (MD, 18.7±2.3 yrs, 180.4±5.7 cm, 68.6±6.2 kg), and 13 long distance runners (LD, 19.5±2.7 yrs, 184.7±5.6 cm, 79.1±9.4 kg). Two-way ANOVA was used to determine differences in the measured variables between the two tests in each subject group.

RESULTS: The average test duration was 2.6±1.0 min (F05) and 13.0±2.1 min (F10). The following peak blood lactate concentrations (mmol/L) were measured after the F05-test: 15.1±1.4 (S), 14.3±1.4 (400R), 15.3±3.3 (MD), and 10.4±2.0 (LD). After the F1-test peak values were: 15.1±2.7 (S), 14.0±1.4 (400R), 13.7±2.9 (MD), and 10.9±2.4 (LD). No significant differences between the Lpeak measured after the two tests within each subject group were found. The measured time to reach peak lactate concentration (tpeak(min)) was as follows: F05-test
(2.4±1.4 [S] 3.1±1.4 [400R]; 2.0±1.1 [WD]; and 2.4±1.3 [LD]), and F1-test (1.2±0.6 [S], 1.9±1.5 [400R]; 1.8±1.4 [WD]; and 1.5±0.9 [LD]). A significant difference in \( t_{\text{peak}} \) measured after the two tests was found only in the 400R group. The \( t_{\text{peak}} \) was significantly longer after the FOS test (\( p=0.039 \)).

CONCLUSIONS: Similar peak blood lactate values were achieved in the recovery period of both test protocols used in this study, regardless of the running discipline. On the other hand, the time to reach peak blood lactate concentration was longer after the short (FOS) test in all the subject groups, reaching the statistically significant level only in 400R runners. For practical implications, the duration of an all-out incremental treadmill test does not significantly influence the \( t_{\text{peak}} \) value, if volitional exhaustion is reached within 5 to 15 minutes, approximately. Nonetheless, the timing of recovery blood sampling should be chosen with caution, and taking two or more samples may assure the acquisition of true peak lactate values.

References.

HYPERTHERMIA INDUCES PERIPHERAL MODULATION OF NEURAL DRIVE

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Purpose: To investigate if the deficit in voluntary activation that occurs with hyperthermia could be partly attributed to a spinal modulation of the motor output.

Methods: 16 subjects randomly performed neuromuscular testing in an hyperthermic state (HOT, room temperature: 50°C, core temperature: 38.9°C) and in control condition (CONT, room temperature: 20°C, core temperature: 37.0°C). Neuromuscular testing was based on maximal voluntary contractions (MVC) of the plantar flexors with recording of the EMG activity of the soleus (5000 Hz, bandwidth 20 - 450 Hz, gain = 1000). The tibial nerve was electrically stimulated (square waves, 0.2 ms, 400 V) to induce muscle action potentials (M-waves) and reflex waves (H-reflex) both at rest and during the contractions.

Results and discussion: Our data showed that a passively induced hyperthermia decreased the voluntary force production [82 Nm in CONT vs 73 Nm in HOT, -11%, P < 0.05]. This decrease was associated to a decrement in muscle electrical activity (RMS, 89 microV in CONT vs 71 microV in HOT, -16%, P < 0.05) while the force/RMS ratio remained unaltered (1.1 in CONT vs 1.2 in HOT, NS). This suggests that the alterations in the ability to generate maximal force with hyperthermia are linked to motor command disturbances. This assumption was confirmed by a significant drop in voluntary activation level (VA, twitch interpolated method, 77% in CONT vs 65% in HOT, -12%, P < 0.05).

In addition, this study aimed to localise the failure in the muscle drive string. A decrement in muscle activation is not necessarily evident for failure in the cortical areas but can also be a consequence of a peripherally altered transmission of the motor drive to the muscle fibre. For the first time, our results showed that the amplitude of electrically evoked reflex action potentials are reduced with hyperthermia at rest (-44% for H-max and -48% for Hmax/Hmax ratio, P < 0.05), during low contraction (-46% for H-reflex during a contraction at 10% of MVC, P < 0.05) and during MVC (-34% for Hsup, -21% for Vsup, -9% for Vsup/Msup, P < 0.05). These data demonstrate that hyperthermia is responsible for an alteration in neural drive transmission at spinal level and possibly below.

Our results also displayed a drop in the amplitude of an electrically evoked muscle action potential (M-wave) both during contraction (Wsup, -11%, P < 0.05) and at rest (Mmax, -7%, P < 0.05). This suggests an alteration in the transmission of the motor command from the axonal branches of the motoneuron to the sarcomlemma.

Conclusion: Our results showed that a passive hyperthermia (without any exercise induced fatigue) reduced the ability to voluntary activate a muscle. For the first time, our data demonstrate that this decrement is partly linked to alterations in the transmission of the motor output at both the spinal and sarcomembranous levels.

INTERMITTENT HYPOXIA DOES NOT EFFECT ENDURANCE PERFORMANCE AT MODERATE ALTITUDE IN WELL TRAINED ATHLETES

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Endurance contests at moderate or high altitude such as ski mountaineering or cycling become more and more popular; but little is known on possible pre-acclimatization schedules for these events (1,2). Therefore the aim of this study was to determine the effects of a pre-acclimatization program using intermittent hypoxic exposures on endurance performance at moderate altitude in well trained athletes.

9 male cyclists (age: 37±7 years, height 183±6, body weight 73±7 kg, peak oxygen uptake: 61±6 ml/min/kg) performed two ergometer tests at low altitude (LA) (Innsbruck, Austria, 600 m) within 4 days. The tests comprised two submaximal stages (150 W and 200 W, each for 5 minutes) for warm-up and determination of submaximal ventilatory responses followed by a 30-min time trail. The results of the better test were included into the analyses. After the pre-tests participants were randomly assigned into the hypoxia group (H) or the control group (C) in a double-blind fashion. The pre-acclimatization program comprised seven 1-hour breathing sessions (face mask, group H: FiO2=12.6 %, group C: FiO2=20.9 %, Hypoxyclean HypO2, HypoMed, Moscow, Russia). The identical test procedure was repeated (a) within 1-3 hours after arriving (MA1) and (b) after 2 nights (MA3) at moderate altitude (Obergurgl, Austria, 1970 m).

Mean power output decreased from LA (H: 3.8±0.3 W/kg, C: 3.8±0.4 W/kg) to MA1 (H: 3.5±0.3 W/kg, C: 3.6±0.4 W/kg) and increased slightly at MA3 (H: 3.6±0.3 W/kg, C: 3.8±0.4 W/kg). The diminution of power output from LA to MA1 seems to be more pronounced in H but did only reach statistical significance when LA compared to MA3 (p=0.004). We detected no differences between groups neither in submaximal ventilation nor arterial oxygen saturation during the time trials.

We can conclude that a pre-acclimatization for endurance contests at moderate altitude seems not to be advantageous when using the described protocol. One important factor could be that an increased hypoxic ventilatory response initiated by short-term exposures to high altitude (FiO2=12.6 %, 4500 m) does not increase ventilation at moderate altitude (e.g. 2000 m) (3). Further studies have to be done to get more scientific based data on possible effects and optimal pre-acclimatization protocols in this field of research.

References.

ACUTE EFFECTS OF EXERCISE MODE (TREADMILL VS. CYCLOERGOMETER) AND INTENSITY ON THE PHYSIOLOGICAL AND PERCEPTUAL RESPONSES

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This study aimed to (i) identify the effect of exercise mode on the acute physiologic (cardio-respiratory and metabolic) and perceptual responses between the treadmill and the cycloergometer and (ii) identify the exercise mode effect interacting with exercise intensity. The sample comprised 20 voluntary male subjects: age=22.5±1.8years, height=177.7±7.0cm, weight=72.6±7.9kg and fat mass =7.8±1.1%.

that performed five submaximal 8 min exercise bouts, interspersed with a 10 min period of passive recovery. Exercise intensity in the
treadmill was 10, 12, 14, 15 e 16 km/h (0% gradient), and 80, 120, 160, 180 e 200 W in the cycloergometer (65-70 rpm). Data analysis was performed through a general linear model with two dependent factors (Mode and Intensity) with polynomial contrast. There was statistical significant mode effect and interaction Mode x Intensity in VO2, HR, RPP, O2 pulse. Also, we have identified variables only affected by exercise mode (VE, Systolic and Diastolic BP, RPE). The VCO2/VO2 ratio and blood lactate concentrations were not affected by the studied factors. Globally, results allowed identifying a larger exercise mode effect on the cardio-respiratory variables with higher response patterns on the treadmill, changing according to exercise intensity.

ACUTE EFFECTS OF EXERCISE MODE AND INTENSITY ON THE PHYSIOLOGICAL RESPONSES DURING SHORT RECOVERY PERIODS

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This study aimed to (i) identify the effect of exercise mode on the acute physiologic (cardio-respiratory and metabolic) and perceptual responses between the treadmill and the cycloergometer and (ii) identify the exercise mode effect interacting with exercise intensity in short recovery periods. The sample comprised 20 voluntary male subjects age=22.1±8.1years; height=177.7±17.0cm; weight=72.6±7.9kg and fat mass =7.8±1.3%, that performed five submaximal 8 min exercise bouts, interspersed with a 10 min period of passive recovery. Exercise intensity in the treadmill was 10, 12, 14, 15 e 16 km/h (0% gradient), and 80, 120, 160, 180 e 200 W in the cycloergometer (65-70 rpm). Data analysis was performed through a general linear model with two dependent factors (Mode and Intensity) with polynomial contrast. There was a statistical significant exercise mode effect and interaction Mode x Intensity on EPOC, body temperature, HR, VCO2/VO2 ratio and O2 pulse. The VE, RPP and blood glucose concentrations were only affected by exercise mode. Blood lactate concentrations, Systolic and Diastolic BP values were not affected by the studied factors.

PERFORMANCE ANALYSIS OF ELITE WOMEN’S FIELD HOCKEY WITH SPECIFIC REFERENCE TO HIGH INTENSITY ACTIVITY

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Background: Field hockey is a highly competitive amateur sport with worldwide appeal, defined as a fast moving intermittent sport involving bouts of high intensity efforts, separated by periods of low intensity activity (Boyle et al., 1994). Previous studies in hockey based on single match motion analysis have demonstrated that the volume of sprinting, high intensity running and distance covered are lower in the second half than in the first half of a game (Lothian & Farrally, 1994; Boddington et al., 2002). This may be an indication that performance is inhibited in the second half due to various mechanisms of fatigue. The aim of the present study is to develop the understanding of elite hockey through the measurement of player speed and distances during 13 international games using global satellite technology. Method. Twenty six female international hockey players (mean ± SD; age = 24.9 ± 3.1 years; height = 167.4 ± 4.6 cm, body mass = 62.4 ± 6.4 kg) volunteered for the study. Player distance and speed was recorded for a total of 13 games using a Global Satellite System (GPS) (GPSport, Fyshwick, Australia) and all players involved had regular international experience and played in out-field positions. A single GPS unit per player, positioned between the scapular plains and secured in place through the use of a harness, was used to assess match heart rate, and the distances run at particular speeds (stand: 0-0.7; walk: 0.8-5.9; jog: 6.0-10.9; run:11.0-14.9; cruise: 15.0-18.9; sprint: >19 km/h) and intensities (low:0-5.9; moderate: 6-14.9, high: >15 km/h). Data were analysed using paired t-tests. Statistical significance was accepted as P<0.05.

Results: There was no difference in mean playing time between the first and second half performances. The percentage of time at low intensity for first half performances were lower than second half performances (54.5 ± 7.4% and 56.6 ± 6.8% respectively P<0.001). Conversely the percentage of time performing moderate and high intensity activity in the first half (38.9 ± 6.0% and 6.6 ± 2.6%) were higher than the second half (37.3 ± 5.7% and 6.1 ± 2.2%; P=0.001 and P=0.003). Mean total sprint distance and the mean number of sprints declining in the second half. Differences were evident for mean sprint distance. The volume of high intensity activity during the second half has been shown to reduce, with mean total sprint distance and the mean number of sprints declining in the second half.

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IMMUNE RESPONSES DURING AND AFTER CONSTANT AND ALTERNATING INTENSITY EXERCISE AROUND THE LACTATE THRESHOLD

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Although exercise intensity is an important determinant of the immune response during prolonged exercise (1) there is a sparsity of information regarding the effects of intensity fluctuations on the metabolic and immune responses. The purpose of the study was to investigate the changes in IL-6 and TNF-a concentration during and after prolonged continuous and alternating intensity exercise of the same mean power and duration. Ten male recreationally trained subjects (age=24.7±1.5, VO2max = 46.5±1.9% VO2max, condition I) so that the mean exercise intensity was maintained the same as in condition C. Blood samples were taken at rest, on the 30th and 60th min of exercise and 1 hour post exercise. Levels of TNF-a and IL-6 in whole blood supernatants were measured after in vitro LPS stimulation (Escherichia Coli). Differences between the two conditions were analyzed using two-way ANOVA with repeated measures. No significant differences were observed in TNF-a concentration between the two exercise protocols (p>0.75), but there was a significant time effect (P<0.01). TNF-a was increased from a resting value of 436.1±102.5 to 649.5±187.7
MOTION ANALYSIS AND PHYSIOLOGICAL DEMANDS IN INTERNATIONAL WOMEN’S TEAM HANDBALL

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Introduction: Handball is a sport characterized by repeated accelerations, sprints, jumps, rapid changes in movement directions and a high number of direct contacts towards opponents. Due to changes in rules and new tactical strategies, international female handball has increased enormously in dynamics, velocity and intensity in the last years. Probably, the physiological demands of the players increased accordingly. The main aim of the present investigation was to analyze movement patterns during the match and their corresponding physiological reactions in top-level female handball players.

Methods: 25 elite handball players from Germany (n=11) and Norway (n=14) of different positions (3 goalkeepers (GK), 12 back, 10 wing and pivot (field players, FP)) agreed to participate (age: 25.2±2.8 years; height: 175.2±6.3 cm; weight: 67.8±4.9 kg.; VO2max: 53.1±4.8 ml/min/kg; HRmax: 194.8±5.2 l/min, V4: 3.6±0.25 m/s). The analysis of run distances and velocities was done with the software "Sagit", using virtually modified videos. Heart rates (HR) during the matches were recorded with the POLAR TEAM SYSTEM. Run velocity corresponding to 4 mmol/l blood lactate (lactate threshold) was determined during an incremental field test according to the method of Mader. Maximal oxygen uptake (VO2max) was determined by means of an incremental treadmill test.

Results. Mean HR during the match was about 86% of HRmax. For more than 90% of playing time it was higher than 85% of HRmax. With the exception of GK, who had lower values, no position-specific differences could be detected. During the 1st half of the matches, players stayed in higher intensities with mean heart rates higher than 95% of HRmax for a longer time period as compared to the 2nd half of the match. Mean run distance during the match was 4614 m and varied widely between 2066 m (GK) and 5251 m (FP). Accordingly, also mean run distance per minute varied in a remarkable manner between 31.3 m/min (GK) and 69.7 m/min (FP). No significant differences could be detected between FP of different positions. Run distance per min was lower during the 2nd half of the match (65.1±18.0 m/min vs. 71.5±17.2 m/min). Differences in acceleration categories among some field players might indicate some position-specific patterns.

Conclusions: The individual physiological demands of female handball player seem to be determined by their motorial capacities and their movement patterns rather than by position-specific loads.

EFFECTS OF TIME OF DAY ON POWER OUTPUT AND THERMOREGULATORY RESPONSES DURING CYCLING OVER A SIMULATED HILLY COURSE IN THE HEAT (35°C)

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The aim of the present investigation was to compare responses to sustained exercise in the morning and evening in the heat (35°C) over a hilly prolonged simulated course. Thermoregulatory responses were examined: core temperature, skin temperature, mean body temperature and mean skin temperature. In addition, power output, heart rate (H-R), rate perceived exertion (RPE), thermal comfort (T.C.) and time were examined. Eight active males (25-40 years) were instructed to work as hard as possible over the entire exercise period, with variation of pedal frequency permitted at any time. The second and third prolonged sessions were performed at 08:00 and 17:00h, and counterbalanced with at least 5 days recovery between tests. The examined variables showed no significant main effect for time of day. Mean power in the evening was greater by 9 Watts (W) in comparison to the morning exercise, furthermore, time increased by 2.8% in the evening compared to the morning. Future studies should include the examination of circadian rhythms and performance during undulating courses using each gradient period.

CARDIORESPIRATORY ANALYSIS OF BALLET DANCE EXERCISES

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The classical ballet is a dance modality that involves many components of the physical aptitude, such as aerobic and anaerobic capacity. However it has been observed that the performance in dance brings limited stimuli for physiological adaptations related to physical fitness. Studies directed to the assessment of dancers’ VO2max have been done, which VO2max perceptual differences have been checked between dance classes (36%VO2max) and rehearsals (80%VO2max). Nevertheless, more sensitive parameters to fitness changes due to training as the ventilatory thresholds (VTs) have received little attention in dance. Therefore, the objectives of this study were: 1) to quantify the female dancers’ VO2max and their respective first and second ventilatory threshold (VT1 and VT2); 2) to describe the cardiorespiratory variables responses VO2 (ml/kg-min-1), HR (bpm) and RER (respiratory exchange rate) during the execution of nine ballet exercises sets; 3) to relate the VO2 responses in ballet exercises to ballet dancers’ VO2max and VTs. Twelve trained female ballet dancers were volunteers. VO2max, VT1 and VT2 were determined by a treadmill running progress test. Ballet session included the execution of nine exercises sets (pliés, tendus, jetés, rond de jambes, fondu, adagio, grand battlements, petit allegro, sautés). The data were evaluated in a gas analyzer MGC/CPX. The movements’ rhythm was monitored by a metronome and there was five minutes of break.
between the exercises. The VO2max values (40.2 ± 2.2) suggest a low aerobic power in ballet dancers. VO2VT1 and VO2VT2 were respectively 17.3 ± 1.8 and 30.6 ± 2.4. The VO2 in ballet exercises showed the following crescent order: tendus (17.5 ± 1.8); plies (17.6 ± 1.6); adagio (20.3 ± 2.9); ronde de jamb (21.8 ± 3.1); fondus (22.1 ± 1.8); jetés (22.9 ± 2.0); sautés (24.5 ± 2.4); petit allegro and grand battement (23.8 ± 2.9). There were differences in HR values from sautés (168.9 ± 7.5); fondus (166.6 ± 13.4) and grand battements (172.2 ± 12.0) to tendus (148.8 ± 16.1). RER’s value of sauté (1.1 ± 0.06) was higher than other exercises. Tendus and plies were near to VT1; adagio, ronde de jamb, fondus and jetés between VT1 and VT2, sauté, petit allegro and grand battement were close to VT2. The relations of VO2 in ballet exercises with ballet dancers’ VO2max and VTs allows a direction to elaborate parallel trainings with classes’ routines, using those with intensities related to expected goals.

References.

WEEKLY MONITORING OF SALIVARY IGA RESPONSE DURING A WINTER SWIMMING TRAINING SEASON: IMPLICATIONS FOR UPPER RESPIRATORY TRACT INFECTIONS SUSCEPTIBILITY

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Objectives
In spite of a number of studies focusing the potential relationship between the fatigue imposed by systematic training in endurance sports and immunodepression and higher risks of contracting upper respiratory tract infections (URTIs) remains unclear. The aim of this study was to evaluate the influence of the training loads on the immune status, expressed by changes in salivary IgA concentration and secretion rates, and the predispositions for URTI occurrence, on a group of well-trained swimmers during a competitive swimming winter season.

Methods
19 well-trained national level swimmers (13 men and 6 women, age: 16.46 ± 1.29 years old) were recruited for this project. The training volume and intensity, as well as participation on competition, were monitored during 29 weeks of a winter season. Before the beginning of the research as well as on a weekly routine, saliva samples were collected to access salivary IgA concentration (sIgA), determined by ELISA. IgA secretion rate (srIgA) was computed from saliva flow rate. All the upper respiratory tract infection (URTIt) episodes that occurred during the study period were documented using daily logs.

Results
No significant differences were found for sIgA and srIgA values between genders. The association between training load and sIgA showed a negative trend, more pronounced with the increment of the volume. Although the high variability of sIgA values, a small but significant correlation was found between mean weekly volume and mean sIgA concentration (r=-0.150, p=0.001) and mean srIgA (r=-0.183; p<0.001). The pre-season values of sIgA correlated well with the mean weekly sIgA during the study (r=0.488, p=0.034). sIgA values tend to be significantly depressed in association with high training loads and after intense participation in competition. Reduction of training load was related to the elevation or return of sIgA values to typical pre-season ones. During the study period 21,1% of individuals did not register any URTI episodes and 31,6% recorded more than 3 URTI episodes. The pre-season sIgA concentration and secretion rate values were unable to predict the predisposition for URTI occurrence, but most of the URTI episodes (51,3%) occurred at a sIgA- lower-ed condition, and a statistically significant correlation was found between sIgA concentration and the URTI episodes number (p=0.501, p=0.006).

Conclusion
More than the intensity, the volume of swimming training load seems to affect the sIgA response. Lower values of sIgA and srIgA seem to be related to predisposition to URTI. The high interindividual variability of sIgA and srIgA values, in connection to the verified occurrence of immunodepression as a chronic effect of exercise training, seems to justify an individual surveillance using these markers.

IMPACT OF DRINK FLAVOUR AND COMPOSITION ON VOLUNTARY FLUID INTAKE AND THE PHYSIOLOGICAL AND BEHAVIOURAL RESPONSE TO RECREATIONAL EXERCISE

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Many physically active adults take part in exercise moderately dehydrated and typically fail to consume sufficient fluids during exercise to replace losses. This has been associated with more negative changes in psychological affect, and could influence adherence to an exercise programme. This purpose of this study was to investigate the impact of drink flavour and composition on voluntary fluid intake and selected physiological and behavioural responses to a typical recreational exercise session.

Twelve recreationally active men aged 26 ± 1 years (mean ± SEM) completed three trials in a randomised, counterbalanced design. Each trial was performed in temperate conditions and consisted of three 20-min bouts of exercise at 75% of HRmax on a treadmill, cycle ergometer and cross-trainer, respectively. Participants then completed 4 sets of 10 repetitions at 75% of 1RM, for chest and leg press resistance exercises, followed by 20 min of seated recovery. In each trial, participants either had ad libitum access to water (W), a lightly flavoured hypotonic 2% carbohydrate-electrolyte solution (CES), or had no access to fluids (NF). Urine samples were collected on arrival for analysis of osmolality and to ensure eurhodoxy at baseline. Core temperature, oxygen uptake, fluid intake and nude body mass were recorded at regular intervals. Taste preferences were recorded using a 9-point category scale, whilst ratings of pleasure were determined using an 11-point scale with anchors ranging from very bad (=1) to very good (=5). Venous blood samples were drawn pre- and post-exercise and post recovery.

Fluid intake was greater with CES than W (1706 ± 157 vs. 1711 ± 152 ml; P < 0.01). The change in body mass during exercise was greater with NF than the other two trials (NF vs. W vs. CES: -1668 ± 73 vs. -700 ± 99 vs. -273 ± 78 g; P < 0.01). This was equivalent to a greater percentage change from pre-exercise body mass with NF than either fluid trial (NF vs. W vs. CES: -2.13 ± 0.09 vs. -0.91 ± 0.14 vs. -0.34 ± 0.10%; P < 0.01). Plasma volume was better maintained throughout trials with CES relative to NF, but was not different to W (CES vs. NF: -4.41 ± 0.73 vs. -6.96 ± 0.95%; P < 0.05; vs. W: -4.99 ± 1.26%). Plasma glucose concentration was greater throughout trials with CES.
relative to NF or W (CES vs. NF vs. W: 4.26 ± 0.12 vs. 4.06 ± 0.08 vs. 3.97 ± 0.10 mmol·L⁻¹, P < 0.05). Ratings of pleasure were more positive with CES than during the other two trials (CES vs. NF vs. W: 2.72 ± 0.23 vs. 1.09 ± 0.20 vs. 1.74 ± 0.33, P < 0.01), whilst ratings of drink flavour were greater with the CES than W (CES vs. W: 7.0 ± 0.3 vs. 4.9 ± 0.5, P < 0.01).

The lightly flavoured hypotonic carbohydrate-electrolyte drink promoted greater voluntary fluid intake and was more effective than water in maintaining fluid balance and enhancing feelings of pleasure during a simulated recreational exercise session. Supported by a research grant from GlaxoSmithKline, Consumer Healthcare (UK).

EXHAUSTIVE EXERCISE: INDUCED OXIDATIVE STRESS CAUSES INTESTINAL MITOCHONDRIA DISORGANIZATION

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Introduction. Exhaustive exercise (EE) is associated with oxidative stress, which can induce adverse effects on health. It was recently demonstrated that intestine is quite susceptible to EE, but these effects were poorly understood. We thus investigated the effects of EE on ultra structure of ileum myocytes and the possible relationship with oxidative stress. Methods. C57BL/6 mice were divided in control (CT), exercised for 4 (E4), and 10 days (E10), and supplemented control (CT-V), and supplemented and exercised for 4 (E4-V) and 10 days (E10-V). EE program consisted of a daily treadmill running session at 85% of the maximum velocity until exhaustion. Animals were supplemented with intraperitoneal injections of vitamins C and E, 2h before the running session. Morphologic alterations were analyzed by transmission electron microscopy. Ileum oxidative stress was assessed by protein carbonyl content and total antioxidant capacity. Results. Ten days of EE causes mitochondrial disorganization of intestinal myocytes, which was accompanied an increase about 115% in the intestinal protein oxidation, and a reduction of 36% in the intestinal total antioxidant capacity compared with the control group. These effects were totally prevented by vitamins C and E supplementation. The E4 group did not differ from the control animal group. Conclusion. Altogether these results suggest that the mitochondrial damage caused by 10 days of EE, but not after 4-days, is tightly related to the exercise-induced tissue oxidative stress.

CHANGES IN LEUCOCYTE AND LYMPHOCYTE SUBPOPULATIONS AND UPPER RESPIRATORY TRACT INFECTION SUSCEPTIBILITY IN ELITE SWIMMERS DURING A TRAINING SEASON

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Objectives
Seasonal variations in training loads influence on the immune status of athletes undergoing systematic and heavy training programs is not well established yet. The aim of this study is to verify the variation basal values of leukocytes, B, T and NK lymphocytes in well trained swimmers during a competitive season.

Methods
19 well-trained swimmers (13 men and 6 women, mean age 16,46 ± 1,29 years old) were recruited for this study and gave their written informed consent. The training load, volume, intensities and participation on competition events were monitored during 29 weeks of a winter swimming season. Quantification of leukocytes, B, T and NK lymphocytes was done by flow cytometry. Blood samples were taken before the beginning of training season (M1), after the first 7 weeks of incremental training load (M2), after 6 weeks of an intermediate intense training mesocycle (M3) and immediately after a major competition (M4). All the upper respiratory tract infection (URTI) episodes that occurred during the study duration were documented using daily logs.

Results
Leukocyte counts were lower in M1 than in M2 (p=0,011) and those found after the major competition, in M4 (p=0,033). The % of total lymphocytes, on the contrary, was lower in M2 then in M1 (p=0,003), in M3 (p<0,001) and in M4 (p=0,053). The T lymphocytes also decreased from M1 to M2 (p=0,011), M3 (p=0,001) and M4 (p=0,033). The % of B lymphocytes was higher at the beginning of the study and decreased M3 (p=0,025) remaining depressed in M4 (p=0,009). % of NK showed a decrease in M2 and M3 but recovered to the initial values in M4, following the decrease in training volume. The CD4+/CD8+ ratio showed higher values M2 when compared to M3 (p=0,006) and M4 (p=0,002). A higher frequency of URTI episodes occurred on the two intense training phases (M2 and M3) with four more episodes in the incremental load period when compared with the intense training cycle.

Conclusion
Production of antibodies that protects against bacterial infection may be compromised after intense periods of training and after major competition. T helper cells are recognized as activators of B cells and monocytes, and T cytotoxic cells are able to kill tumour and virus-infected cells, so lower values could also impair the immune response. The NK cells showed a decrease after major training cycles which could explain the depression in immunity as a result of heavy loads training phases. The higher incidence of URTI episodes in these phases justifies the need for immune surveillance.

DYNAMIC EXERCISE DOES NOT DECREASE AN INCREASED HAND AND WRIST VOLUME DURING VENOUS-STASIS

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Exercise is often recommended to use for reducing edema and further protecting against symptom of deep vein thromboemboli (DVT). However, there is no evidence to show that exercises promote to decrease an increased local limb volume while venous blood flow is obstructed. Rather, I have recently demonstrated that repetitive exercise induces an elevation of the hand and wrist volume [HWV] (Yamauchi et al. 2007, 2008). Therefore, the purpose of the study was to investigate how exercise affected to local volume of hand and wrist during venous-stasis of arm. I hypothesized that exercise would not decrease HWV, but maintain or increase accumulation of blood volume and interstitial fluid volume. Six healthy men (age, 35 ± 7 yr; height, 173 ± 6 cm; body mass, 68 ± 10 kg; mean ± S.D.) volunteered for this study. HWV was measured with a hand volumeter during rest, after the 5-minute of venous-stasis, after the following dynamic exercise with venous-stasis, followed by a 5-minute of recovery. Initially during rest, HWV was measured after the hand was passively hung for 5 minutes. Venous-stasis was created by a 14.5-cm-wide pneumatic arm tourniquet, which was inflated to 60 mmHg. Dynamic exercise was performed by repetitive squeezing and relaxation of the hand around an elastic ball at frequency of 1 squeeze/second, consisted of 6 sets of 30 seconds contractions with 10 seconds of rest between exercise bouts. A diameter of hand-sized ball was 7 cm and commercially available as a therapeutic hand ball. Also, maximum voluntary contraction (MVC) was measured with a handgrip

13TH ANNUAL CONGRESS OF THE EUROPEAN COLLEGE OF SPORT SCIENCE
EFFECTS OF A 7-DAY SUPPLEMENTATION OF ANTRODIA CAMPHORATA FOLLOWING INTENSELY FATIGUED RUNNING ON SALIVARY IGA RESPONSES

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Salivary immunoglobulin A (sIgA) is secreted by the local plasma cells of salivary glands and protects against oral and nasal epithelial infections. The lower levels of sIgA have been associated with recurrent upper respiratory tract infection. The purpose of this study was to investigate the influence of Antrodia camphorata (AC) supplementation following a single bout of intensely fatigued exercise on sIgA responses.

With local ethics committee approval, twelve male volunteers (age 23.2 ± 1 years, height 1.75 ± 0.01 m, body mass 69.6 ± 2.3 kg, VO2max 50.4 ± 2.2 mLkg-1min-1, means ± SEM) participated in this study. After a preliminary trial of VO2max measurement, participants completed four main trials, which were exercise (running on treadmill at 80% VO2max until fatigue) with placebo (EP) or AC supplementation (EA) and rest with placebo (RP) or AC supplementation (RA) in a double blind crossover design after an overnight fast. The amount of AC supplementation was 200 mg kg-1 body mass per day for 7 days after exercise. Water ingestion was allowed ad libitum during the trials except for the 10 minutes preceding each saliva sample collection. Timed, unstimulated saliva samples were collected at pre-exercise (preEX), post-exercise (postEX), and 0.5 h (0.5h-postEX), 1h (1h-postEX), 2h (2h-postEX), 24h (24h-postEX), and 72h (72h-postEX) after exercise. Salivary IGA concentrations were determined by ELISA. Results were analysed using a two-factor (trial x time) repeated measures ANOVA with post hoc Tukey tests.

The main findings of this study were: (1) the saliva flow rate was significantly decreased at postEX (P<0.05) compared with preEX in both exercise trials, however, no significant differences among trials were found. (2) there were no significant changes in sIgA concentration and secretion rate among trials and timepoints. In conclusion, the findings of this study suggest that a 7-day supplementation of Antrodia Camphorata following an intensely fatigued running does not appear to affect salivary IGA responses.

CHANGE IN BLOOD PROPERTIES BEFORE AND AFTER CLIMBING OF HIGH MOUNTAINS

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High mountain climbing places a great deal of stress on climbers. Body composition and blood tests before and after climbing were examined in climbers who scaled 8,000m or more than two times over a two year period.

Methods

Examinations were conducted on four climbers. A (26 years old), B (27), C (28) and D (29). Body weight and body fat were measured.

Particular items involved in the blood test included measuring red blood cell count (RBC) and haemoglobin (Hb), hematocrit (Ht), serum iron, ferritin, total cholesterol, triglyceride, and total protein levels.

Results

The mean RBC (106/mm3) levels before and after climbing were 4.87±0.14 and 5.73±0.49 (p<0.05), respectively. The mean Hb (g/dl) levels before and after climbing were 15.4±0.60 and 17.6±1.3 (p<0.05), respectively. The mean Ht (%) levels before and after climbing were 45.6±0.8 and 53.0±4.4 (p<0.05), respectively. In looking at each subject on an individual basis, we found that although in three of the subjects the figures for Hb, Ht, and serum iron had all increased after high mountain climbing; in one of the subjects we were unable to find any significant changes in these indices between before- and after-ascent levels.

Discussion

In a hypoxic atmosphere, oxygen-carrying capacity decreases. Because of this, hematopoietic function becomes hyperactive to improve oxygen-carrying capacity and as a result RBC increases. In all of these two times of climbing, 4 climbers stayed at more than 2,500m for more than 60 days, and generally gained altitude during the period and finally reached more than summit of 8,000m. We did a blood test for three to four weeks after descending to less than 2,500m, and three out of four climbers had an increase of RBC compared to what they had before climbing and also had an increase in Hb, Ht and serum iron. Three to four weeks after descending the mountain, the effects of high altitudes were still apparent. Their reticulocyte count decreased after going down the mountain, which means there was no hyperactivity of the hematopoietic function at this time.

On the other hand, the fourth climber didn’t see any changes in RBC, Hb, Ht and serum iron after descending the mountain, compared to before climbing. He also didn’t have experience any changes in reticulocyte count before and after climbing. This means he didn’t have any changes of hematopoietic function in a hypoxic atmosphere. However, there was no decreased ability to exercise and he succeeded in climbing to more than 8,000m two times. This means there was no decreased ability to exercise in a hypoxic atmosphere.

Conclusions

Under low oxygen and low pressure conditions the effects of climbing activity showed themselves in the increase after climbing rates of RBC, Hb, and Ht. We did, however, see individual differences among the subjects regarding these increases.
DIFFERENCE IN PHYSIOLOGICAL RESPONSES TO INCREMENTAL EXERCISE BETWEEN HYPERCAPNIC AND HYPOXIC CONDITIONS

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<Introduction> The purpose of this study was to determine the difference in physiological responses to incremental exercise between hypercapnic and hypoxic conditions.

<Materials and methods> Eight healthy males volunteered to participate in the present study. Each subject performed incremental exercise until exhaustion on three occasions; 1) breathing ambient air (Air); 2) breathing hypercapnic (21% O2, 6% CO2, N2=balance) gas (HCl); 3) breathing hypoxic (12% O2, N2=balance) gas (HP). Subjects breathed ambient air, hypercapnic or hypoxic gas from 10 min before the start of exercise until the end of exercise. Exercise was conducted with an electrically-braked cycle ergometer. The initial workload was 30 Watt (W), and thereafter the workload was increased by 30 W every 2 min until exhaustion. Arterialized blood was drawn from a superficial vein.

<Results> Exercise performance time in HC and HP were significantly shorter than that in Air (P<0.05). VO2 was significantly lower in HP than those in Air and HC (P<0.05), but those did not differ between HC and HP. RER was significantly lower in HC than those in Air and HP (P<0.05). VE and ETCO2 were significantly higher in HC than those in Air and HP (P<0.05). HR was significantly lower in HC and HP than that in Air at the end of exercise (P<0.05). HR did not differ between HC and HP. Blood pH was significantly lower in HC than those in Air and HP (P<0.05). Blood PCO2 was significantly higher in HC than those in Air and HP (P<0.05). Plasma lactate concentration (La) was significantly lower in HC than those in Air and HP just after exercise (P<0.05). La was significantly lower in HP than that in Air at the end of exercise, but those did not differ between HP and Air just after exercise. Plasma ammonia concentration (NH3) was significantly lower in HC than that in Air just after exercise, but those did not differ between HC and HP. NH3 was significantly lower in HP than that in Air at the end of exercise, but those did not differ between HP and Air just after exercise.

<Conclusion> On cardiorespiratory responses, under hypercapnia, accumulation of CO2 in pulmonary alveoli and blood led the larger increase in pulmonary ventilation and a decrease in RER during exercise. On the other hand, hypoxia led a decrease in oxygen uptake during exercise. Maximum heart rate was reduced in both conditions. On acid-base status, exercise induced blood acidosis was promoted by respiratory acidosis under hypercapnia, but was attenuated by respiratory alkalosis under hypoxia. On metabolic status, accumulation of anaerobic metabolites was limited during exercise under hypercapnia, but did not differ under hypoxia in comparison with normoxia.

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INFLUENCE OF AGING ON VERTICAL JUMP PERFORMANCE IN RELATION TO DYNAMIC PROPERTIES OF LOWER LIMB MULTI-JOINT MOVEMENT

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The declines of muscular power capability in lower limb are associated with impaired functional mobility in elderly individuals. There are numerous studies on aging and muscle functions, however, only few studies have demonstrated some mechanisms underling aging-related decline in vertical jump performance. No studies have ever examined aging-related changes in vertical jump performance in relation to the dynamic characteristics of lower limb multi-joint movement. It has been demonstrated that the muscle function of lower limb multi-joint movement measured with the servo-controlled dynamometer (Yamauchi et al. 2007) is profoundly correlated with the vertical jump performance (Yamauchi & Ishii 2007). Therefore, the present study was to investigate how aging influenced the vertical jump performance in women in relation to the dynamic properties of leg multi-joint movement. Two groups of women, twelve per group Y; age, 22.3±3.7yrs and E; age, 69.2±6.3yrs, means±S.D, performed three different types of vertical jump: i) a countermovement jump combined with arm swings (CMJA), ii) a countermovement jump without arm swing (CMJ), and iii) a squat jump starting from a semi-squatting position (SJ). The vertical jump heights were evaluated with force-velocity-power properties of lower limb multi-joint movement measured with the servo-controlled dynamometer. All three types of vertical jump height were significantly lower in E than in Y. CMJA was higher than CMJ and SJ, and CMJ was higher than SJ in Y, whereas in E, CMJA was higher than CMJ and SJ, but CMJ was not statistically different from SJ, suggesting that the performance difference between CMJ and SJ was diminished so as to impair full utilization of elastic component in elderly women. Analyzing the force-velocity-power properties of lower limb multi-joint movement, body weight (BW) as a resistive load for vertical jump performance was almost close to optimum load for the maximum power output in Y; however, in E, BW was heavier than optimum load. As a result of this, the velocity of the lower limb multi-joint movement at BW was lower in E than in Y. These are due mainly to the lower level of relative maximum force capacity (Force/body weight). These results indicate that decrease in vertical jump performance in elderly women was related to the development of power at less optimum force level so as to decrease velocity of the leg extension movement. Such impairment of muscle functions causes less a capability of accelerating and decelerating the mass. Therefore, to maintain maximum power ability of vertical jump performance in elderly women, it is necessary to improve the relative maximum force capacity i.e., reduce body weight and/or increase maximum force generating capacity and the ability to utilize elastic components of muscles to some extent.

References

TIME COURSE OF THB AND CYCLE ERGOMETER PERFORMANCE DURING 21 DAYS OF SIMULATED ALTITUDE

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Living at simulated moderate altitude but training near sea level (LHTL) is a common practice among athletes seeking to enhance sea-level performance (1), with an increase in red cell mass considered to be important (2). A dose of hypoxia equivalent to ~2500 m for >12 h/d for ~3-4 weeks is proposed as optimal for increasing red cell mass (3), but the weekly rate of accelerated erythropoiesis is unclear. Consequently the aim of the current study was to determine the time course of changes in total haemoglobin mass (THb) and cycling...
performance during 3 weeks of LHTL. 11 well-trained male endurance cyclists spent 14 h/d for 21 consecutive days, in simulated moderate altitude (3000 m) and trained at normoxia (600 m). Thb and cycling performance were measured twice before, weekly during and 1wk-post LHTL. Thb was measured using CO re-breathing (4) and cycling performance was measured using a 'power profile' test, which involved successive maximal efforts on a cycle ergometer of progressively longer duration (6s, 15s, 30s, 1 min, 4min and 10min) interspaced with progressively longer recovery periods (2 10min). Mean power (watts) was measured during each time interval using SRM chronos. Statistical analyses were performed with the log-transformed data to report the change in the mean. Precision of estimation was established using 90% confidence intervals (CI).

The mean ±SD Thbmass increased weekly (0.6±1.4%, 1.9±1.2%, 3.3±1.3%, 3.5±1.7% at wk1, wk2, wk3 and 1wk-post, respectively). Nine of the 11 cyclists exhibited an increase in Thb above their own pre-altitude value 1 wk after LHTL. Mean power increased for all time intervals except 6s, by the 3rd wk and at 1wk-post. The magnitude of these increases at the 3rd wk were 2.1±4.1% for 15s, 5.8±4.7% for 30s, 6.4±3.8% for 60s, 4.9±1.4% for 4min and 3.8±2.6% for 10min, and the corresponding increases at 1wk-post were 4.4±4.4, 6.6±6.5, 10±3.1, 9.8±2.6 and 8.9±3.0%.

For the first time, serial measurements reveal that Thb increases progressively by ~1% per wk for an optimal dose of simulated hypoxia. This result is similar to that previously observed at natural altitude (5) and supports the idea of an 'optimal dose' of hypoxia to induce physiological changes. Interestingly, improvements in performance were observed across the spectrum of time intervals including those with a high anaerobic contribution suggesting factors other than increased red cell mass may be contributing to performance improvements. However, the practical ability of athletes to combine training while accumulating 14 h/d using simulated altitude to obtain this optimal dose may be difficult and therefore limit the benefits achievable using simulated LHTL.

**EFFECT OF AGONIST AND ANTAGONIST EMG ACTIVITY DURING SIMULTANEOUS MOVEMENTS OF ELBOW AND WRIST**

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Introduction: Recently, many studies in the control of arm-movements have shifted from single to multi-joint movements in human. Interactions of multi-joint movements are influenced change of kinematics, changing the timing of joint movement onsets and EMG activity. Changes in muscle activity and EMG onset during multi-joint movements in comparison with single-joint movements are less clear. The present study was to clarify the kinematics of multi-joint movements of elbow and wrist at fast- and slow-speeds.

Methods: Right-handed five normal subjects [25-60 years] with no known history of motor system disorders participated in this study. We did informed consent about the experimental aim and risk to all subjects. Experimental posture was seated in a chair and shoulder was supported on the trunk with the forearm supine position. All subjects performed simultaneously elbow flexion movements accompanied by wrist flexion or wrist extension in a tracking paradigm using visual feedback of oscilloscope (CRT) including two bar-beams of forearm- angle and target position. Fast and slow movements are to move fast and accurately and two seconds attainment between the target bars, respectively. Target amplitude of elbow flexion was 45° and 90°, and range of wrist movement was full flexion and extension. In addition, other task was each movement at weight holding of dominant-hand (500g). Each movement was performed 10 practices and interval of rest was after rest for five minutes. During some movements, angle of joint (wrist, elbow) and EMG (BB, TB, FCU, ECR, deltoid) were measured in all experimental conditions.

Results and Discussion: When subject perform forearm movement, elbow-flexion preceded more than onset of wrist in unidirectional fast movement of 90° amplitude. Conversely, wrist-flexion preceded more than onset of elbow-flexion in unidirectional slow movement of 90° and 45° amplitude. EMG activity was significant correlation between agonist (biceps) and antagonist muscles (triceps) of upper-arm in unidirectional and bidirectional fast movements. However, there was no significant correlation in slow movement. During handhold of weight EMG activity was significant correlation between both muscles in unidirectional and bidirectional slow movements of 90° and 45° amplitude. Similarly, EMG activity was significant correlation between agonist (biceps) and synergist muscles (deltoid) in unidirectional fast movement of 90° and 45° amplitude. In contrast, EMG activity was significant correlation in unidirectional and bidirectional slow movement. These results suggest that EMG activity of agonist and antagonist muscles in elbow movement related to direction of wrist movement and to speed of elbow movement.

References:

**CONTRALATERAL STRENGTH FACILITATION DURING ATTEMPTED HIGH VELOCITY MOVEMENTS**

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Neural mechanisms are thought to be responsible for contralateral strength gains following unilateral resistance training. We hypothesised the elevated motor drive associated with explosive exercise may produce increased contralateral facilitation, but in the absence of repetition failure. Therefore, we investigated neuromuscular adaptation of contralateral biceps brachii in untrained males (N=29) using three elbow-flexion (60°-160°) treatments: C controlled 2-s eccentric and concentric to repetition failure, in contrast EC attempted explosive concentric and eccentric without repetition failure, performing 31% less work than C. Each group exercised 3 days per wk for 12 wks at 85% of one repetition maximum (IRM). Strength was assessed isometrically (90°) and dynamically via a IRM elbow flexion task. Filtered electromyographic (EMG) data were sampled at 2 kHz (Digitimer, Neurolog). Peak and average root mean square (RMS) and mean frequency (MF, Spike 2 Ver5.13) were calculated over scrolling 250 ms windows with a 50% overlap. Data means ±SE with alpha set at 0.05. Dominant limb mean IRM and MVC strength gain for all groups was 30.7% and 13.3% respectively, with no significant between-group differences. Contralateral limb IRM strength increased significantly SSC 17.6% (3.0 ±0.8 kg), EC 13.4% (2.75 ±0.5 kg), C 12.2% (2.13 ±0.4 kg), again with no differences between groups. Relative to IRM dominant limb strength gain, contralateral limb strength gain, increased by 57.2% (SSC), 45.3% (EC) and 37.2% (C), differences were not significant. The explosive exercise groups recorded significantly greater IRM contralateral peak RMS (SSC 13.43 ±10.4%, EC. 8.34 ±5.1%) and mean biceps RMS (SSC 28.6 ±9.4%, EC. 7.66 ±5.1%) compared to C-18.0 ±7.1% and 11.5 ±3.3%. Isometric strength increased in SSC (20.12%, 15.73 ±6.2 Nm) and C (14.10%, 9.93 ±3.5 Nm), but not EC (-0.36%, -0.63 ±3.8 Nm). The cross-over effect observed within this investigation has been proposed to be due to cortical mechanisms, postural stabilisation or familiarity with the test procedures (Munn et al. 2005). Despite the absence of repetition failure and a significant reduction in total work, the attempted explosive exercise groups were equally effective in facilitating contralateral strength gains compared to C. This suggests cortical mechanisms, via increased motor drive, may be responsible for the adaptations observed.
Cyclosporine (CsA) is an effective immunosuppressive agent widely used to prevent allograft rejection and chronic inflammation in clinical practice. CsA exerts its immunosuppressive action by interfering the activation and proliferation of T cells. There is growing evidence that regular exercise can increase immune function. Patients taking CsA may be benefit from regular exercise in improving cardiovascular and musculoskeletal functions. However, the effect of exercise on immune functions in patients who are taking CsA is unclear. The aim of this study was to measure the interactive effect of CsA administration and regular exercise on the functions of immune cells in mice. Fourty-eight adult female BALB/c mice were randomly assigned to one of the 6 groups: 0-Ex (no CSA, no exercise), 0+Ex (no CSA, exercise), 10-Ex (10 mg/kg/d CSA, no exercise), 10+Ex (10 mg/kg/d CSA, exercise), 20-Ex (20 mg/kg/d CSA, no exercise), 20+Ex (20 mg/kg/d CSA, exercise). The 3 exercise groups were trained 3 times a day at approximately 75% VO2max for 6 weeks. Nitric oxide and interferon-gamma production abilities by mitogen-activated macrophages and spleen cells respectively were higher in 20+Ex group comparing to 20-Ex group. The proliferation of mitogen-stimulated spleen cells was not significantly different between the exercise and non-exercise groups receiving the same dose of CSA. The results of this study indicated that in lower dose of CsA, regular exercise had no effect on immune function in mice. However, regular exercise may enhance immune function in mice receiving higher dose of CsA.

**MODERATE FITNESS DOES NOT AFFECT SHORT-TERM HEART RATE VARIABILITY AND BAROREFLEX SENSITIVITY IN HEALTHY MALES**

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Considerable scientific research has pointed to the clinically beneficial effects of increased beat-to-beat heart rate variability (HRV) and vagal tone for reducing the risk of cardiac morbidity. Alterations in HRV and modified cardiac parasympathetic modulation in individuals with disease, obesity, and during acute exercise have been observed by previous investigators. Evidence obtained from cross-sectional research designs have demonstrated that increased physical fitness elevates HRV, while lowering the resting heart rate in healthy individuals. This investigation had two primary aims: i) to investigate the effect of physical fitness on time- and frequency-domain indices of HRV, and, ii) to determine the effect of graded orthostatic stress on autonomic control in healthy young men of differing physical activity and fitness levels.

Nineteen male subjects, 8 of lower activity (LA) and fitness (VO2peak: 44.0 ± 1.1 ml/kg/min) and 11 higher activity (HA) and fitness (VO2peak: 60.5 ± 2.7 ml/kg/min), aged 23.8 ± 1.8 y and 24.0 ± 1.5 y, respectively, volunteered to participate in this study. Each individual was required to rest supine for 20 minutes prior to collection of RR-intervals and beat-to-beat blood pressures (from fingertip photoplethysmography) for 520 cardiac cycles during entrained breathing. Graded incremental lower-body negative pressure was applied at 0, -15, -30 and -45 mmHg for 520 cardiac cycles. Time- and frequency-domain indices of HRV and spontaneous baroreflex sensitivity were determined at rest and during each level of lower-body negative pressure. Resting HR was significantly lower in HA (58.6 ±2.5 b/min) than LA (66.9 ±2.4 b/min). However, no significant differences were observed between the groups in time- and frequency-domain indices of HRV and baroreflex sensitivity at rest or during lower-body negative pres-
To examine the pacing of an 800 m running race, six collegiate male middle distance runners performed maximal bicycle exercises for 2 min, and the relationships of total work to energy of the exercise and muscle fiber composition were determined. They carried out the maximal exercise four times, and the total work was calculated from the number of wheel revolutions, while oxygen uptake and oxygen debt were obtained by collecting expired gas in a Douglas bag at rest, during exercise and during recovery. At first, the subjects performed the maximal exercise imagining their pace in an 800 m race (Control). Then, they performed the exercise at work during the first 1 min of 95% (SF), 100% (Steady) and 105% (FS) of one half of the total work for 2 min in the control. During the second 1 min, the subjects performed the exercise with maximal effort. The order of the trials was counter-balanced. In another experiment, they performed 50 maximal knee extensions at the load of 180 degree/sec, from which their percentages of fast twitch fibers (%FT) were estimated. There was a significant negative correlation between personal 800 m record times and the total work of the 2-min maximal bicycle exercise (r = 0.931, p < 0.01). The total work was the greatest in the FS trial, but was not significantly different from the other trials. However, the total work in the five of the six subjects was the greatest in the FS trial. The total work was significantly correlated with oxygen requirement (r = 0.502, p < 0.05) and oxygen debt (r = 0.467, p < 0.05), which were the highest in the Steady trial. There were significant correlations between %FT and percentage of work during the first (r = 0.838, p < 0.05) and the second (r = -0.838, p < 0.05) 1 min, when maximal total work was achieved. Performance in maximal bicycle exercise for 2 min by middle distance runners is an indicator of their 800 m run records. Performance is influenced by %FT fibers and can be improved when work during the first 1 min is increased by 5% of one half of the total work.

EFFECTS OF WALKING VELOCITY ON THE CARDIAC AUTONOMIC NERVOUS SYSTEM ACTIVITY DURING TREADMILL WALKING

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Introduction: The purpose of this study was to investigate a relationship between the walking velocity and the cardiac parasympathetic nervous system activity during treadmill walking on land and in water.

Methods: Experiment1Eight healthy Japanese males voluntarily participated in this study. Their mean age, height, body weight and % body fat were 22.1±1.8 years, 169.9±6.9 cm, 64.7±6.4 kg and 15.0±3.2%, respectively. After resting for 5 minutes in a standing position, subjects walked on the treadmill for 45 minutes with the progressively increasing and decreasing its velocity by 2, 3, 4, 5, 4, 3, 2 and 1km/h; each stage continued for 5 minutes. After the exercise, they rested for 10 minutes in a standing position. The room temperature and room humidity were 25.4±1.2 degrees Celsius and 36.8±8.0%, respectively. Heart rate, cardiac autonomic nervous system activity and oxygen uptake were measured. Experiment2Subjects who participated in the experiment 1 also voluntarily participated in this study. The room temperature and room humidity were 25.6±0.5 degrees Celsius and 73.6±3.3%, respectively. After resting for 5 minutes in a standing position, subjects walked on the treadmill for 45 minutes with the progressively increasing and decreasing its velocity by 2, 3, 4, 5, 4, 3, 2 and 1km/h; each stage continued for 5 minutes. After the exercise, they rested for 10 minutes in a standing position. The room temperature and room humidity were 30.6±0.2 degrees Celsius and 36.0±3.3%, respectively. Water temperature was 30.6±0.2 degrees Celsius. Subjects had a rest for 5 minutes in a standing position on a land and had a rest for 5 minutes in a standing position in water. Then, they walked on the treadmill for 45 minutes. After the exercise, they rested for 10 minutes in a standing position in water. The measurement items were the same as experiment 1. All subjects were not allowed to drink caffeine components on the experiment day. Also, they ate nothing for three hours before the experiment. All subjects signed the informed consent forms before the experiment.

Results:Experiment1Heart rate and oxygen uptake increased with the gradual increase in the walking velocity and decreased with its gradual decrease (ANOVA: P<0.05). LogHF decreased with the gradual increase in the walking velocity and increased with its gradual decrease (ANOVA: P<0.05). Exercise intensity was equivalent to 3.7 METS during the treadmill walking on land of 5 km/h. Experiment2Heart rate and oxygen uptake increased with the gradual increase in the walking velocity and decreased with its gradual decrease (ANOVA: P<0.05). Exercise intensity decreased to 5.5 METS during treadmill walking in water of 5 km/h.

Discussion: Heart rate was increased by the inhibition of cardiac parasympathetic nervous system activity during the gradual increase in the walking velocity. Heart rate was decreased by the hyperactivity of cardiac parasympathetic nervous system activity during the gradual decrease in the walking velocity. These data suggest that changes of cardiac parasympathetic nervous system activity depend upon the walking velocity during treadmill walking on land and in water.

HUMAN CORE TEMPERATURE RESPONSES DURING EXERCISE AND SUBSEQUENT RECOVERY: THE INTERACTION BETWEEN MEASUREMENT SITE AND TIME OF DAY

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Background: Oesophageal temperature [Tes] is considered the gold standard site for measurement of core body temperature in exercising humans due to its high sensitivity to changes in central blood temperature. Both rectal (Trec) and intestinal temperature (Tit) measured with an ingestible temperature sensor, provide valid measures of core temperature during extended periods of exercise and recovery. The validity of these measures is, however, questionable under conditions were rapid changes in core temperature occur. Moreover, the
rate of increase and decrease in core temperature may be subject to diurnal variation, depending on measurement site (Waterhouse et al., 2005). Therefore, we present the first comparison of Tes, Trec and Tit during exercise and recovery at different times of day.

Methods: Seven healthy male subjects (age, 27 ± 5 years) completed 30 min of cycling at 70% of maximal oxygen uptake followed by 30 min of rest at two times of day (08:00 h and 17:00 h). Tes and Tit were continuously assessed during exercise and recovery. Tit was measured using an ingestible telemetric pill ingested eight hours before arriving at the laboratory. Heart rate, skin temperature, ratings of perceived exertion and total sweat loss were also measured. Data were analysed using a three-factor (condition x time x site) within-subjects general linear model (GLM).

Results: Tes (37.16°C, s=0.45) was significantly lower than Trec (37.35°C, s=0.48) and Tit (37.45°C, s=0.51) across the entire protocol (P<0.01). This difference was, however, dependant on exercise/recovery time due to the greater rate of change in Tes relative to Tit and Trec (P<0.001). The relationship between measurement sites, particularly Tes and Tit, was also influenced by time of day with greater differences noted in the afternoon (37.27, ±0.44, 37.52, ±0.44, 37.67, ±0.48) compared to morning (37.06, ±0.45, 37.19, ±0.47, 37.22, ±0.42). Differences between Trec and Tit sites were not significantly different (P=0.083). The rate of change in core temperature during the afternoon (0.01°C.min⁻¹, s=0.0037) and afternoon (0.0074°C.min⁻¹, s=0.0054) was similar regardless of measurement site (P=0.67). Core temperature was significantly lower throughout the morning trials (37.15°C, ±0.45) compared to the afternoon (37.48, ±0.48; P=0.0032). This difference (exercise and recovery) was greater for Tit (0.45°C, ±0.32) compared with Trec (0.33°C, ±0.24) and particularly Tes (0.2°C, ±0.21) (P=0.019).

Conclusions: The present findings suggest the rate of change in core temperature during exercise and recovery is not influenced by time of day, however, the absolute value of core temperature is over estimated by Tin compared to Tes and Trec in the afternoon. This greater time of day difference may be related to the circadian rhythm in gastrointestinal motility (Goo et al., 1987).


CHANGES IN FORCE OUTPUT OF HUMAN MUSCLE FIBERS DURING REPETITIVE ACTIVATION AT PHYSIOLOGICAL RATES

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Introduction: The spike interval of MU gradually elongated from several seconds to minutes during even constant force contraction in a wide range of developed force levels. To account for the maintenance of constant force during spike interval elongation, some researchers have implicated the potentiation of muscle fibers developed force. However, the electrical stimulus rates used in human experiments are higher than the discharge rate during voluntary submaximal constant force contraction.

Methods: Six healthy adult subjects participated in the study. They sat with hip and knee joints fixed at 90 deg. and with an ankle fixed to record force. The vastus medialis muscle was stimulated with constant intensity at its motor point. The stimulus duration was 1ms. To determine the stimulation intensity, we obtained the relationship between the time to the peak of twitch (CT) and stimulus intensity. Furthermore, we used the minimum level of stimulus intensity at which the CT became constant despite the intensity increased. This intensity was within the pain tolerance of subjects during tetanic stimulation at low frequencies [10 Hz]. Two patterns of stimulation were delivered at constant intensity. One was constant frequency stimulation for 3 min: 5 Hz, 6.7 Hz, 10 Hz, and 20 Hz. Another was brief stimulation for 1 s and 30 s at 10 Hz. We investigated the twitch response before and immediately after the brief stimulations.

Results: We observed potentiation of the force during electrical stimulation at all frequencies. The evoked force showed respectively two peaks and one peak during 10 Hz and 20 Hz. These patterns of change correspond to our previous results. The rate and duration of the potentiation at 10 Hz was larger and longer than that at 20 Hz. The peak force (PF) of twitch tended to increase and CT shortened significantly after stimulation at 10 Hz for 1 s. However, PF significantly increased and CT shortened no change after 10 Hz for 30 s.

Conclusion: Potentiation is expected to contribute to the elongation of the MU spike interval during voluntary contraction. Furthermore, this effect in MU at low activity level might be larger than that at the high activity level. Moreover the two peaks of the force in MU at low activity level might result from different mechanisms. This work was partially supported by the Academic Frontier Project of JWCPE.

EFFECTS OF EXERCISE TRAINING ON PLATELET FUNCTION AND PLASMA TOTAL ANTIOXIDANT STATUS

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It is clear that platelets implicated in the pathophysiology of variety of conditions including coronary heart disease. Therefore prevention of enhanced platelet activation is one of the major targets of therapeutic strategies. Although no valid conclusion can be drawn on the effects of physical training on platelet functions, results of some recent studies have clearly shown that long term physical training of moderate intensity reduces platelet activations both at rest and in response to intense exercise. On the other hand, causing oxidative stress, exercise changes redox status of the plasma which may also interfere platelets, and antioxidant defenses of the body appear to be modulated by the state of physical training.

Preliminary Data: Male Sprague-Dawley were randomly assigned to two experimental groups: 1) control, 2) exercise. The protocol for the acute exercise bout was 30 min, 0% grade, for 60 min, which elicits a workload of approximately 65% maximal oxygen consumption.

Exercise decreased plasma TAS (p<0.05). This finding indicates that the host was unable to deal effectively with the increased free radical load due to the exercise.

PURPOSE: The present study was undertaken to seek whether a short-term training protocol is capable of increasing plasma total antioxidant status (TAS) and desensitising platelets and elucidate a possible relationship between plasma TAS and platelet responsiveness.

METHODS: Adult male Sprague-Dawley rats were randomly divided into short-term training and control groups. Rats in the short-term training group were subjected to an exercise protocol consisted of three bouts of treadmill running on three consecutive days for 30 min at 25 m/min. Blood samples were taken twenty four hour after the end of last bout of exercise. ADP and collagen-induced maximal platelet aggregation rates and platelet ATP release were measured in the whole blood using an aggregometer. Plasma TAS were measured in plasma according to Miller’s method. RESULTS: Composed with control group, trained rats had higher plasma TAS and lower ADP-induced platelet ATP release (p<0.05). A negative correlation was seen between plasma TAS and ADP-induced ATP release from platelets. Exercise protocol did not elicit any statistically significant changes in aggregation response and collagen-induced ATP release. CONCLUSION: Findings of the study suggest that even short-term training may enhance antioxidant defenses in plasma and this improvement, not enough to inhibit aggregation may play a role in incomplete desensitising of platelets.
EFFECT OF LOW INTENSITY ECCENTRIC EXERCISE ON OXIDATIVE STRESS AND ANTIOXIDANTS IN RAT SKELETAL MUSCLE
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[Introduction] Eccentric exercise frequently induces development of muscle damage. The exercise is maintained by recruitment of a small number of motor units, that causes an enhancement of muscle fiber stress. Even if the exercise is performed at low intensity, it is easy to develop muscle damage for a long period. Exercise induces the generation of a reactive oxygen species (ROS) that facilitates muscular damage via peroxidation. The mitochondrion is a major site of ROS generation that depends on metabolic rate and an increase in nuclear (nDNA) and mitochondrial DNA (mtDNA) damage during exercise. But, whether mtDNA has been damaged similarly to nDNA is still unclear because a high metabolic rate is not necessary to maintain eccentric exercise. The aim of this study was to examine the effect of contraction type and intensity on muscular oxidative damage during exercise. [Methods] Male wistar rats (10-11 wk, 360-380 g BW) were used in this experiment. Animals in exercise groups performed running on a treadmill at different inclines and speeds, i.e. uphill (UH: 16 degree, 16 m/min for 90 min), downhill (DH: -16 degree, 16 m/min for 90 min) or downhill at low speed (DL: -16 degree, 10 m/min for 3 h). Immediately after the exercise, quadriceps muscle was removed from both legs and was stored at -80 °C until analysis. nDNA and mtDNA were extracted from the muscle specimen and were treated with nuclease P1 and alkaline phosphatase to isolate nucleoside. 8-hydroxy-2'-deoxyguanosine (8-OHdG) was determined by enzyme-linked immunosorbent assay (ELISA) as an index of the muscular oxidative DNA damage. Activities of superoxide dismutase (SOD), glutathione peroxidase (GPH), glutathione reductase (GR) and lipid hydroperoxide content (LH) in aliquot of the muscle specimen were determined. Blood was also collected with muscle. Contents of glucose (Glu), free fatty acid (NEFA), lactate (La) and creatine kinase (CK) activity in plasma were determined. [Results] Plasma CK activity showed 2-3 fold increase in DL similar in DH and UH. LA level showed a 2 fold increase in DH and UH, but did not change in DL. Glu and NEFA were also elevated in DL and UH, but NEFA did not change in DH. Muscular LH levels increased in all exercise groups depending on their work intensity (DL < DH < UH). Oxidative mtDNA damage (8-OHdG) also increased in DH and UH, this might depend on running speed (DL < DH = UH). In nDNA, damage increased in DL and no changes were observed in DH and UH. No changes were observed in antioxidant enzyme activities depending on their muscular oxidative damage. [Discussion & Conclusion] Eccentric exercise, even if at low intensity (DL), enhances oxidative stress in the muscle. However, there is no similar change in DNA damage in the nucleus and mitochondrion suggesting that muscle DNA damage is not necessary to involve a common factor in exercise.

HIGHER MUSCLE DESATURATION HETEROGENEITY DURING BICYCLE EXERCISE AT HEAVY WORK RATES
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Background: Muscle tissue oxygen saturation (StO2) is derived from the oxygen balance (O2 balance) between muscle oxygen consumption and oxygen supply. We hypothesized that the StO2 in the activating muscle will be more heterogeneous at heavy work rates as nonuniform O2 balance distribution is greater. The purpose of this study was to examine the muscle desaturation heterogeneity in a single muscle during arterial occlusion and bicycle exercise using multi-channel near infrared spatial resolved spectroscopy (NIRSRS).

Methods: Fourteen healthy male subjects participated in this study (Age: 19-34 yrs, Height: 171.1 +/- 5.2 cm, Weight: 66.6 +/- 6.9 kg, VO2peak: 54.3 +/- 10.8 ml/kg/min). The eight measurement probes were arranged vertically and the measurement probes were attached on the left vastus lateralis muscle along the direction of the long axis. The sampling rate of the signal was 0.5 sec. To determine the minimum value of the StO2, a cuff was attached on the thigh to occlude the femoral artery for 6 min. After the experiment, the subjects performed a 30W ramp incremental bicycle exercise until exhaustion. The pulmonary O2 uptake was monitored continuously during the experiment. As Komiyama et al (2001) reported, fat layer thickness affects StO2 as determined by NIRSRS, thus the fat layer thickness of each measurement site was measured using ultrasound device for correction of the effect of fat layer thickness on reduced scattering coefficient. Results: The StO2 was significantly lower at the distal site than the proximal site (Distal: 76.0 +/- 5.8 % vs. Proximal: 80.2 +/- 4.6 %, p<0.05) and the StO2 differences were higher at 6 min of arterial occlusion (Distal: 15.1 +/- 9.8 % vs. Proximal: 42.5 +/- 10.2 %, p<0.01). In addition, the StO2 at the end of exercise was significantly lower at the distal site than the proximal site (Distal: 40.4 +/- 5.8 % vs. Proximal: 52.7 +/- 5.8 %, p<0.01). Moreover, the heterogeneity of the StO2 during exercise was significantly higher at heavy work rates (p<0.05). Conclusions: This study revealed that O2 balance was significantly different in a single muscle not only at rest but also during arterial occlusion and bicycle exercise. These results suggest that O2 extraction is greater at the distal than the proximal site and nonuniform O2 balance distribution in a single muscle is greater in heavy work rates.

REFERENCES

CHANGES IN THE CROSS SECTIONAL AREA OF THE FEMORAL VEIN AND HEART RATE DURING STANDING, SITTING, LONG-SITTING, SUPINE AND PRONE POSITIONS AT REST
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INTRODUCTION It is thought that gravitational force affects the amount of venous return. It has been postulated that posture may affect amount of gravitational force exerted on the body. Therefore, the purpose of this study was to determine the effects of the standing, sitting, long-sitting, supine and prone position on the cross sectional area of the femoral vein and heart rate whilst at rest. METHODS: Six healthy males volunteered for this study. Their mean age, height, body mass and % body fat were 23.2±1.3 years, 173.7±5.4 cm, 69±17.0 kg and 16±2.6%, respectively. All subjects were instructed about the protocol and they gave their informed consent before the experiments. The cross sectional area of the femoral vein and heart rate were measured. The cross sectional area of the femoral vein was measured in the right-side inguinal section by using B-mode ultrasonography. Heart rate was continuously measured by electrocardiography. The experiments were conducted under five positions: the standing, sitting, long-sitting, supine and prone positions. Subjects performed the five positions in each experiment at random and rested in each position before the experiments. RESULTS: The cross sectional area of the femoral vein was 1.73±0.16cm² in the standing position, 1.73±0.18cm² in the sitting position, 1.64±0.37cm² in the long-sitting position, 0.41±0.17cm² in the supine position and 1.78±0.51cm² in the prone position. The cross sectional area of the femoral vein in the standing, sitting, long-sitting and prone positions were significantly higher in the supine position (P<0.05). Results of the standing, sitting, long-sitting and prone positions suggested that storage of blood could have occurred in the
EFFECT OF THE DURATION OF INTERMITTENT HYPOXIA ON VENTILATORY CHEMOSENSITIVITY IN HUMANS

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Intermittent exposure to hypoxia associated with rapid ascents and descents from high altitudes have been utilized as methods of pre-acclimatization before climbing to high altitude (Richalet et al. 1992, Savourey et al. 1994). Previous studies showed an increase in ventilatory response to hypoxia after intermittent hypoxia in humans (Garcia et al. 2000, Katayama et al. 2001, 2005, 2007). However, there are no published studies that have maintained the levels of altitude or the inspiratory fraction of O2 (FI O2) and the period of the exposure constant while only varying the daily exposure duration. The purpose of the present study, therefore, was to clarify the influence of duration of intermittent hypoxia per day on ventilatory chemosensitivity in humans. For this purpose, we determined ventilatory responses to hypoxia and hypercapnia before and after 1 and 3 hours of exposure each day for 7 days of intermittent hypoxia. We hypothesized that the magnitude of the increase in ventilatory chemosensitivity would be larger as the duration of intermittent hypoxia is prolonged. Nineteen subjects were assigned to one of three groups, i.e., the first hypoxic group (H-1 group, n=6), the second hypoxic group (H-2 group, n=6), or a control group (n=7). The hypoxic tent system was utilized for intermittent hypoxia, and the oxygen levels in the tent were maintained at 21.3±0.2% (simulated altitude of 4,300m). The H-1 group spent 1 hour per day and H-2 group spent 3 hours per day in the hypoxic tent for 7 days. Resting hypoxic ventilatory response (HVR) and hypercapnic ventilatory response (HCR) were determined in each subject before, after 7 days of intermittent hypoxia, and again after the cessation of hypoxic exposure for 7 days. HVR was increased significantly (P<0.05) after 1 and 3 hours per day of intermittent hypoxia for 7 days, but the magnitude of the increased HVR after 3 hours per day did not differ from that after 1 hour per day of intermittent hypoxia. After 7 days of the cessation of intermittent hypoxia, HVR in the H-1 and H-2 groups were still higher (P<0.05) than those before intermittent hypoxia. There were no significant changes in HCR in either group throughout the experimental period. The results suggest that the duration of hypoxic exposure each day from 1 hour to 3 hours could not affect the magnitude of the increase in hypoxic ventilatory chemosensitivity.

References.

THE EFFECT OF CARBOHYDRATE INGESTION ON THE INTERLEUKIN-6 RESPONSE TO A 90-MINUTE RUN TIME-TRIAL

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Cytokines released during exercise have been implicated in suppressing the immune system [1,2] and mediating fatigue [3]. Carbohydrate (CHO) ingestion during constant load exercise is associated with an attenuated interleukin-6 (IL-6) response immediately post-exercise [1,2], although, during intermittent high intensity exercise [4] and self-paced running [5,6] the effect of CHO ingestion on immediate post-exercise IL-6 is equivocal. However, the self-paced studies comprise field studies and such factors known to affect IL-6 release are not accounted. Therefore the aim of this study was to evaluate the effect of CHO ingestion during a laboratory-controlled self-paced time-trial on post exercise IL-6 concentration. Seven recreationally trained runners completed two 90-minute time trials ingesting either CHO or a placebo, in a randomized order. The study was of a double-blinded, placebo-controlled, cross-over study design. Immediate post-exercise IL-6 levels were significantly lower in the CHO trial compared with the placebo trial (5.3±1.9 pg/ml vs. 6.6±3.0 pg/ml, respectively, p=0.029). Furthermore, distance covered in 90 minutes was significantly greater with CHO compared to placebo ingestion (19.1(1.7) km vs. 18.3(1.9) km, respectively, p=0.002). Blood glucose was maintained during both conditions. The results from this study support the model in which IL-6 release during exercise is attenuated by CHO ingestion. Furthermore, the full extent of the mediating effect of CHO is probably masked by the increased intensity at which the CHO trial was performed. However, improvement in time trial performance is unlikely to be explained by the physiologically insignificant difference in post-exercise IL-6 between trials. The confounding effect of intensity in self-paced exercise trials examining IL-6 illustrates the need to use a different model to assess the role of IL-6 in mediating fatigue. In conclusion, CHO intake attenuates the immediate post-exercise IL-6 response in a 90-minute running time-trial.

References.
items from Italian version of PSDQ need to be revised in order to improve their measurement precision.

Additional questions were raised which require further investigations. It would be relevant to relate Italian PSDQ scales to alternative external measures. These results emphasize the importance to design effective interventions to improve overweight disorders.

CONCLUSIONS: Additional items were raised which require further investigations. It would be relevant to relate Italian PSDQ scales to alternative external measures. These results emphasize the importance to design effective interventions to improve overweight disorders.

METHODS: A questionnaire about physical self-description (PSDQ) and a test battery to assess physical performance (EUROFIT) were administered to 103 Italian high school students (age 12-15) coming from a wide range of family backgrounds.

RESULTS: A comparison between our results of the PSDQ and those of a previous Italian research showed lower scores for each scale with the exception of Health, Physical and Esteem representing higher scores in our participants. In the present work there were not so many differences between boys and girls about physical self perception. In the PSDQ and EUROFIT tests boys scored significantly higher with the exception of Health, Physical and Esteem presenting higher scores in our participants. In the present work there were not so many differences between boys and girls about physical self perception. In the PSDQ and EUROFIT tests boys scored significantly higher than girls in the PSDQ Strength (W=815, p=0.00) and Endurance (W=815.5, p=0.00) scales, in Standing broad jump test (W=898.5, p=0.00), in Endurance shuttle run test (W=939, p=0.00), while girls scored significantly higher then boys in Sit and reach test (W=2167, p=0.00). Results also supported the construct validity of PSDQ responses in relation to some external validity criteria. The largest correlations between internal and correspondent external criteria were found between endurance perception and endurance performance (p=0.05), and between body fat perception and BMI (p<0.05). Overweight adolescents perceived themselves as really they were. They also showed a low level of self esteem, a poor physical attractiveness perception and a negative conception of their physical performance. These results emphasize the importance to design effective interventions to improve overweight disorders.

THE UTILISATION OF REFLECTIVE PRACTICE BY SOCCER COACHES IN THE UK

Cropley, B., Hanton, S., Mellalieu, S., Jenkins, R.

Movements in UK coach education programmes to a focus on what a coach should be able to do rather than on what they should know has increased support for the notion that experience plays a central role in influencing practice (Cushion, Armour, & Jones, 2003, Miles, 2001). However, while the practicum experience lies at the heart of coach education, National Governing Bodies (NGB's) have, to date, done little to introduce structures that support learning from experience. Nevertheless, one particular framework that has consistently
been demonstrated as beneficial for both personal and professional development is that of reflective practice. Therefore, in an attempt to enhance understanding of the current reflective practices of coaches and inform future developments in coach education, this investigation examined the how? what? why?, where?, and when? of reflective practice within soccer coaches. Six highly qualified (UEFA A Licence), experienced (number of years coaching M = 11, SD = 2) soccer coaches completed a two-stage interview. Part one examined participant knowledge and general use of reflective practices, while part two explored a chosen critical incident experienced by the participant in order to understand the processes involved in generating learning from practice. Inductive and deductive content analysis procedures were adopted and the results were displayed in the form of causal networks. Findings highlighted a greater use of unstructured, reflection-on-practice away from competitive and practice environments. Participants also emphasised the importance of personally-defined critical incidents for the instigation of and focus for reflection, rather than reflecting on experiences as a whole. In addition, the use of either structured or unstructured reflection enabled participants to manage their own development and learning by gaining greater awareness of their coaching practice and coaching behaviours. Consequently, informed decisions could be made about how to approach issues concerning the effectiveness of their coaching. These findings highlight the value of reflective practice as a tool for improving future coaching performance and its defining role within the coaching process. NGB’s need to recognise the necessary role of reflection in excavating learning from experience and become familiar with the basic elements of a reflective practice. This will allow practitioners to begin to act on the notion that knowledge is embedded in the experience of their work, and to realise the importance of this knowledge in furthering their practice.

References.

THE ACUTE EFFECT OF SELF-PACED FATIGUING EXERCISE ON PERCEPTION OF MENTAL FATIGUE AND MENTAL TASK PERFORMANCE

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There is considerable evidence supporting the positive impact of exercise on mood states, affect and psychological well-being. Less robust is the notion that exercise positively influences cognition (Tomporowski and Ellis, 1986, Etnier et al., 1997). A recent review however concluded that submaximal aerobic exercise (< 60 mins) facilitates specific aspects of information processing, but relatively little systematic laboratory-based research has been conducted (Tomporowski, 2003). In addition, self-paced exercise has received very little attention. The purpose of this study was to investigate the effect of a bout of self-paced exercise on mental fatigue and performance on a rapid visual information processing (RVIP).

Nine physically active participants volunteered (mean (SD) age = 27 (5) years, stature = 178.8 (6.0) cm, mass = 78.3 (9.7) kg). All participants completed two trials on consecutive days. On day 1 participants completed multiple 5 minute sets of a RVIP task for 30 minutes or to volitional mental exhaustion (Mental fatigue trial [MF]). The RVIP task provides performance scores for reaction time and correct, incorrect and missed responses. After each 5 minute block participants were asked to rate their mental fatigue using visual analogue scales (‘How mentally fatigued are you?’), their associative score (‘How much of your focus is on sensations of mental fatigue?’) and their affect score (‘How much are you enjoying the task?’). On day 2 the participants completed the same mental fatigue trial after a time-matched self-paced bicycle time trial with instructions to ‘cover as much distance as possible’ (Exercise and mental fatigue trial [E+MF]).

Two participants failed to complete the mental fatigue task during the E+MF trial due to excessive symptoms of fatigue. Mental task performance decreased, and mental fatigue increased, from set 1 to 6 in both trials (P < 0.05). No main effects were detected between trials for any of the performance or fatigue measures. (P > 0.05). Post-hoc analysis however did reveal exercise had a positive effect on mental task performance and mental fatigue, with the effects limited mainly to the first 3 sets of RVIP testing for all outcome measures (P < 0.05).

Self-paced exercise had an acute positive effect on mental fatigue and mental task performance. This positive effect dissipated with time. The RVIP has elements relating to response speed, response inhibition, attention and short-term working memory. The finding that exercise positively influenced these components is consistent with previous literature that have employed similar tasks.


REFLECTIVE PRACTICE: THE INFLUENCE ON COMPETITIVE EXPERIENCE AND INTERPRETATION OF ANXIETY RELATED SYMPTOMS

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Recent research has demonstrated that competitive experience influences the way in which athletes interpret symptoms associated with anxiety (e.g., Hanton et al., 2007, Mellalieu, Hanton, & O’Brien, 2004). Further, Hanton et al. (2007) found that athletes engage in forms of reflective practice in order to generate knowledge from their competitive experiences. Specifically, athletes improved their understanding of symptoms associated with anxiety, allowing them to learn how to interpret these symptoms as facilitative to performance. The purpose of this study therefore was to provide an in-depth examination of these reflective processes that athletes undertake in order to better cope with their anxiety related symptoms. Six experienced, elite athletes were interviewed regarding their reflective practices adopted following both positive and negative critical sporting incidents with a view to generating knowledge concerning their interpretation of competitive anxiety symptoms. Composite sequence analysis procedures were employed to allow data to be considered as meaningful sequences for both the positive and negative incidents. Findings showed distinctions between the effects of positive and negative incidents on the reflective and learning processes and how this influenced further appraisal of competitive anxiety symptoms. Positive incidents resulted in greater occurrence of reflection with significant others leading to improved understanding of the situation and how to recreate positive aspects of performance in future experiences. Conversely, negative incidents generated more deliberate, critical processes of reflection, resulting in the active process of learning how to restructure negative symptoms so that they could be interpreted...
more positively. The findings suggest sport psychologists and coaches need to be aware of the importance of reflective practice as a method to help athletes generate the knowledge required to better cope with anxiety related symptoms. They also provide support for reflective practice as a framework for experiential learning within sport and highlight the need for the skills required for effective reflection-on-action to be nurtured and developed within athletes.

References:

**PERSONALITY AND EMOTIONAL RESPONSES TO SPORTS INJURY IN U-14 SOCCER PLAYERS**

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It is important to consider and understand not only physical fitness, appropriate training and competition conditions, but also each player's individual character and emotional responses, when nurturing adolescent soccer players and to take necessary preventive measures against sports injury that can occur. We investigated both personality and emotional responses using the Yatabe-Guilford(YG) personality questionnaire and POMS in U-14 (30 male) soccer players during short elite-programme camp. The purpose of the present study is to identify (1)physical changes, (2)personality traits, (3)psychological changes, (4)personality traits that influence situations with respect to the emotional states and injuries.

Most players, were evaluated as Directoral type by YG personality questionnaire. It was said that the personality profile was not Sports-Injury(acute injury/chronic injury) group specific. However, differences were revealed in the factors of personality traits between injured group and uninjured group. The 'Anger' scale of POMS showed a high score in acute-injured group before they were injured. The difference in personality traits was considered a risk of injury as follows:
1) Each factor of personality traits was directly related to an emotional response(mood states), and influenced the incidence of sports injury.
2) During the short-period camp under similar conditions, it was suggested that sports players, who were not able to change mood states in a positive-direction early without psychological care and preparation for such condition, were considered to be at high risk of injury occurrence.
In a training programme under special environment, the influence of psychological factors should be considered important to reduce the risk of sports injuries.

**INDIVIDUAL X TEAM: COMPARATIVE ANALYSIS OF THE SPORT COMPETITIVE ORIENTATION BEHAVIOR AMONG MEN ATHLETES FROM JUDO AND FOOTBALL**

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INTRODUCTION: The sports are social phenomena of great importance in Modern Society, a game of fighting between micro-society in which the actions are established in function of a specific objective to be achieved. The practice competitive sports can still be classified as highly individual or team, a fact that influences, particularly the way in which the individual builds his competitive behaviour. Knowing this behavior can help the athletes and coaches to seek improvement and sportive conquer. OBJECTIVE: The objective of this study was to identify male athletes of Judo and Football Field the competitive trends analyzing them comparatively between the terms and correlate them according to age and time of practice of the athletes. METHODS: the instrument The Sport Orientation Questionnaire - SOQ (Gill & Deeter, 1988) was adopted and validate by Simões (2000) it was used to identify the Sport Orientation (SO) in athletes of Judo JU (n = 18), members of the Junior Men’s Selection of the State of Sao Paulo and Football FO (n = 27), Junior Men’s Team belonging to a traditional club football in Brazil. For a comparative analysis between groups in the qualitative variable (SO) the Chi-square was used. In the analyses of the quantitative variable, age (AGI) and time of practice (TP) the test t applied. For the correlation between qualitative and quantitative variables it was used the procedure of correlation of Spearman. The level of significance adopted for all the analyses was p<0,05. CONCLUSION: The results descriptive of the variables (SOI and AGI) of the analyzed athletes were: SO JU = 40,22±9,86 and SO FO = 36,22±5,99; AG JU = 17,50±1,33 and AG FO = 18,55±1,05; these results showed significantly statistic different. The Football athletes have a better level of competitiveness and greater age than the Judo, while both groups have similar in time of experience sports. The high rate of default deviation observed and the largest scale of the minimum and maximum values of SO found for the athletes of Judo (min 25 - max 56) compared to football (min 28 - max 49), show a lower homogeneity of the group, a fact that may indicate a greater orientation for victory of Football athletes than Judo athletes and therefore they are better able to seek achieve personal goals. The highest average age found in football athletes serves as guidance to greater maturity as competitive the establishment of goals. Despite the climate pre-established by the groups where we find young athletes of Judo and Football field, the reality of professional Brazilian experience in football seems to influence a higher potential of the competitiveness of these athletes.

References:

**ANALYSIS OF THE SPORT COMPETITIVE ORIENTATION BEHAVIOR AMONG FEMALE ATHLETES OF JUDO, RHYTHMIC GYMNASTIC AND SOCCER INDOOR ACCORDING TO THE AGE AND TIME OF PRACTICE**

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INTRODUCTION: Representing shares, sport competitive orientation behavior indicate a path in which the athlete in the World of Sports search achieve their goals. The manner in which each individual track this path is still uncertain, however, whether supposes that this
These symptoms were then interpreted as facilitative towards upcoming performance through the initiation of strategies that included rationalising the situation and subsequent thoughts, positive self-talk, reflecting on previous successful performances, and focusing on increase effort to accomplish these tasks. The current findings have implications for sport psychologists and coaches, along with athletes who interpret their anxiety symptoms as detrimental to their performance.

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HARDINESS AND COMPETITIVE ANXIETY SYMPTOM INTERPRETATION: A QUALITATIVE EXAMINATION
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The resilient nature of the hardy individual has not only been attributed to the components of commitment, control, and challenge, but also to the effective coping style associated with the dynamic combination of these attitudes (Kobasa et al., 1982). Indeed, it is through the use of such strategies as positive appraisals, active coping, planning, and increased effort that individuals high in hardness excel in the face of adversity (Maddi & Khoshaba, 2005). This notion has been supported within the sporting literature by Hanton et al. (2003) who found that elite high hardy individuals interpreted their anxiety symptoms as more beneficial (i.e., facilitative) to upcoming performance compared to those elite, low in hardness and nonelite, high and low in hardness. The purpose of this study was to examine how and why elite high hardy athletes interpret their anxiety symptoms as facilitative in the face of adversity. Qualitative interviews were conducted with five elite high hardy athletes in an attempt to identify the underlying mechanisms of their facilitative interpretations. Findings suggested that elite performers initially appraised a stressful situation as threatening and, consequently, experienced anxiety symptoms. These symptoms were then interpreted as facilitative towards upcoming performance through the initiation of strategies that included rationalising the situation and subsequent thoughts, positive self-talk, reflecting on previous successful performances, and focusing on increase effort to accomplish these tasks. The current findings have implications for sport psychologists and coaches, along with athletes who interpret their anxiety symptoms as detrimental to their performance.

References:

PHYSICAL SELF-PERCEPTION AND MOTOR ABILITIES IN MALE ADOLESCENTS: EFFECTS OF BMI AND PHYSICAL ACTIVITY PRACTICE
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Introduction
Physical self-perception is associated with certain health behaviours such as exercise, which plays an important role in the prevention and treatment of obesity. Data suggest that obese adolescents (Bar-Or & Baranowski, 1994) and youth with low perceived sport competence (Marsh, 1996) are less physically active than their respective counterparts. Consequently, obese adolescents showed lack confidence in their physical ability (Bar-Or, 1993) and poorer performances on weight-bearing tasks (Delorme et al, 2003) compared to their non-obese peers. The purpose of the study was to examine the differences by BMI and physical activity practice in physical self-perception and motor abilities of high school male students.

Methods
An Italian reduced version of the Physical Self-Description Questionnaire (Meleddu et al, 2002) was used to measure perceived Coordinations (CO), Body Fat (BF) and Sports Competence (SP) in 80 boys (15.6±0.9 yrs), who were (n=38) or were not (n=42) involved in organized extra school physical activity. The Perceived Physical Ability Scale (Bortoli & Robazza, 1997) and fitness tests of standing long jump (SLJ), 2 Kg medicine-ball throw, 30m sprint and 10x5m shuttle run were also administered to the students. Participants were categorized into non-obese (n=48) or overweight and obese (n=32) groups according to age- and sex-specific BMI cut-off points (Cole et al, 2000).

Results
ANOVA 2 (group) x 2 (practice) showed differences (p<0.01) between groups, with overweight and obese boys reporting higher scores in the BF scale (18.2±7.9 vs. 8.2±4.0) and poorer performances on weight-bearing tasks (SLJ: 1.7±0.3 vs. 1.9±0.3 m; 30m: 5.1±0.5 vs. 4.7±0.4 sec; 10x5m: 21.8±1.7 vs. 20.3±1.3 sec) than their leaner peers. Differences (p<0.01) also emerged for practice, with students involved in organized physical activity showing lower scores in the BF scale (10.3±5.6 vs. 13.9±8.8) and higher scores in the CO (27.4±6.9 vs. 24.8±6.1), SP (28.5±5.4 vs. 23.3±7.8) and Perceived Physical Ability (19.5±3.0 vs. 17.7±3.6) scales compared to their counterparts.
Conclusions

Results provide evidence on the important role physical activity can play to the improvement of self-perception in adolescence. Enhancing the individual's ability levels can result in improved physical self-efficacy and motivation to participate in exercises programs (Bar-Or, 1993). In particular, to raise their self-perception of obese adolescents not only a reduction of body weight, but also with an improvement of motor abilities is recommended.

References


PHYSICAL SELF-EFFICACY, BODY DISCREPANCY AND MOTOR ABILITIES IN YOUNG GIRLS: EFFECTS OF BMI AND DIFFERENT SPORT PRACTICES

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Introduction

Participation in sport has positive impacts on self-perceptions such as physical self-efficacy and body image (Sabo et al., 2004). Self-efficacy perceptions vary across different activities and different levels of the same activity, and are related to some aspect of body image. Chan et al. (1989) found that subjects characterizing themselves as fat reported lower perceived physical ability than did subjects characterizing themselves as slim. However, the link between self-efficacy beliefs and body image related to body mass and sport involvement has not been investigated in girls. Thus, this study aimed at examining the effects of BMI and different sport practices on the self-efficacy, body satisfaction and motor abilities in young girls.

Methods

Participants were 135 girls (9.2±0.8 yrs) involved in non-agonistic sport activities (rhythmic gymnastics, volleyball, and basketball) 3 times week-1, were equally divided (n=45) into non-overweight (NOW), overweight (OW) and obese (OB) groups according to BMI cut-off points (Cole et al., 2000). Perception of personal strength, speed, and coordinative abilities was assessed by the Perceived Physical Ability Scale for Children (Colella et al., while difference between perceived and ideal body image (body discrepancy, BD) was measured through Collins’ Child Figure Drawings (1991). Fitness tests of standing long jump (SLJ), basketball throw, 10m and 20m sprint were also administered. A 3 (group) x 3 (sport) ANOVA (p<.05) and post-hoc Scheffé test were applied.

Results

Differences (p<.001) between groups emerged, with NOW presenting a smaller BD and OW showing poorer SLJ performances than their counterparts. Differences (p<.01) between sports were found, with girls practicing basketball reporting higher perceived physical ability and better results in 10m sprint than girls practicing rhythmic gymnastics. Participants involved in volleyball showed lower (p<.01) SLJ and 20m sprint performances than the other groups. Significant correlations (p<.001) was shown between BMI and BD (r=-.38), and between BD and self-efficacy (r=-.40).

Conclusions

Findings confirm that obese girls were more dissatisfied with their body image than normal-weight peers (Vander Wal & Thelen, 2000). Moreover, an increase in BMI is related with a desire to have a thinner body size (Tiggemann & Pennington, 1990). Further research is needed to examine the causal link between feelings of satisfaction/dissatisfaction with own body and perceived physical ability, as well as children’s sources of self-efficacy in the sport domain in relation to age.

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WHEN EAST MEET WEST: MODEL INVARIANCE OF 2 X 2 ACHIEVEMENT GOALS IN TWO COUNTRIES

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The importance of how individuals judged their competence in an achievement setting has been long-term interests when discuss about achievement-related processes and outcome (Roberts, 2001). Different achievement goal theories (Deweck, 1989; Elliot, 1999; Nicholls, 1984) have been conducted in educational and sport setting in order to investigate motivation. The aim of the present study is going to test the model invariance of newly created 2 x 2 achievement goals on athletes from two different countries: A large sample of athletes from a far east Asia country is going to be included in this study and is going to compare with a western country sample via SEM to examine the factorial invariance of 2 x 2 achievement goals proposed by Elliot (1999). Several instruments are going to employ to measure concepts such as perceived competence, fear of failure as well as motivation regulations. The factorial invariance of four goals as well as the structural invariance of antecedent-goals-consequences model is going to be analyzed. The results should give implications beyond gender invariance based on Nien and Duda (2008) and suggestions will be made according to possible cultural differences.

References


ACHIEVEMENT GOALS, SELF-DETERMINATION AND BELIEFS ABOUT THE NATURE AND DETERMINANTS OF SPORT COMPETENCE - A COMPARISON BETWEEN YOUNG FOOTBALL PLAYERS COMPETING AT DIFFERENT LEVELS

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Competitive environments are likely to promote a focus on winning, promote ego involvement and subsequently a decrease in intrinsic motivation through its adverse effect on self-determination (Vallerand et al., 1987). There has been little research that investigated the differences in motivation as function of competitive level (Mallet & Hanrahan, 2004) and the research to date has yielded equivocal findings. Hence, the purpose of this study was to compare the achievement goal, self-determination and beliefs about the nature and determinants of sport competence in function of competitive level in young football players.

The participants were 140 male football players that competed in National League (n=78) and in Regional Leagues (n=62). Ages ranged from 15 to 16 years (M=15.73, SD=.62). Participants completed the following tools: Task and Ego Orientation in Sports Questionnaire (TEOSQ), Self-Regulation Questionnaire (SRQ), and Questionnaire relative to Beliefs about the Nature and Determinants of Sports Competency (QCNHS). Student’s t test for independent samples was used to analyse the differences between the two groups (National vs. Regional League). Statistical significance was set at P = .05.

Football players competing in the National League had significantly higher scores for ego orientation (2.85±.97 and 2.47±.87; respectively, p=.02), introjected regulation (3.28±.96 and 2.96±.86, p=.04), identified regulation (4.44±.51 and 4.12±.65, p=.00), intrinsic regulation (4.18±.63 and 3.90±.70, p=.02), beliefs that the sport competence result to learning (4.50±.46 and 4.26±.64, p=.01), is subject to improvement (4.3±.48 and 4.10±.64, p=.02) and if’s a gift (3.28±.79 and 2.96±.87, p=.03), than did players who competed in Regional Leagues.

As suggested by the literature (White & Duda, 1994), athletes who were involved in the highest competitive level were significantly more ego-oriented than the football players involved in a less competitive atmosphere. In contrast, as previously found by Mallet & Hanrahan, (2004) our study does not fully support the prediction of social-cognitive theories of motivation in that the structure of competitive sport environments will promote a decrease in intrinsic motivation and self-determined forms of extrinsic motivation. National league football players were characterized by higher levels of intrinsic motivation and self-determined forms of extrinsic motivation. These athletes also believe, more than regional league athletes do, that their sport competence is due to learning and is subject to improvement. The results suggest that high-level football players were more intrinsically motivated, were more likely to choose to commit to the demands of competitive sport and had a higher perception of control on the development of their competence.

References.


ACHIEVEMENT GOALS, SELF-DETERMINATION AND BELIEFS ABOUT THE NATURE AND DETERMINANTS OF SPORT COMPETENCE - AN AGE-GROUP COMPARISON BETWEEN MALE FOOTBALL PLAYERS

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Motivation is a particularly important outcome that coaches require because it can affect the quality of athletes’ experience in sport as well as the likelihood of maintaining sports practice in the future (Conroy et al., 2006). The purpose of this study was to compare the achievement goals, self-determination and beliefs about the nature and determinants of sport competence in function of age in age-group football players.

The participants were 339 senior players (S) (19 years), 98 juniors A (JA) (17-18 years), and 140 juniors B (JB) (15-16 years). Participants completed the following tools: Task and Ego Orientation in Sports Questionnaire (TEOSQ), Self-Regulation Questionnaire (SRQ), Questionnaire related to Beliefs about the Nature and Determinants of Sports Competency (QCNHS). Analysis of variance (ANOVA, One-Way) was used to analyse for differences between the three groups. Statistical significance was set at P ≤.05. The analysis of data suggests that the three groups were preferentially task oriented although no significant differences were found between them. The seniors, when compared with the juniors B, tended to report significantly higher levels of introjected regulation (S, 3.44±.83, JB, 3.14±.93, p=.00) for the beliefs that the sports competence is specific to football (S, 3.90±.70, JB, 3.69±.62, p=.01) and is a gift (S, 3.36±.85, JB, 3.14±.84, p=.04), and report significantly lower levels for the belief that the competence to play football is stable (S, 2.51±.69, JB, 2.69±.69, p=.03). The senior players also showed significantly higher levels than the juniors A relatively to the belief that sport competence is a gift (S, 3.36±.85, JA, 3.14±.84, p=.01). As for the belief that sport competence is general more significant differences were found between the three groups (S, 2.09±.83, JA, 2.36±.87, JB, 2.78±.86, p=.00).

In accordance with other studies with sport Portuguese footballers (Fonseca & Maia, 2000), our results suggest that during growth football players do not modify their motivational orientations or, the more or less self-determinate form as they were being involved in the activity. The only exception is with senior football players who reported higher levels of introjected regulation when compared with juniors B. All groups strongly believe that their sport competence is specific, due to learning and is subject to improvement. This is a positive and desirable tendency, because these players showed a higher perception of control during the development of their competence (Sarrazin et al., 1995). However, the observed differences suggest that these football players modified their beliefs as they got older.

References.

BODY MASS INDEX AND INTRINSIC MOTIVATION IN FITNESS EXERCISERS

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Drop-out from exercise programmes could be a function of the motivation underlying exercise behaviour. Accordingly with the Self Determination Theory (Deci & Ryan, 1985), some individuals exercise due to the enjoyment they get during the workout, but others may exercise to attain extrinsic or intrinsic rewards, such as to look more attractive, lose weight, or obtain recognition (Markland & Ingledew, 1997).

The purpose of the present study was to examine the relation between Body Mass Index (BMI) and different motivational regulations. It was hypothesized that less determinate types of exercise motivation (i.e. external and introjected regulation) would be superior in exercisers with high BMI.

117 fitness exercisers, 31 male and 86 female, aged 15-66 years (mean = 32.9 ± 3.9), from three fitness health clubs in the littoral centre of Portugal, took part of the study. It was considered the participants IMC (mean = 23.2 ± 2.9) and also the exercise motivation through the Portuguese version of the Behavioural Regulation in Exercise Questionnaire 2 (Palmeira, Teixeira, Silva & Markland).

Person correlation shows a negative correlation between the relative autonomy index and the IMC, which mean that the exercisers with a higher IMC were more external regulated.

It was conclude that in order to reduce the drop-out from exercises, especially in those with a high BMI, interventions should also considered the way exercisers think, feel and behave. A multidisciplinary approach was recommended with the inclusion of strategies to promote intrinsic motivation and eradicate pressure.

COLLECTIVE DECISION MAKING : NEW CHALLENGES TO MATCH ANALYSIS

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Analyses of team sport performance are supported by a range of statistical data of discrete actions that typically inform what happens, and not how and why it happens. One way to examine these questions is to observe the behavioural dynamics in sports teams to understand how players’ interactions in game sub-phases give rise to successful intra-team coordination patterns. To achieve our aim we followed insights of Couzin and colleagues on coordination in biological systems when they argued that researchers should account the ability of grouping individuals to modify their motion on the basis of those local interactions (Couzin et al, 2005, pp. 513). In every match situation rugby players attempt to maintain relative positioning with and interpersonal distance between teammates to successfully receive the ball or support the ball carrier. We sought to understand whether, similar to collective behaviour observed in biological systems (e.g. schools of fish, colonies of ants and locusts), such decision making in team games demanded sharing and propagation of information available in the performance context. In this research we attempted to identify the existence of pattern forming dynamics in rugby union where the ball carrier has preferred information that propagates through a behavioural interaction with support players.

In our analysis of (4×2+2) sub-phases of rugby near the try line, videogrammetry captured players’ motion and TACTO 7.0 software digitized player positions (Passos et al., 2006). Collective actions in team sports can be described by a single point defined as the geometric centroid of the area composed by a group of players. Centroids were calculated based on the values for interpersonal distance between players within a micro unit and their changes over time. Vector linked centroids were used to define a collective variable that described attacker-defender group interactions.

Our findings showed that when a defender disturbed the stability of a micro-unit formed with an attacker in a game, this sub-system self-organized to maintain its goal directed behaviour. Results suggested that different curve shapes of the collective variable described when the attacker’s collective decisions broke the defensive balance in a micro unit instigating a phase transition in the system’s pattern dynamics. Data confirmed that the centroid trajectory that emerged due to systemic couplings between players allowed collective decisions and actions to be described as a whole rather than as stand-alone entities in analyzing the tendency of a micro unit to self-organize when perturbed.

References.

RELATIONSHIPS BETWEEN MOOD AND COHESION IN FITNESS

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The main goal of this study was to investigate Perceptions of group cohesion and mood in a fitness group. Participants were all female (n=43), from a community program Community Physical Activity, developed in a small municipality (Alenquer) and completed the Group Environment Questionnaire (GQG) and the Profile of Mood States (POMS).

Main conclusions of this study were, -individuals higher perception of cohesion in the ages between 35 and 63 years old showed High individual attraction towards the group relating to the social aspects (AIG-S) and integration in the group relating to the task (IG-T). The dimensions -individual attraction towards the group relating to the task and Integration in the group relating to the social aspects, show no significant differences between the two age stadims. Participants with less than 50% of assiduity to the classes show a higher perception of cohesion and integration in the group relating to the task and relating to the social aspects.

In General, participants exhibit an iceberg profile with the Vigour dimension relatively higher than all the others. Participants with over 75% assiduity to classes reveal, higher values, in the dimensions Depression and Hostility. This probably means that those participants who tend to be more depressed attend more often to classes in pursuit of a good time. Results are discussed in relation to the R. F. Bau- mester and M. R. Leary (1995) proposition that the need to belong is a fundamental human motive.

Concerning to mood states in all its dimensions (Tension, Depression, Hostility, Vigour, Fatigue and Confusion) relating to age, we found no significant statistical differences.

In this study we found no statistical significant relation between group cohesion and mood states.
EXPLORING HIGHER ORDER CATASTROPHE MODELS IN ELITE JUDO ATHLETES

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This study re-examines Hardy, Woodman, and Carrington's (2004) findings that self-confidence may act as a bias factor in Hardy's (1990, 1996) higher order catastrophe model. Hardy's (1990) catastrophe model proposes that under conditions of high physiological arousal increasing levels of cognitive anxiety should have a detrimental effect upon levels of performance. It is proposed that self-confidence can moderate this effect. In other words, high levels of self-confidence can allow performers to tolerate higher levels of physiological arousal when they have high levels of cognitive anxiety before suffering a decrement in performance (Hardy et al., 2004). However, athletes with low levels of self-confidence should suffer performance decrements at a much lower level of physiological arousal when cognitive anxiety is high. Hardy et al. (2004) found support for their hypothesis in that the maximum interaction effect size between cognitive anxiety and somatic anxiety was at a higher level of somatic anxiety for the high self-confidence condition than for the low self-confidence condition. However, the sample that Hardy et al. analysed (i.e., golfers) requires low levels of physiological arousal to perform well (i.e., a physically relaxed state). Hence, the generality of the findings and their application to sport is limited. The present study further extends these findings in a sport where high levels of physiological arousal are required (i.e., Judo). Presently 13 senior judo athletes (10 male; 3 female) report their cognitive and somatic anxiety and self-confidence immediately before an international judo bout. Performance is assessed via coach assessment, athlete assessment and subjective judging points.

It is expected that maximum interactive effect sizes between cognitive anxiety and somatic anxiety will be at a higher level of somatic anxiety for the high self-confidence condition than for the low self-confidence condition. However, due to the nature of the sport, the exact nature of the interaction may be somewhat different to that predicted by the catastrophe model in that, under conditions of high cognitive anxiety, increasing physiological arousal may not be detrimental to performance.

References


MOTIVATIONAL ORIENTATIONS AND INTENSITY OF NEGATIVITY AND SELF-CONFIDENCE IN ELITE PORTUGUESE ATHLETES OF INDIVIDUAL SPORTS

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The aim of this study was to compare elite athletes of different individual sports at the level of ego and task motivational orientations, pre-competitive intensity of negativity and self-confidence.

The sample consisted of 323 athletes (207 male and 116 female, age 20.5±4.0 yrs) from six individual sports (track and field n= 115, swimming n=60, gymnastics n=29, judo n=49, wrestling n= 34, badminton n=36). The athletic experience was 10.1 ±5.0 years. The sample was organized into four groups namely: National (n=221), European (n=49), World (n=38) and Olympic (n=15). The instruments used were Task and Ego Orientation in Sport Questionnaire (TEQOSQ) and an adaptation of Competitive State Anxiety Inventory-2 (CSAI-2). The independent variable was individual sports and dependents were ego and task motivational orientations and intensity of negativity and self-confidence. The nonparametric tests Kruskal-Wallis (H) and Mann-Whitney (U) were used to compare groups.

Main results demonstrated differences among six sports in task motivational orientation (H= 20.99, p=0.00). Higher values were obtained by gymnasts than track and field athletes, swimmers and judo players. The differences among the groups might be explained by the sport characteristics, since swimming and athletics are objective scored sports (measured by time), while the excellence in gymnastics depends on perfection of the movement, as perceived by judges, thus a result of a subjective interpretation. The concentration of gymnast tends to be focused on the task at hand, because their’s is an isolated performance. Both explain why gymnastics obtained higher task oriented scores.

Results also showed differences between the six sports at the levels of negativity (H=11.30, p=0.04), and self-confidence (H=16.08, p=0.00). Among the comparison made between sports, only evidenced differences at the intensity of self-confidence: track and field vs. judo (26.4±5.1 vs. 23.1±4.8). The results are in agreement with the literature that suggests that lower scores on self-confidence should be found among athletes in contact sports, in part due to the increased threat that emerges from personal confrontation situations.

In conclusion, there are differences between the sports and the results can be explained by the characteristics of the sport itself. The results of the present study are in agreement with the literature.

AN INTERVENTION TO INCREASE SOCIAL SUPPORT AND IMPROVE PERFORMANCE

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Sarason, Sarason, and Pierce (1990) proposed that social support might affect various aspects of sports performance, and recent studies have demonstrated links with performance-related factors in tennis (e.g., Rees & Hardy, 2004) and performance outcome in golf (Rees, Hardy, & Freeman, 2007). In sport psychology, however, no study has investigated the effects of an intervention designed to increase social support and improve performance. The present study addressed this issue and investigated the effects of a professionally-led intervention designed to increase social support and improve performance using a single-subject multiple baseline design. Participants were 3 high-level male golfers. Participant A was a 27 year old professional golfer. Participant B was a 22 year old amateur golfer with a +1 handicap. Participant C was a 26 year old amateur golfer with a +2 handicap. The baseline phase consisted of participants playing 14, 12, and 10 competitive rounds, prior to the introduction of the intervention. The intervention consisted of all participants playing 10 competitive rounds with social support provided by the principal researcher over the duration of this period. The intervention was individually-tailored, and each participant was provided with emotional, esteem, informational, and tangible support (cf. Rees & Hardy, 2000). All participants reported significantly higher levels of emotional, esteem, informational, and tangible support in the intervention phase compared to the baseline phase. The performance of all participants improved during the intervention phase compared to the
baseline phase. Participant A improved by an average of 90 shots per round, Participant B by 1.33 shots per round, and Participant C by 3.10 shots per round. The effectiveness of the intervention upon performance outcome was supported by a chi-square analysis (p < .05).

Further, social validation data demonstrated that all of the participants rated their improvement in the intervention phase as important, and the provision of social support as both acceptable and useful. The results suggest that a professionally-led intervention may be a useful strategy to increase social support and improve performance. The findings indicate that sport psychologists should be aware of the potential influence of social support interventions upon performance.

References:

**STRENGTH TRAINING IMPROVES SHORT-TERM MEMORY PERFORMANCE**

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Introduction: Many is known about the effect of strength training on cognition in elderly. A period of strength training could improve cognition in elderly [1]. However, in the current society sedentism is becoming widely present. This group could also gain from physical activity, both in a physical and psychological way. We wanted to investigate if strength training in young sedentary subjects could lead to an improvement in cognition, more specifically memory performance.

Methods: Fifteen untrained subjects (age 20.1 ± 1.5 yr; BMI 23.9 ± 1.1) followed a 10-week strength training program. Strength training was performed 3 times per week and consisted of 6 different exercises at 80% of 1 repetition maximum (1RM). Before and after the training period short-term memory (digit span forward and backward) [4] and mid-term memory (memorisation-recall of images) [2;3] were tested.

Results: Muscle strength improved significantly for all six exercises (p<.01), with an improvement of 39.78% of total weight lifted after 10 weeks of training. Mid-term memory was unaffected by exercise (p<.05). However, total score on the short-term memory exercise, measured by the digit span, was improved after the training period (p< .01). The difference between pre- and post-training was situated in the backward part of the digit span. No correlations were found between the increase in strength for the different exercises and the improvement of performance on the digit span.

Conclusion: Not only in elderly, but also in young sedentary subjects strength training can promote cognitive performance. A prolonged period of strength training seems to improve short-term memory, measured by the digit span. Future studies could relate cognitive performance to metabolic changes as a result of strength training.

References:

**SPORT NUTRITION CONSULTANTS' PHYSICAL CHARACTERISTICS INFLUENCE POTENTIAL CLIENTS' PREFERENCE TO WORK WITH THEM AND PERCEPTIONS OF THEIR EFFECTIVENESS**

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There are many factors that contribute to the effectiveness of a sport nutrition consultant (SNC). Although each context presents different challenges to the SNC, the first barrier is often gaining entry. As Lubker and his colleagues point out, the world of performance sport is a fraternal system where entry is not automatically open to all (Lubker et al., 2005). Despite research in other sports science disciplines demonstrating that practitioner’s physical characteristics do influence clients’ perceptions of their effectiveness which potentially mediate the efficacy of subsequent interventions, e.g., psychology (Lubker et al., 2005), little attention has been directed towards SNC’s. Therefore, the purpose of this investigation was to identify if physical characteristics of SNC’s, specifically body mass index (BMI) and type of dress, influences potential clients’ preference to work with them and perceptions of their potential effectiveness. Furthermore, if these perceptions are effected by the potential clients’ sex or standard of competition.

Participants (age mean=18.68, SD=0.82 years) all participating in regular competitive sport, classified by sex (male, n=55, or female, n=45) and competitive standard (elite / sub-elite, n=68, or club / recreational, n=32) viewed slides representing four concurrently presented computer generated images of the same female SNC. These slides represented the SNC dressed in sports attire manipulated to represent a range of BMI’s (23, 28, 33, and 38 kg/m2) typifying four World Health Organisation classifications of obesity (normal, pre-obese, obese class I, and obese class II), and in formal attire again representing the same four BMI’s. Participants were asked to rank the SNCs in order of their preference to work with them, and secondly, to rate their perceived effectiveness of each of the SNCs on a 7 point Likert scale. Results of the sex by competitive standard by BMI by dress MANOVA demonstrated a significant BMI main effect F6,91=287.28, p<0.001 (effect size 0.95) with participants’ ranking of preference and rating of perceived effectiveness of SNC decreasing with increasing BMI. Other significant MANOVA results, although with weak effect sizes, were BMI by dress and BMI by competitive standard interactions. No sex main effects or interactions were evident. In conclusion, SNCs physical characteristics do influence potential clients’ preference to work with them and perceptions of their effectiveness. Implications of these findings include that SNCs should consider their physical appearance when meeting with sports performers. This relationship is likely to be complex, including factors such as expected social etiquette and physique associated with the client’s sport, justifying further research.

References:
EFFECTS OF PSYCHOLOGICAL TRAITS ON PERCEPTUALLY BASED VALUES

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The Ratings of Perceived Exertion scale (RPE) of Borg (1970) is frequently used to measure the perceived exertion. Garcin et al. (1999) proposed to associate it with the Estimated Time Limit scale (ETL) to have further information on the exercise psychological load. These scales are valid and reliable. However, psychological states can mediate RPE and ETL. Hall et al. (2005) suggested that the effect of psychological states on RPE change with the exercise intensity. No study tested the influence of psychological states on ETL in different intensities. The purpose was to test the influence of psychological states on RPE and ETL, in different intensities.

Subjects
Twenty-three cyclists (22.8±5 yr, 70.1±5.6kg, 178±6cm) were recruited.

Material
Perceived effort was expressed with the RPE (Borg, 1970) and ETL (Garcin et al., 1999) scales.

Procedure
Cyclists performed an incremental test on a cycle ergometer. The initial power output was set at 150W/4min then increased by 50W/4min, until 300W. Then, an increment of 25W/2min was set until exhaustion. RPE and ETL were collected during the 4 first stages.

Statistical Analysis
RPE and ETL at 25, 50, 75 and 100% maximal aerobic power (MAP) were computed. The correlations between these values and the scores for the different psychological states were examined with the Bravais-Pearson test and coefficients.

Results
Significant effect of familial self-esteem at 100% MAP for RPE was noticed (r= 43). Significant correlation was found between leadership and RPE at 25 and 50% MAP (r = - .48). RPE was significantly correlated to the psychological resistance (<= - .51 at 25, 50 and 75% MAP) and psychological endurance (<= - .51 at 25 and 50% MAP). Social desirability was significantly correlated to ETL at 25% MAP (r = .45). The psychological endurance was correlated to ETL but only from 75% MAP (r = - .46).

Discussion
Some psychological states influence the effort hardness and the time limit predicted by teleoanticipation. However, these effects vary according to the exercise intensity. The lack of significant correlation between the RPE and/or ETL and some psychological states may be linked with the cyclists' high athletic experience.

References

MOTIVATION, TEAM LOYALITY AND VIOLENCE TENDENCIES OF HANDBALL SUPPORTERS: A CASE STUDY IN TURKEY

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Handball is a sport that has a large number of spectators in the world. It is seen that the number of handball spectators and supporters has decreased but the number of rows has increased on courts and grandstands, and recently, these events have been figured in mass media. A lot of projects have been prepared in order to ensure handball spectators and supporters' interest in handball. On the other hand, it can be said that there have been no prosperous results. Furthermore, there are not enough studies on handball spectators, supporters, marketing of handball and sponsors. In addition, the existing studies are not satisfactory for handball.

In this research, the answer was sought for the following questions: Is there a correlation between the tendencies and the supporters' demographic characteristics? In order to answer these questions, a survey has been prepared by the specialist researchers in Istanbul, Ankara, Bursa and Eskisehir and the survey was conducted with 386 handball supporters.

In analyzing data, a statistical program was used. Frequency, percentage, mean average and standard deviation were revealed in analyzing of data. Cronbach Alpha was used for the reliability of the variants. T-test and ANOVA were used to reveal the differences between the tendencies (the motivational factors, team loyalty, and violence) and demographic characteristics (age, gender, education and marital status).

% 47.4 of the supporters are male, % 77.2 of them are single, % 67.4 of them are students, % 45.3 of them are university graduate, % 51.8 of them are under the age of 21, % 45.6 of the supporters' earn 400 or fewer than 400 dollars in a month. It can be said that majority of the handball supporters are singles and students, for this reason they have low income. The most common answer in terms of motivational factor is that: "I feel excited when I watch my favorite team." Most of them like going to handball matches because they get excited.

In terms of team loyalty 'I support my team even if there is no famous handballer in the team' was the most common opinion. It means that when they watch their team, they have emotional relations with their team and they try to support it in any case. "I believe that hard game makes the game exciting" was the most common answer which reflects the supporters' opinions on violence tendency. As the large number of spectators is under 21, they like watching hard games.

The findings of the research revealed that there are significant discrepancies between the tendencies (motivation, team loyalty, violence and gender). Female supporters' mean value is higher than male supporters' in motivational factors and team loyalty. It can be said that female supporters' tendencies such as supporting the team, emotional relations with the team, watching the match with friends are higher than male supporters.
INQUIRY EXAMINING TEACHING MOTIVATION AND CONTENTS OF A TWO-YEAR COURSE SSIS

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In Italy SSIS (Specialization School of Secondary education) consists of a two-year course meant to prepare future teachers in Physical Education. One can be admitted via an open competition, after getting a University degree. The only examination centre in Lombardia is at Università Cattolica del Sacro Cuore in Milan. To know the motivation of those students who choose to attend SSIS, a school that teaches people how to teach, is the aim of this survey.

Secondly we tried to inquire into the contents and the organization of SSIS.

SSIS is divided into three modules:

1) common area which is shared by students who usually attend different faculties; themes are studied in depth from a sociological, psychological, pedagogical point of view (with an evaluation of the courses at the end);
2) specialist area, restricted to the students of SSIS with a Physical Education degree, [epistemology, planning-evaluation in PE], themes and methodologies are examined closely (with regard to the pupils' age, from 11 to 14 and from 14 to 19);
3) teaching practice, which is compulsory for both "Secondary education school from 11-14 year and 14-19 year".

Potentially future teachers must assist an experienced teacher (a 'tutor') who has been working for seven years at least in public schools, in order to get the know how of their profession. We gathered data about student's motivation through questionnaires, subjects were asked to rate the questions using a Likert scale (1-7), from "1" being of little importance to "7" being of very important. The sample consists in 67 interviewed students, attending the second year of the SSIS course, 37 were male and 30 were female.

The age of these students is between 20 and 29 (43 people); between 30 and 40 of age (23 people) and just one is over 40 years of age.

As to the Common Area activities, most students think that it was uninteresting and rather boring. Teaching Motivation: almost all students love teaching. 75% thinks it's well to be employed by the state. Analyzing the results of our search, the feedback should be used to modify the common area contents.

Teaching practice has been considered very interesting by all the participants to the course.

References.


ATTITUDE TOWARD PHYSICAL ACTIVITY - DIFFERENCES BETWEEN PARTICIPANTS AND NON PARTICIPANTS

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According several authors (e.g. Doganis & Theodorakis, 1995, Dosil, 2002, Biddle & Mutrie, 2001) the structure of attitudes can be defined by a three component model: cognitive (e.g. beliefs about exercise), affective (e.g feelings about exercise) and behavioral (e.g. approach or avoidance of exercise). In last years studies linking attitudes with physical activity participation have increased considerably on scientific literature (Dosil, 2005). This fact reveal the influence of this psychological construct into human behavior. However, most of the studies are conducted with people who are already involved into physical activity. This fact maybe supposes a wrong idea that positive attitude towards physical activity depends exclusively on the degree of participation (Dosil, 2005). For this author it is logical for those who do exercise or sport to have a positive attitude towards it. However, it is likely possible for those who don't do it, have a similar attitude. So, the main propose of this paper is to present the study of differences between participants and non-participants into attitude toward physical activity and sport.

For such, we studied a sample of 325 individuals, of both genders, with 23 ±5.2 years old of mean age and different degree on participation in physical activity (i.e. 114 non-participants and 211 regular participants). The measurement instrument was the Attitudes towards Physical Activity and Sport Scale, developed by Dosil (2002).

The main results indicate that participants attitudes are significant higher (i.e. more positive) than the non-participants (t=3.621; p=0.000).

This result is consistent with the literature. However the calibrate result of attitudes scale show us a similar percentile between groups: non-participants 61.1±8.4 (percentile 40 medium attitude) and participants 64.9±9.3 (percentile 45 medium attitude). This fact suggests that a negative or positive attitude can be found independently of the degree of participation. According Caetano & Raposo (2005), this happens because apparently everybody recognizes the importance and the benefits of physical activity.

References.


PHYSICAL EDUCATION PRACTICE LEVEL AND ATHLETIC AND PHYSICAL SELF-ESTEEM CONTROLLING FOR AGE, GENDER AND SCHOOL GRADE

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For developmental and educational well known reasons the aim of numerous programs among adolescents is to improve their self-esteem. To achieve these objectives, Physical Education is often presented as an effective tool. As part of their attempt to understand how students feel about themselves in Physical Education, researchers have asked whether different levels of practice might be related to self-esteem, defined as how well a person prizes, values, approves, or likes him or herself, an important benefit of sport practice. With regard to the relationship between these variables, research has been mixed. In view of these somewhat conflicting findings, we re-examined
In last years studies linking attitudes with physical activity participation have increased considerably on scientific literature (Dosil, 2004). According Biddle & Mutrie (2001), the definition of attitudes can be delimited by three components (i.e. beliefs, feelings and behaviors), that leads individual intentions to action. This fact reveal the influence of this psychological construct into human behavior. According Dosil (2004), the exercise conduct could be determinate by a negative or positive attitude toward physical activity and sport. In general, attitude and subjective norm explain about 30% of the variance in intentions to exercise and the addition of perceived behavioral control increased the value up to 40% (Biddle & Mutrie, 2001); however, attitude is far more consistently associated with intentions and behavior. Some recent studies (e.g. Dosil, 2003, Caetano & Raposo, 2005, Araújo, Calmeiro & Palmeira, 2005) are not consistent in results about the differences between genders. So, the propose of this paper is to clarify the differences between female and male individuals into attitudes toward physical activity.

For such, we studied a sample of 325 individuals (i.e. 165 female and 160 male), between 16 and 40 years old (i.e. 23.8±5.2 mean of age) and different degree on participation in physical activity (i.e. non-participants and participants). The measurement instrument was the Attitudes towards Physical Activity and Sport Scale, developed by Dosil (2002).

The main results indicate that male attitudes (67.2±7.9) are significant higher more positive (t=7.610, p=0.000) than the female (60.1±9.0). This result was consistent when we divided the sample by groups of different degrees of physical activity participation. In both cases the results are significantly different between genders: Non-Participants Group (female 58.1±8.4; male 65.2±6.4) and Participants Group (female 61.4±9.1; male 68.1±8.3).

References.


THE EFFECT OF SELF-TALK ON SELF-EFFICACY

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The mental skill of self-talk is heavily promoted within the sports psychology literature and one aspect of self-talk that is commonly referred to is its valence (i.e., positive vs. negative self-talk). To date, research focussed on self-talk has been relatively atheoretical in nature. In line with the predictions of self-efficacy theory, if a person is told to perform a task or engage in a specific activity, their self-efficacy towards that activity will increase (Bandura, 1986). Therefore, self-talk is often seen as a means of influencing performance expectancy. However, recent research suggests that the use of positive self-talk can have a detrimental effect on self-efficacy levels. Participants using positive self-talk were expected to have higher levels of self-efficacy compared to those utilising negative self-talk.

Forty five Sports Science undergraduate students were randomly assigned to one of three groups; positive self-talk (n = 17), negative self-talk (n = 14), and a control group (n = 14; given no self-talk instructions). All participants completed a novel throwing task which provided minimised options for performance feedback. This was done in order to limit the influence of previous mastery achievements which have been found to have a potent source of efficacy beliefs. To supplement this strategy, participants were also provided with standardised feedback regarding task performance (60% successful). Following this all participants completed the same task again, except that those in the self-talk treatment groups were assigned I can do this, strong wind (positive self-talk) or I’ll never do this, poor technique (negative self-talk) to repeat to themselves before each attempt. Self-efficacy was assessed twice, once follow the standardised feedback and once after having completed the throwing task for a second time.

A one-way ANOVA revealed that no significant differences between the three groups were evident prior to the self-talk intervention. However, results from a 3 x 2 (group x time) mixed model ANOVA revealed a significant interaction (p < .001). More specifically, self-efficacy levels significantly decreased for the negative self-talk group (p < .001) whereas, self-efficacy did not change for both the positive self-talk and control group.

From an applied perspective the results suggest that the potential detrimental effects of negative self-talk (on self-efficacy, at least) are of a greater magnitude than the potential benefits of positive self-talk. However, not only does the present study suggest that practitioners should aim to reduce athletes’ usage of negative self-talk but it is recommended that they also provide their clients with an active strategy (e.g., positive self-talk) to act as an alternative and thus, prevent the use of negative self-talk by their athletes.
RAPID WEIGHT LOSS AND RISKS FOR EATING DISORDERS IN JUDO, TAEKWONDO, AND KARATE ATHLETES

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Rapid weight loss (RWL) in preparation for competitions is a common method in certain sports to achieve a desired weight which enables the athlete (AL) to compete in a lower weight category. The issue of whether AL who compete in sports in which weight plays a crucial role are at an elevated risk for developing eating disorders has been of concern during the past years. Several studies have pointed out that at least some of the methods used by AL for weight control resemble those observed in clinically bulimic patients. American wrestlers have been shown to have higher risks for bulimic disorders, at least during the season. To examine whether this observation also holds true for AL competing in other sports, a questionnaire was used to evaluate weight loss methods, nutrition knowledge, and possible eating disorders. AL from the national and state Taekwondo, Judo, and Karate teams (NA, SA, and from local clubs (CA) were surveyed using a standardized questionnaire including the Eating Disorder Inventory (EDI). 1199 questionnaires (response rate approx. 35%) were analyzed, 39.3% females (16.5 +/- 3.7 years, 56.7 +/- 11.4 kg body weight [BW], body-mass-index [BMI] 20.4 +/- 3.1 kg/m²) and 60.7% males (18.1 +/- 4.9 years old, 66.7 +/- 13.7 kg, BMI 21.6 +/- 2.9 kg/m²). According to the WHO classification, 66.2% of females (F) and 72.3% males (M) had normal BMI if 24.0% underweight (UWF), 6.1% overweight (OWF), M 13.7% overweight (UWM), 9.9% overweight (OWM).

40.1% F and 49.5% M reported using RWL to prepare for a competition. Among them 21.6% F and 26.2% M stated that they had to lose weight before every competition. On average, AL reported losing 3.1 +/- 1.8% (F) and 3.3 +/- 1.9% (M) of their BW, respectively, equivalent to 0.005 +/- 0.005% (F) and 0.006 +/- 0.003% of their BW per day.

The results of the EDI show significantly higher values for F compared to M in 6 of 8 subscales.

Compared with AL who did not have to lose weight, those who reduced at least 4% of their normal BW had significantly higher scores in the subscales Drive for Thinness (DFT) [F: 16.7 +/- 7.3 vs. 21.7 +/- 8.6; M: 13.3 +/- 5.6 vs. 15.5 +/- 6.0], Bulimia [B] [F: 11.7 +/- 5.1 vs. 14.1 +/- 5.1; M: 10.6 +/- 4.2 vs. 12.2 +/- 5.0], and Body Dissatisfaction (BD) [F: 26.9 +/- 11.1 vs. 31.3 +/- 9.8; M: 20.5 +/- 9.4 vs. 21.2 +/- 8.0]. However, the magnitude of the higher scores in the RWL group did not reach the published levels of bulimia patients.

AL with an over weight BW displayed significantly higher scores in the DFT, B, and BD subscales. In female over weight AL, BD subscale showed levels comparable with published data from bulimia patients (OWF 36.2 +/- 11.5, UWF 24.4 +/- 10.0).

There was no significant difference between NA, SA, and CA concerning EDI scores.

In conclusion, significant differences were observed between RWL and non-RWL-AL. The magnitudes of the scores in bulimia-typical subscales do not suggest a clinically relevant risk for eating disorders in these sports.

YOUNG NATIONAL TEAM FOOTBALL PLAYERS- COMMON CHARACTERISTICS OR NOT?

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In order to develop football players’ skills, possessing more knowledge about elite players’ backgrounds, lifestyles, activities and motivation may be important. The aim of this study is to describe some characteristics regarding to family backgrounds and motivation. 45 male football players in three National teams of Norway, U17, U19 and U21 participated in the study. Among these players, two thirds reported they were part of big families. Two thirds were three or more siblings and more than 20% reported they were four or more siblings. More than two thirds reported that they have older siblings. Furthermore, they reported about athletically active families, all of their siblings, more than fifty percent of their mothers and seventy five percent of their fathers had been athletically active. 35% of their siblings, 20% of their fathers and about 10% of their mothers had played sport at a high level. All of the players reported about a very high activity level in their childhoods, at age six, 65% and at age eight, more than 90% had been members of an athletics club. Moreover, most of the players also reported about a diversified involvement in a number of sport activities. From the ages of six until fourteen, more than 70% participated in one or more athletic activities in addition to football. The players’ ambitions were high, more than 75% wanted to be National team players or players on the international level.

Poster presentations (PP)

PP-RE02 Rehabilitation 2

MUSCULAR TONE CHANGE DUE TO INDIVIDUAL HYDRO-REHABILITATION TREATMENT

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Research objective: to determine the influence of individual hydro-rehabilitation exercises on the lower extremities and back muscle tone with patients suffering from the lumbosacral osteochondrosis at the remission stage.

Twenty-two women aged 25-45 were tested. The group was divided into two sub-groups - a control, comprising 11 healthy females, and a test one of 11 females with a clinically proved diagnosis.

Muscle contraction value was analyzed, i.e. the difference between muscle tone at rest and the one at maximum muscle tension.

It was discovered that unaffected subjects did not show a significant difference of bilateral muscle tone both at rest and at supertension - Rectus Femoris M. (RFM), Tilialis Anterior M. (TAM), Erector Spinae M. (ESM), M. Gluteus max. (MGM), M. Biceps Femoris (MBF), M. Gastrocnemius med. (MGm) (P=0.05). The mean contraction value appeared to be as follows - RFM - 1.1 mm, TAM - 1.3 mm, ESM - 2 mm, MGM - 1.4 mm, MBF - 1.2 mm, MGm - 1.2 mm.

Osteochondrosis patients are observed to have a hypertonia of all the muscles under study. In comparison with the healthy subjects the mean difference made 14.1% for RFM, 15.6% for TAM, 12% for ESM, 12.4% for MGM, 8.9% for MBF, and 10% for MGm. However, the contraction mean value for all the muscles under study was 2.1 times lower in comparison with the healthy subjects. The latter might attest to a lower functional condition of the neuromuscular apparatus owing to the osteochondrosis.

Predominancy of afferent or efferent nerve fiber affection of the mixed peripheric nerve was taken into account to individualize rehabilitation methods, the former was stated with the help of a complex electromyography.
40% of exercises in the system for those with predominant efferent nerve fiber affection took those for movement coordination. Such motor exercises are accompanied by parallel work of the cerebral cortex, subcortical systems, the cerebellum, the vestibular apparatus, spinal alpha-motoneurons, which peripherically activate damaged motor nerve fibers. For patients with afferent nerve fiber affection 40 per cent of the entire exercise set were those containing movements, with visual control off, to develop minor motor activity of the lower extremities’ neuromuscular apparatus. The choice of exercises enabled an increased activation of the affected sensitive neurifibers.

After a course of hydro-rehabilitation exercises held for 3 months the test group showed a decrease in the muscle tone level for all the muscles tested. The results changed significantly in TAM, MGM, in the right side of the MBF, MGM (P<0.05) and came up close, though not reaching, to the values typical for the healthy. There was a 44 per cent improvement of the muscle contraction in this group. Individually selected hydro-rehabilitation exercises made it possible to reduce the muscle tone and improve the functional condition of the neuromuscular apparatus.

**EVALUATION PROCEDURE OF PREDISPOSITION TO NARCOTISM AND MOTOR-MENTAL CONTROL DURING REHABILITATION PROCESS**

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Introduction. Numerous researches of domestic and foreign experts on the given problem do not answer to the basic question: why the rising generation starts to accept drugs? Results of many sociological researches show that the main motives of drugs consumption:

- thirst of pleasures;
- desire to test sharp sensations;
- euphoria.

Drugs among youth have extended in the sizes disturbing the public of Russia. The narcotism is a complex condition of a brain which has psychological, social and biological aspects.

Methods of research. Inclusion in rehabilitation process at narcotism various stages means, methods and methodical approaches from area of physical training and sports will allow to raise efficiency of this process, due to complex influence on psychological, motor and socially-biological structure of a human body. In control system of person occurrence over a prospective narcotism condition from stimulators, and also in rehabilitation process it is necessary to allocate three basic stages causing application of specific complexes, methods.

Results. The first control stage is directed on revealing of person’s genetic predisposition to narcotism at early life stages.

The second control stage is directed on definition of person type on the basis of research its specific features-psychological. We can find a lot of information on these methods in the special literature about predisposition of various psychological person types to the use of drugs.

The third stage of the control is the most complex and less developed. The primary goal of the given stage is diagnostics of a condition of the person on the various beginning periods of the use of drugs. Thus it is necessary to consider a narcotism level, drugs type, age, social and other features. In Saint-Petersburg research institute of physical culture the unified complex of a quality monitoring is developed at carrying out of mass inspections which in the further was a basis for formation of the automated complex of an person condition estimation, allowing operatively to evaluate parameters of motor maintenance of impellent activity on different parameters reflecting realized impellent and vegetative components of a mental condition. The automated unified complex includes 43 parameters received skilled and settled.

Conclusion. Basic researches which have been carried out on various contingents of people, various age groups, practically healthy both having in motor-mental sphere of life-support have shown the various congenital and got high informative deviations and reliability of the received results. It is a necessary condition of adequate scientifically-methodical recommendations according to and corrections of a motor-mental condition surveyed, including in rehabilitation process of drug addiction people in conformity with a narcotism stage, characteristics of used drugs, age features and social conditions.

**EFFECTS OF DIFFERENT COOLING CONDITIONS ON THE EXERCISED SKELETAL MUSCLE**

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Background: Cooling at a very low temperature, such as by ice bag application (almost 0ºC), frequently causes cold-induced pain. Thus, cooling at a temperature that does not evoke excessive pain is desired. However, the effects of a relatively higher cooling temperature on the skeletal muscle have not been sufficiently elucidated (1).

Materials and Methods: Axial T2-weighted and diffusion-weighted MR images of the ankle dorsiflexors (7 subjects; mean age, 27.6 years) were obtained before and after ankle dorsiflexor exercise and at 60 min after postexercise treatment by using a 1.5-Tesla MR device with a knee coil. T2 relaxation time, indicative of the intramuscular water level, and apparent diffusion coefficient (ADC) were calculated from the T2-weighted and diffusion-weighted images, respectively. The ADC values were divided into ADC1 and ADC2, the former reflects the diffusion and perfusion within the muscles, while the latter provides the approximate true diffusion coefficient within the muscles. The temperature of the skin over the ankle dorsiflexors was measured during 60 min after postexercise treatment successively. Postexercise treatments were classified into noncooling (60 min), ice bag application (20 min cooling followed by 40 min noncooling), and 10ºC gel pack application and 17ºC gel pack application (60 min cooling). As a common treatment, 30 mmHg pressure was applied to the cooled portion. The subjects received all the treatments separately.

Results. The T2 values showed significant increases immediately after exercise in all the treatment groups but were restored to values at rest after postexercise treatment, regardless of the treatment administered, there was no significant difference among the treatments in the T2 values. The ADC1 and ADC2 values (×10-3 mm2/s) showed significant increases immediately after exercise in all the treatment groups. All the cooling treatments resulted in significantly lower ADC values (ice bag: ADC1/ADC2, 2.4/1.51 at rest, 1.95/1.4 posttreatment; 10ºC gel pack: 2.4/1.53 at rest, 1.89/1.36 posttreatment; 17ºC gel pack: 2.49/1.5 at rest, 1.84/1.34 posttreatment), however, there was no significant difference among the cooling treatments in the posttreatment ADC values. For skin temperature, the noncooling and all cooling groups showed significantly greater and lower posttreatment ADC values compared with the postexercise values, respectively.

Conclusion: Local cooling decreases perfusion and water diffusion within the exercised muscle. Moreover, even when the cooling temperature is mild, effective cooling is achieved without evoking cold-induced pain by prolonging the application time.
EXERCISE TRAINING IN BREAST CANCER PATIENTS RECEIVING ADJUVANT TREATMENT

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Chemotherapy frequently results in fatigue that impairs the development of a normal life, and patients are unable to perform daily activities. However, recent studies show that regular physical activity will blunt the deconditioning process and may help to improve the quality of life and psychological status of these patients.

The aim of this study was twofold; (a) to assess the effects of physical exercise training on functional capacity in breast cancer patients during their chemotherapy treatment, and (b) to determine the level of functional impairment in the early recovery of chemotherapy cycle.

Eight women (49.6 years SD: 5.7) with breast cancer in stage I, IIA or IIB (Singletary, 2002) that have undergone surgery and were receiving adjuvant chemotherapy treatment participated in the study. After receiving oral information, they signed an informed consent document.

Chemotherapy regimen comprised 4 to 6 cycles. Forty hours before and after the infusion, functional capacity was evaluated by means of Six minute walk test.

The exercise program lasted 6 months with a frequency of 3 sessions per week that lasted approximately one hour. Activities were mainly aerobic and intensity was set at 50-75% of their maximum heart rate.

Results show that 48 hours after chemotherapy infusion (post-infusion test) the distance covered in the 6-minutes test declined significantly (p<0.05) from 566.2 (SD: 60.9) (pre-infusion test) to 556.5 (SD: 81.4) metres in the first cycle and from 598.0 (SD: 49.2) to 554.7 (SD: 57.7) metres three months later. In the last cycle, that took place at the end of the six months of the exercise programme, the distance covered was slightly inferior (12 meters) in the post-infusion test, but did not differ significantly from pre-infusion data. Maximal heart rate registered at the end of each post-infusion test did not differ significantly from the values observed in pre-infusion test for any of the 3 time points.

Data show that chemotherapy impairs the functional capacity in the early recovery period, but even with the cumulative effect of several cycles of chemotherapy, women who attended to the exercise program were able to perform the post-infusion 6 minutes walk test suffering a minor functional impairment than at the beginning of the treatment.

References:

THE EFFECT OF PELVIC CORRECTION AND SWISS BALL EXERCISE ON PELVIC TILT AND PELVIC TORSION IN THE SPINE

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We analyzed female students of N univ. who had a deformation-disposition or displacement of pelvis and for 4 weeks they’ve been treated by correction of pelvis and Swiss-Ball exercise. After checking the its effect on pelvic slope and rotation, we suggest that manipulation and exercise be a good program for curing displacement of spine. For 4 weeks manipulation and Swiss-Ball exercise had been given to female univ. students with lower back pain and menstrual pain due to displacement of pelvis, and then we’ve got the following conclusion: 1) concerning with the degree of slope of pelvis, both two groups had significant effects compared with non-therapy group. 2) concerning with the change of length of pelvic slope, both of two groups had smaller numerical value than before, but the difference between them was not significant in the pelvic manipulation group, the numerical value reduced from pre- manipulation 0.05±1.19(°) to after-manipulation -0.14±1.25(°), but there were no significant difference in the Swiss-Ball exercise group, the numerical value increased from pre-exercise -0.04±1.19(°) to after-exercise -0.90±2.47(°).

As a result of the dual variant analysis on pelvic rotation, there was no significant difference between them. In conclusion, two ways of therapy (manipulation and Swiss-ball exercise) had effects on pelvic displacement, so we suggest that new programs using these ways be made.

VALIDITY AND RELIABILITY OF HIP ABDUCTOR MUSCLE STRENGTH ASSESSMENT IN THREE DIFFERENT BODY POSITIONS

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Hip abductor muscles are responsible for hip stabilisation in the frontal plane during single leg stance and gait. Hip abductor weakness has frequently been associated with sport-related knee injuries and also with hip osteoarthritis. Unilateral hip abductor muscle strength has been assessed using either the lateral, supine or upright position but to our knowledge the optimal posture remains to be determined.

The aim of this study was to test the validity and reliability of unilateral hip abductor muscle strength assessment in the lateral, supine and upright body positions. Sixteen healthy subjects (8 men, 8 women) participated in two identical testing sessions separated by 2-3 days. In both sessions unilateral isometric hip abductor muscle strength was measured in the three body positions (randomly presented) using a portable dynamometer fixed to a custom-designed frame. Construct validity was based on concomitant gluteus medius electromyographic (EMG) activity recordings from the tested and contralateral hips. The posture permitting greater muscle activation on the tested hip, while minimizing muscle activation on the contralateral hip, was considered as the more valid position. For this, the tested-to-contralateral EMG ratio was compared between the three body positions. Maximal isometric strength and EMG data were analysed with a 3-way ANOVA (position x session x side). Coefficients of variation (CV), systematic bias ± random error (Bland-Altman plots) and intraclass correlation coefficients (ICC) were also calculated to determine the test-retest reliability in the different positions.

Maximal isometric hip abductor muscle strength was significantly higher in the lateral posture (364 ± 74 N) than in the upright (310 ± 56 N) and supine (243 ± 61 N) positions. EMG recordings showed considerable activation of the contralateral gluteus medius muscle in all body positions indicating that isolated unilateral hip abductor muscle strength assessment was not feasible. However, only in the lateral position the tested-to-contralateral EMG ratio was lower than one, thereby achieving our construct validity criterion (lateral: 0.79, supine: 1.17, upright: 1.21). Test-retest reliability of the maximal strength measurements in terms of CV (lateral: 3.7, supine: 6.1, upright: 4.2), Bland-Altman (lateral: -1.2 ± 6.9, supine: -0.3 ± 8.4, upright: -0.6 ± 7.5) and ICC (lateral: 0.90, supine: 0.83, upright: 0.88) was better in the lateral posi-
tion. Valid and reliable assessments are needed for bilateral comparison of hip abductor muscle strength (e.g., dominant vs. non-dominant side for healthy subjects or affected vs. non-affected side for patients). In this study we observed the highest validity and reliability for unilateral hip abductor muscle strength assessment in the side-lying lateral posture and therefore we strongly recommend the use of this body position to clinicians and practitioners.

MUSCLE STRENGTH AND STABILITY IN ACL RECONSTRUCTED PATIENTS AND CONTROLS

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Anterior cruciate ligament (ACL) injury is associated with increased knee instability, alterations in neuromuscular function, muscle strength and movement pattern, defective proprioception and impaired postural control and functional performance. The aim of this study was to examine the isokinetic muscle strength and stability during one-leg stance in patients who had undergone unilateral ACL reconstruction. Twenty five males who had surgical reconstruction of the ACL (reconstructed group), 8-10 weeks after surgery and 15 participants without knee injury (control group) participated in this study. Eccentric and concentric strength testing was performed for knee flexion and knee extension at 60, 120 and 180°/s on a Biodex isokinetic dynamometer. The subjects also performed five single-leg stance trials on an EPS pressure platform (Loran Engineering S.r.l., Bologna - Italy). The duration of the test was 30 sec. The distance and velocity of the center of pressure (COP) and the sway area were examined. Independent t-tests were used to examine group differences in each dependent variable at p < 0.05. The results indicated that ACL reconstructed individuals demonstrated a significantly (P < 0.05) higher COP distance (499 (133) mm) compared with controls (387 (81) mm). Similarly, sway velocity was significantly higher in ACL reconstructed individuals (21 mm/s) compared with controls (16.5 mm/s). Furthermore, subjects with ACL reconstruction displayed significantly lower (p < 0.05) knee extension and flexion muscle strength compared with controls. It appears that ACL-reconstructed individuals demonstrate significantly lower knee extension and flexion moments and higher COP movement compared with healthy subjects. Reduced muscle strength and sensory deficits after ACL reconstruction lead to decreased stability and explain the increased movement problems at the early stages of ACL reconstruction.

STRENGTH TRAINING ACCOMPANYING CHEMOTHERAPY AFTER LUMPECTOMY

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Purpose.
To examine 1. the feasibility of strength training during chemotherapy in breast cancer patients, 2. the effects of strength training on muscular performance of upper and lower extremity muscles under isometric and isokinetic conditions, 3. the effects of strength training on indicators of quality of life.

Methods.
Ten female patients aged 56.6 (SD=9.41) years participated in a 12 weeks strength training program after lumpectomy and during chemotherapy. The strength training program consisted of 3 sets of 7 exercises at strength training machines at a 12 repetition maximum level twice a week. The exercises involved shoulder rotation, knee extension - flexion, spine stabilisation, shoulder elevation, latissimus pull, active back extension - flexion and elbow extension - flexion. Neuromuscular performance was registered before and after the study on an isokinetic dynamometer (IsoMed2000) under isometric (3 positions within the tested range of motion) and isokinetic conditions for leg flexion extension and arm inward outward rotation respectively.

Quality of life was evaluated with the EORTC QLQ-C 30 questionnaire at the start, after six weeks and at the end of the study.

Results.
None of the patients retreated from the study or missed a training session. Strength parameters: independent from the surgery site we registered improvements of strength parameters under isometric (maximum torque, average torque) as well as under isokinetic conditions (maximum torque, average torque, total work and total as well as maximum power) for knee extensor muscles and shoulder rotator muscles respectively. The differences were independent from handlingness and the side of the extremity.

There was a slight tendency of a bigger improvement of the strength parameters on the side where the surgery had taken place which must not be attributed to improvements of muscular abilities only but are obviously due to an improved confidence in general movement abilities.

Quality of life: the patients subjective quality of life improved significantly throughout the test period. Symptoms of nausea particularly after medication were significantly moderated towards the end of the training period. The same came true for state of fatigue and loss of appetite. A significant improvement of the overall emotional state together with a better estimation of the social situation could be identified. The parameters of physical function, pain, shortage of breath and sleeplessness showed a decrease during the first half of the study but an improvement above the starting level at the end of the study.

Conclusions.
Strength training during chemotherapy of breast cancer patients leads to improvements of neuromuscular performance. It also helps to improve quality of life as it moderates side effects usually attributed to chemotherapeutical treatment. The study proofed its feasibility as all patients finished the study after regular participation.

ANALYSIS OF PERFORMANCE OF WHEELCHAIR HANDBALL TEAMS

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Every day the Adapted Sport is gaining more space, which is justified by the importance of this activity as a factor of Reintegration, Social Inclusion, Rehabilitation and promotion of a better quality of life for people with disabilities. A good example is the Wheelchair Handball, created in the Toledo city from Brazil, in 2005, and which is being contested in two ways: the HCR7, who adopted the rules of the Handball Team, and is the object of this study, and HCR4, who adapted the rules of the Beach Handball, which will be discussed in another study. This study aimed to evaluate the performance of teams participating in the II WEST CUP. Were recorded and quantified the following factors: 1) index of Technical Errors (TE = were considered only the mistakes that resulted in loss of ball possession), 2) rate of Shots...
Errors (SE), 3) Attack Effectiveness = goal (AE/G) of each team in the competition. The sum of these three factors indicated the total of Ball Possession (BP), which is an index of the influence of different indexes (TE, SE, AE/G) in the performance of teams. METH-ODS - The form of assessment (scale) to register the shares of play. Data collection was performed by the team of arbitration, because in this mode the chip in evaluation (scale) is a summary of departures. Data analysis was performed using the percentages of errors (TE and SE) and goals (EA/G) in relation to the total of PB. Three teams participated in this competition. RESULTS & DISCUSSION. The competition presented a total of 336 possessions of balls, of which 160 (47.7%) were wasted with shots errors. Other 103 (30.7%) were wasted with technical errors and only 73 (21.6%) were converted into goal, the greater goal attack in the game of handball. There is a high number of shots errors with balls defended by goalkeeper (80/50%), indicating that the decision to keep the goalkeeper in the wheelchair allied to reduce the crash, maintained the importance of the role player in this adaptation of the sport. In Technical Errors there was a predominance of errors in the plea pass (74/71.8%), which we infer that the coordination between area of the chair to field the ball needs to be improved. In Attack Effectiveness there was a predominance of Goals of 6 meters (42/57, 5%), which indicates that the release of long distance are elements that still need to be developed and that can become differential result of the evolution of the sport. CONCLUSION: This study has identified the factors that influenced the performance of the participating teams of the 2nd. West Cup WCH, establishing parameters initial analysis and serving as reference for the implementation, planning and training of new teams this new adapted sport. It has been as expectation that the performance of a larger number of competitions and the production of new scientific studies provide the evolution of the WCH, which has been an effective tool for the inclusion of the poor, especially those who are unable to pursue other modalities collective, as the basketball and rugby, for example.

ADAPTATIONS IN HUMEROSCAPULAR RANGE OF MOTION AND SCAPULOTHORACIC ARTHROKINEMATICS IN FEMALE HANDBALL PLAYERS

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34 female handball players were studied for 3D scapulohumeral and humeroscapular arthrokinematics by means of electromagnetic tracking. The purpose of this study was to measure and compare 3D scapulohumeral orientation during scapular plane humeral elevation, as well as the humeroscapular range of motion during external/internal rotation at 90° abduction and internal rotation at 90° flexion. Methods: Dominant (throwing) and heterolateral shoulders of the subjects had 3 electromagnetic sensors secured to the humerus with a cuff, to the scapula with a specially designed adjustable spine scapulae fixator (1), and to the sternum. A fourth sensor was used as a stylus to digitize the anatomical landmarks used to embed the anatomical coordinate systems, according the recommendations from the international Shoulder Group of the International Society of Biomechanics. Orientation of the scapula was defined as internal/external rotation, upward/downward rotation, anterior/posterior tipping. Humeral orientation was expressed as rotation into plane of elevation, elevation, and longitudinal axis rotation. Orientation of the scapula was analyzed at the initiation of movement 0°, 30°, 60°, 90°, and 120° of humeral elevation. Not above 120° of elevation because of the lack of validity due to skin-bone motion (1). Results: Comparing the throwing with the contralateral shoulder in these female handball players, the results indicate a significantly (p<.05) enhanced upward rotation and internal rotation. No significant differences could be demonstrated with respect to anterior/posterior tipping. Related to the humeroscapular arthrokinematics, a significant (p<.05) gain in external rotation at 90° abduction, a decrease in internal rotation at 90° abduction and a decrease in internal rotation at 90° flexion was found. Conclusion: Female handball players develop adaptations that most likely result from the throwing motion. It remains difficult to determine if the adaptations result in improved throwing skill or injury prevention (increased scapulothoracic upward rotation) or contribute to joint injury (such as decreased humeroscapular internal rotation which has been demonstrated to correlate with subacromial and internal impingement). References.


EFFECTS OF REHABILITATION PROGRAM BASED ON THE INTERMITTENT WALK

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Physical activity (PA) has beneficial effects on obesity. However, obese patients weakly adhere to PA probably because of continuous exercises monotony often proposed (Wing et al., 1988). To increase the adhesion to PA, intermittent exercises may be more appropriated.

Subjects

Twenty obese women were recruited (Age: 52.4±7.6yr; Body mass: 108.2±14.9kg; Height: 162±8cm; Body mass index, BMI: 41.4±8.1kg/m²; Body fat: 47.4±4.9%). Ten women integrated a training group and 10 women were not trained (control group).

Material

Body mass and fat were assessed using a bioelectroencephalic impedance scale (TBF 543, Tanita®). Resting systolic (SBP) and diastolic (DBP) blood pressures were measured by an electronic device (BP 3AC1-T, Microlife®). Resting heart rate was recorded by a cardiotachometer (Accurex+, Polar®). Perceived effort was expressed with the Ratings of Perceived Exertion (RPE) (Borg, 1970).

Procedure

During a baseline visit, anthropometric and physiological data were collected (age, body mass and fat, height, resting SBP and DBP, and resting heart rate). Then, the women performed a 6-min walking test to determine a maximal distance (Dlim). To examine the less hard walk, the control training group performed CW and IW on a treadmill with a similar velocity and duration (32 min). During CW, women continually maintained 70% velocity during the 6-min walking test, whereas during IW, they alternated 60 and 80% velocity during the 6-min walking test. The less hard walk was determined by lower RPE. Then, the trained women performed IW during 10 weeks (3
(TA) and internal oblique abdominals (IO) activity while minimizing that of the mobilizers, including the rectus abdominus (RA) and external oblique abdominals (EO). However, no studies have investigated the motor control responses in the abdominal muscles to maintain the lumbar stability after applying therapeutic modalities to the abdominal muscles themselves.

**Material and Methods.**

Subjects: 8 healthy adult males free of low back pain. Measurements: Surface EMG activity was recorded from the right RA, EO, IO, erector spinae (ES), and multifidi (MT) during the 2 tasks (abdominal hollowing exercise and static full-forward bending position) before and after applying a hot pack to the anterior and lateral sides of the upper and middle abdomen for 20 minutes. Furthermore, surface EMG activity was recorded in static full-forward bending position while performing abdominal hollowing. To reduce the bias of EMG measurements between pre-test and post-test, skin temperature was monitored and equal.

**Results.**

For the IO and EO, there was significantly higher activity during the abdominal hollowing in post-test compared with pre-test (p = 0.04 and 0.01, respectively). In static full-forward bending position while performing abdominal hollowing, the IO produced significantly higher activity, while the MT produced significantly lower activity in post-test compared with pre-test (p = 0.04 and 0.01, respectively).

**Conclusions.**

Abdominal hollowing or contracting the TA and IO may increase intraabdominal pressure, enhancing stability around the lumbar spine. Furthermore, the increased intraabdominal pressure may supply the extension force to the lumbar spine, reducing the loads on the lumbar extensors. On the other hand, hot pack may warm superficial muscles and reduce their tone. Our study found that applying a hot pack to the abdomen easily brought out the higher activity of the IO during the abdominal hollowing and minimized that of the MT in static full-forward bending position once the IO was easily activated. Thus, strengthening exercises for the abdominal stabilizers plus thermal modalities for abdominal mobilizers may be effective for the rehabilitation of low back pain.

**THE INFLUENCE OF SKIN-FOLD THICKNESS IN DETERMINING IN DETERMINING**

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Purpose For this project we evaluated the palpation skill of two experienced athletic therapists (AT) and looked at the influence skin-fold thickness may have on agreement between the two ATs. The two AT’s palpated eight different locations on the upper arm and torso of young women, on two separate occasions. The AT’s were palpating for the presence or absence of a nodule in the muscular tissue that is often associated with a trigger point.

Methods Using a double blind process the two AT’s evaluated 19 subjects for this project. None of the subjects had experienced any upper body pain in the 6 months before the testing took place. The two AT’s agreed on the predetermined locations that would be palpated and marked each site with indelible ink. The AT’s were not given any verbal feedback from the subjects on whether or not a nodule had been located. After the completion of the palpation process, skin fold measures were performed at each location to determine skin-fold thickness.

Results A total of 264 locations were evaluated by each AT, 152 locations on day 1 and 112 locations on day 2. (5 subjects were unable to return between day 1 and day 2) The percentage agreement on day 1 varied from a high of 95% -to a low of 35% depending on the location. The percentage agreement on day 2 varied from a high of 89% -to a low of 65% depending on the location. Skin fold thickness was also measured at each of the testing locations and a significant difference (P<0.05) was found between locations. The location with the lowest skin fold values had the most agreement between the two AT’s as to whether a nodule was present or absent. The location with the second highest skin-fold values had the most disagreement between the two AT’s in regards to nodule status at the site. A comparison was also performed evaluating the intraclass correlation between the AT’s (ICC= 0.537) as to the status of a nodule at each location.

Conclusion Skin-fold thickness appears to be a factor when therapists are evaluating tissue. Locations with greater amounts of adipose tissue required repeated trials in determining nodule status. This was seen with the increase in the percentage of agreement between both AT’s from days one to day two at locations with greater amounts of adipose tissue. The percentage agreement between the AT’s did not really change in the locations with less adipose tissue. The low ICC scores for the palpation of the presence or absence of nodules are consistent with other studies evaluating manual techniques by therapist. The difference between this study and previous work in this area is the rigor at which the data was collected. Often a nodule in the muscular tissue may be associated with pain when pressure is
applied to it. With all of the subjects being asymptomatic of pain the therapist could not rely on some type of twitch response/aversion response by the subject to indicate the presence of a nodule.

**IMPACT OF PHASE CARDIAC REHABILITATION PROGRAM ON MORTALITY IN ELDERLY PATIENTS WITH STABLE CORONARY ARTERY DISEASE**


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Background: Cardiac rehabilitation has numerous benefits in not only modification of risk factors, but also improvement of mortality in patients with coronary artery disease[1,2,3]. However, there are few studies, which investigated the long-term efficacy of phase III cardiac rehabilitation in elderly patients. The aim of this study was to assess the impact of phase cardiac rehabilitation on mortality in elderly patients with coronary artery disease. Method: We included 36 male patients (more than 65 years). All patients participated in the supervising cardiac rehabilitation during 6 months. The cardiac rehabilitation consisted of exercise training, diet therapy, and counseling once a week. We followed up to 8 years after the program. Results: After cardiac rehabilitation, body mass index, %fat, fat weight, muscle strength of lower limb, anterior trunk flexibility, lipid profiles and glucose tolerance, were significantly improved. Five patients died (myocardial infarction: 1, cancer: 3, accident: 1). The value of 60min, 120 min, and area under the curve of 75g oral glucose tolerance test at baseline were significantly higher in the event group than the survival group. The value of %fat, and insulin of 60 min of 75g oral glucose tolerance test after cardiac rehabilitation were also significantly higher in the event group comparing with the survival group. The flexibility of anterior trunk after cardiac rehabilitation was significantly lower in the event group than the survival group. Conclusions: These data suggested that cardiac rehabilitation program in phase in elderly patients with coronary artery disease was effective for physical fitness, lipid profiles and glucose tolerance. Moreover, intensive intervention on deterioration of glucose tolerance and insulin sensitivity caused by fat accumulation may be needed to improve the long term prognosis in elderly patients with coronary artery disease.

References:

**HIP MUSCLE WEAKNESS IN PATELLOFEMORAL PAIN SYNDROME**

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INTRODUCTION: Patellofemoral pain syndrome is one of the most common knee complaints, especially in athletes, with symptoms often being triggered during activities such as walking down stairs. The potential causes of patellofemoral pain are poorly understood and thought to be multifactorial. One of the possible factors that may contribute to the development of patellofemoral pain is hip muscle weakness, particularly of the hip abductors and external rotators. However, there is limited research on the contribution of hip muscle weakness in this patient group. The purpose of this study was twofold, firstly to test the reliability of hip muscle strength measures and secondly to determine if hip muscle weakness is present in patients with patellofemoral pain.

METHODS: To determine the reliability of hip abduction and external rotation maximal torque, 21 healthy volunteers (14 females, 7 males, age: 22.4 (3.4) years, height: 167.7 (7.3) cm; mass: 65.2 (8.6) kg, mean (SD)) were tested on one limb on two separate occasions. Maximal hip abduction and external rotation torque were measured isometrically three times at 10 degrees and maximal concentric torque three times at 50 degrees/s (ROM from 0 to 30 degrees) using a Humac Norm isokinetic dynamometer. The affected limb of 18 patients with patellofemoral pain (age: 26.8 (9.2) years, range 19-50 years, height: 169.3 (9.4) cm, mass: 69.2 (12.5) kg) were then compared with the unaffected dominant limb of 18 matched healthy controls (age: 28.6 (10.3) years, range 18-53 years, height: 168.7 (112.8) cm, mass: 73.6 (112.4) kg). The torque values were normalised to body weight. A subgroup of patients (n=11) and healthy matched controls (n=11) also performed a step-down task with EMG electrodes placed over the posterior fibres of the gluteus medius (PGM) and the vastus lateralis muscles to determine reliability and differences in activation onset/offset times between the groups.

RESULTS: The hip muscle strength tests were found to be reliable (intraclass correlations r=0.85 to r=0.96, P<0.001). The patellofemoral pain patients normalised torque values were 21-22% lower than that of the controls in hip abduction (P<0.05) and 38-41% external rotation (P<0.01), isometric and concentric torque, respectively. The PGM/VL EMG step-down measures were found to be reliable (r=0.73 to r=0.89, P<0.001). However, no significant differences were observed between the groups in duration or onset of the PGM muscle, although the patellofemoral pain patients tended to have lower muscle activity than that of the controls during the maximal contractions.

CONCLUSIONS: Weakness of the hip abductors and external rotators is a problem for patients with patellofemoral pain. These data suggest that, regarding motor function of subjects, there were no significant differences between two groups at base line; however after the treatment, all sub-scales of motor function between two groups were significantly different. In the experimental group, the intervention...
improved all sub-scales of motor function significantly, though, no significant changes observed within the control group. In conclusion, physical therapy in conjunction with standard medical therapy, could affect motor function of people with Parkinson disease positively, and therefore could be beneficial for these patients.

Poster presentations (PP)

PP-SM03 Sports Medicine 3

EVALUATION OF EVIDENCE BASED TRAINING THERAPY IN PATIENTS WITH NON-SPECIFIC BACK PAIN VARIABILITY OF SPINE SHAPE PARAMETERS AND DIFFICULTIES IN SHORT-TERM COMPARAISONS

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In an attempt to evaluate the effects of evidence based individually designed training treatment in back pain patients we found significant alterations in pain, health state, trunk muscle peak force and spine posture parameters. But there are some difficulties for reasonable conclusions when you at the variability of back shape analysis parameters in longitudinal short-term interventions.

A sample of 29 back patients (22 females: age 54 +/-15 y, height 1,69 +/-/0,06 m, weight 71,0 +/-14,6 kg, 7 males: age 42 +/-13 y, height 1,89 +/-/0,08 m, weight 88,7 +/-15,2 kg) went through an individualized training intervention (2 units/week, 18 units at all) and were examined before and after the treatment in terms of pain (CR10 pain scale), health state self-rating (SF12 physical and mental score), trunk muscle peak force for back extension, trunk flexion, lateral flexion und trunk rotation (Myoline®) and posture parameters by means of back shape analysis (Formetric®).

There were significant decreases in pain score values (p= .002), significant increases in health state physical and mental scores (physical: p= .020, mental: p=.045 respectively). In addition we found various increases and alterations in peak force and spine shape parameters. Especially, back extension increased significantly (T=26, p<.000) from initially 40.0 kg (59.8/28.3) to 55.0 kg (82.7/43.8). In accordance to other findings there were some alterations in spine shape parameters. A significant increase of lordotic angles (T12-DM & maximum angle) can be observed, in women especially: maximum lordotic angle changes significantly (T=37.5; p=.012) from initially 39.5° (46.3/33.1) to finally 37.0° (44.0/32.3). For females and males there are changes with a tendency for significance (females: T=52; p=.084, males: T=0.0; p=.068) in the lordotic angle T12-DM from 36.8° (39.9/30.3) to 33.5 (38.8/30.5) and from 33.0° (34.0/28.5) to 32.0° (33.5/28.0), respectively.

Analyzing the data pool we recognized that there are angle alterations in both directions and of course more or less extended for the decision if an individual alteration of a spine shape parameter can be judged to be caused by a previous training treatment you have to be aware of the test reliability and the parameter variability in repeated measurements. In case of lordotic angle measurement we found reliability coefficients of rtt=0.92 0.95 (n=157) and a mean range of parameter variability of 2.7° to 3.1° (n=69). That means that individual alterations in lordotic angles should be considered to be induced by any treatment only, if the difference is more than approximately 3°.

Conclusions based on spine shape parameter changes are valid only with regard to these fundamentals. Judging changes in lordotic angles leads to valid information but there are numerous difficulties to rate changes in spine shape parameters like trunk inclination or pelvic tilt or vertebral rotation.

EFFECT OF FOOT AND ANKLE IMMOBILIZATION ON LEG AND THIGH MUSCLE VOLUME AND MORPHOLOGY: A CASE STUDY USING MAGNETIC RESONANCE IMAGING

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Introduction
Despite the routine practice of ankle joint immobilization after injury, the impact of said immobilization and the rate of recovery of both proximal and distal to the immobilized joint muscle groups is poorly characterized in term of muscle morphology and volume changes. The aim of our current investigation was therefore to systematically describe the changes associated with total ankle immobilization, using the quadriceps, hamstring and triceps surae muscles as models of atrophy and post-trauma recovery.

Methods
A healthy young woman (29 years) had suffered a fracture of the fifth metatarsal of the right foot. MRI scanning of her right thigh and calf muscles were performed on three separate occasions: the first, one month before the injury (Pre) during a scan initially planned as a teaching tool, the second, two days following a 4-week cast immobilization period (Post), and the third, after a two-month recovery period (Post+2).

Results
The results show muscle volume decrements in the triceps surae (TS), quadriceps (Quad) and hamstring (Ham) of 21.9, 24.1 and 6.5% respectively, between the Pre and Post measurements. At Post+2 the Quad and TS muscle volumes were still -5.2 and -9.5% decreased, compared with the Pre data. The Ham muscle volume however, was 2.7% greater than at the Pre phase. Following recovery, hypertrophy in individual TS muscle volume was limited to proximal and medial (with respect to the knee joint) segments of the muscles.

Discussion
The current case study shows that complete ankle immobilization leads to a greater loss of muscle volume than other hypo-activity models including unilateral lower limb suspension (Tesch et al. 2004), bed rest (Allen and Tesch 2004), and spaceflight (LeBlanc et al. 2000), where movements are still allowed though the degree of loading is substantially decreased.

Conclusion
These results indicate very substantial and rapid losses in muscle volumes, both proximally and distally to the immobilization site. The results also show that recovery is far from complete up to two months post cast removal. Moreover, the present study suggests the importance of awareness of the localised aspect of the degree of CSA changes. The results have implications for the requirements for rehabilitation for orthopedic patients.

References:
The analysis of the content gave us a half punctuation 5.49 ± 1.00 while punctuation obtained in the writing was of 5.27 ± 1.19. With regard to the content, all those questions with an inferior punctuation to the half punctuation were revised. However, the questions with an inferior punctuation at 5.8 were restated.

Aim of this work was to identify anthropometric and body composition variables that discriminate among groups of sub-elite male athletes aged 25-3 years ± 4.61 from four different sports (cycling, n=10; swimming, n=10; volleyball, n=10; soccer, n=17) and fitness controls (n=59). The anthropometric variables were weight (74.6 ± 9.07 kg), height (1.80 ± 6.9 cm), skin fold thickness in seven sites, sum of skin folds; body composition variable was % body fat estimated from seven skin folds according to Jackson & Pollock equation. Stepwise discriminant analysis was then applied to the 13 variables measured to develop a model capable of predicting which of the four different sports the athletes participated in. Statistical analysis was performed using SPSS software package. Results showed that the 4 discriminant functions were highly significant (P<0.001 for all). Squared Mahalanobis Distance to Centroid showed a better separation for cyclists and swimmers with respect to the other groups. Indeed, it was found that after cross-validation, 100, 100, 80, 77, and 70% of cyclists, swimmers, volleyball, soccer players, and fitness control, respectively, were correctly classified. The variance among 4 different sports and fitness controls was most explained by body dimensions, not body composition. These results suggest that sub-elite athletes practicing sports with different metabolic requirements can be identified with good accuracy by easy-to-measure anthropometric variables. This finding may be useful to identify talents in different sports.

VALIDATION OF A QUESTIONNAIRE FOR THE REGISTRATION OF INJURIES IN THE PROFESSIONAL SOCCER

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Introduction. 
One of the main concerns in the professional soccer, is the high incidence that suffer [1-3]. The main objective of this work is to infer in the causes, designing a new tool of evaluation of the injuries in the soccer. First step in all investigation for questionnaire is the validation of instrument [4].

Material and methods. 
For the process of validation of the instrument, you elaborates a first questionnaire conformed by 46 questions. That questionnaire was sent by 10 experts which known reputation national in this environment for their evaluation. The experts were distributed in two groups, the first specialists in qualitative statistic and the second group in the evaluation practical aspect.

Experts applied for the evaluation of each question, a scale likert of 6 units, valuing the relevancy, content and writing of each question. The results of each questionnaire of experts’ evaluation were processed in the program SPSS v.14 to carry out a descriptive analysis of three variables to analyze on each article.

Results. 
Of 38 questions included, 11 questions initially were excluded, what final questionnaire is 27 items. After descriptive statistical analysis of each questions, first approach, that you uses, was the relevancy. The obtained half punctuation was of 3.60 a 0.909 being eliminated all those questions with a punctuation <3.5 points. That takes us to exclude 11 questions.

The analysis of the content gave us a half punctuation 5.49 ± 1.003 while punctuation obtained in the writing was of 5.37 ± 1.191. With regard to the content, all those questions with an inferior punctuation to the half punctuation were revised. However, the questions with an inferior punctuation at 5.8 in the writing were restated.

This validation process gives us as a result a questionnaire formed by 27 questions, all of them closed character. Which we will be able to value the injury incidence in competition.

Conclusions.
The obtaining of a perfectly valid tool for registration of injuries in the current professional soccer.

References.
1 Roe, K., et al., The Orchard Sports Injury Classification System (OSICS) version 10

PHYSIOLOGICAL AND ANTHROPOMETRIC CHARACTERISTICS OF ELITE JUNIOR HANDBALL PLAYERS

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Introduction: Talent identification is the recognition of potential by means of certain measures accepted as markers of future high performance. Players’ anthropometric and physiological characteristics are recognized as important determinants of performance. Consequently, physical and physiological assessment may assist in the identification of young talents (Carter, 1967). The purpose of the present study was to define the physiological and anthropometric characteristics of elite junior Greek handball players.

Methods: Thirty handball players [age 15.5 (0.4) yrs, mean (sd)], all members of the Greek junior national team, participated in this study. The anthropometric measurements included: body mass, height, five skinfolds thicknesses (biceps, triceps, subscapular, suprailiac and
call), three circums (call and biceps relaxed and tensed) and two widths (femur, humerus). Body density was calculated using the equation of Durnin & Womersley (1974). Percent body fat was estimated from the measurement of four skinfolds using the equation of Siri (1956). The somatotype was calculated following the Heath & Carter method (1967). All anthropometric parameters were obtained according to Heyward & Stolarczyk (1996). Physiological assessment included: flexibility (sit and reach), running speed (5-m, 10-m, 30-m sprint from standing position), maximal oxygen uptake (20-m shuttle run) and muscular power (standing long jump and ball velocity at standing position).

Results: Height was 180.3(6.8) cm, body mass 77.8(11.2) kg, BMI 23.9(3.0) kg/m², body fat 14.3(9%), fat free mass 66.2(7) kg, fat mass 11.5(6) kg, endomorphy 3.0(1.1), mesomorphy 4.3(1.2), ectomorphy 2.4(1.3). The results for the fitness assessment were as follows: sit and reach 35.2(7.1) cm, 5-m sprint 1.07(0.0) sec, 10-m sprint 1.82(0.1) sec, 30-m sprint 4.4(0.2) sec, estimated maximal oxygen uptake 48.5(4.1) ml/kg/min, standing long jump 224.4(17.6) cm and ball velocity at standing position 78.3(7.2) km/h.

Discussion and Conclusions: The results of this study show that elite junior Greek handball players, compared with Danish youth national handball players aged 17.9(0.7) yrs had lower body height [188(6) cm], body mass [83.6(8.4) kg], maximal aerobic power [57.5(4.7) ml/kg/min], and standing long jump 35.2(7.1) cm, 5-m sprint 1.07(0.0) sec, 10-m sprint 1.82(0.1) sec, 30-m sprint 4.4(0.2) sec, estimated maximal oxygen uptake 48.5(4.1) ml/kg/min, standing long jump 224.4(17.6) cm and ball velocity at standing position 78.3(7.2) km/h.

References:

EXERCISE MAY PREVENT AMPHETAMINE ADDICTION
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The dopaminergic mesocorticolimbic system, which is stimulated by amphetamine and other drugs of abuse, is considered to be involved in reward-related associative learning and reinforcement, contributing to the development of drug dependence. The aim of this study was to verify the influence of chronic exercise in the mechanism of addiction using an amphetamine-induced conditioned place-preference in rats, a popular model of drug-mediated associative learning in humans.

Adult male Sprague-Dawley rats were randomly separated in two groups: with and without chronic exercise (n = 6-10 per group). Chronic exercise consisted in a 8 week running program in a treadmill (Panlab/Letica LE8706, Barcelona, Spain), with increasing intensity (velocity, slope and time); the group without chronic exercise had no contact with the treadmill. The conditioned place preference test was performed in both groups using the procedure and apparatus previously established by others. It has three phases: pre-conditioning (20 minutes with free access to all compartments and registration of the time spent in each one), conditioning (during 8 consecutive days, in every other day a session of 45 min with the intraperitoneal injection of 2 mg kg⁻¹ amphetamine or saline solution (0.9% NaCl), being the compartments associated with one of the conditions for each rat and test phase (same conditions as the pre-conditioning phase). Animals were sacrificed by decapitation 24 h after the last amphetamine or saline injection and brain dissected to obtain the striatum. HPLC with electrochemical detection was used to quantify the total tissue content of DA and its metabolites (DOPAC and HVA).

Since the pre-conditioning phase none of the animals presented preference for a compartment, all the animals were used in the study. The group without chronic exercise showed preference for the compartment associated with amphetamine (p < 0.05), being the opposite observed with the animals with chronic exercise (more time spent in the compartment associated with the saline injection (p < 0.05)). In the group with chronic exercise, significant differences were found between the animals treated with saline or amphetamine for the DA total tissue content, turnover [HVA+DOPAC/DA], DOPAC/DA ratio and HVA/DA ratio; between these groups no significant difference was found for DOPAC and in HVA contents. In the groups treated with saline significant higher values were found for the trained in comparison with the untrained animals for all these variables except DA.

According to the present results, chronic exercise may prevent the drug-dependence behaviour caused by this amphetamine dose and administration protocol in spite of an exercise-induced increase of dopamine synthesis in the striatum.

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PHYSICAL ACTIVITY MAY PREVENT OR AMELIORATE MIGRAINE BUT NOT TENSION-TYPE HEADACHE
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Exercise-related headaches are commonly seen but not often associated with significant underlying pathology. The International Headache Society classification (IHS, 2004) describes some forms well, but overall reflects our lack of understanding of how exercise and headache pain are related.

Migraine headache is common, mainly in women, and can be triggered by many factors, including physical activity, which is one of the criteria for diagnosis. In addition, migraine may be worsened by many components of an active lifestyle or specific training, such as resistance exercise, endurance training, or valsava maneuvers while training. Other factors are environmental exposure (heat and cold), dehydration, inadequate warm-up, altitude, fatigue, and dyspnea, which can occur during exercise. Exercise has not been related with tension-type headache, which is the most prevalent form of headache.

This study aimed to compare the lifelong prevalence of headaches in female students of medicine or sports, characterizing the headaches induced or aggravated by physical activity. These two populations were chosen due to the different level of exercise performed, they had similar demographic characteristics. A specific questionnaire was developed and validated.

224 students answered to the questionnaire. 94.3% and 45.6% of the sport and medicine students, respectively, regularly performed exercise. Headaches occur in 94.3% and 97.7% of the sports and medicine students, respectively. Considering the diagnostic criteria of the International Headache Society (2004), migraine, frequent episodic tension-type headache and infrequent episodic affected 11.3%, 50.9 % and 24.5%, respectively, of the subjects in sport sciences, and 20.5%, 63.2% and 17.0% of the medicine students, respectively; chronic tension-type headache occurred in only 2 and 5 sport and medicine students, respectively; primary stabbing or primary thunderclap headaches and primary exertional headache had a low prevalence (less than 2%); Some subjects have more than a type of headache. Routine physical activity is a trigger for migraine in 0.0% and 20.0% of sport and medicine students, whereas moderate to intense exercise-induced migraine in 0.0% and 20.0% of these populations. Routine or slight physical activity aggravated migraine attacks in...
16.7% and 45.7% of the sport and medicine students. For frequent and infrequent episodic tension-type headaches there are no significant differences between the students from sports or medicine for physical activity as an inducer or an aggravating factor. However, in the whole tension-type headaches are significantly less induced or aggravated by physical activity than migraine.

In conclusion, migraine but not tension-type headache is less frequent in subjects who regularly performed physical activity which is also more often an inducer or aggravating factor of migraine attacks than of tension-type headache, namely in subjects who do not perform exercise.

**PHYSICAL CHARACTERISTICS OF ADOLESCENT ELITE FEMALE HANDBALL AND VOLLEYBALL PLAYERS**

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Introduction: It is often the case that the demands of a sport dictate the morphology of the athlete’s body. The nature and the level of performance are also likely influenced by the physical characteristics associated with training for a sport (Carter, 1990). The aim of this study was to compare physical characteristics between adolescent elite female handball and volleyball players.

Method: Twenty-eight handball players (age 17.8±1.2 years) and 28 volleyball players (age 17.2±1.3 years) participated in this study. The anthropometric measurements included body mass, height, five skinfold thicknesses (biceps, triceps, subscapular suprailiac and calf), three circumferences (calf and biceps girth (both relaxed and tensed) and two widths (femur, humerus). Body density was calculated with the equation of Durnin & Womersley (1974) using the sum of four skinfolds (biceps, triceps, subscapular and suprailliac) for females aged <19 yrs. Percent body fat was estimated according to the equation of Siri (1956). All anthropometric measurements were taken in accordance with Heyward & Stolarczyk (1996) guidelines. Comparisons between the two sports were made using t-test for independent samples. Significance was set at p<0.05.

Results: No significant differences were found between handball and volleyball players in body mass, body fat, fat mass, free mass and endomorphy component (64.7±6.5 kg vs. 67.1±6.3 kg, 17.4±2.3 kg vs. 17.7±2.1 kg, 11.8±2.3 kg vs. 11.6±2.3 kg, 55.3±4.6 kg vs. 53.1±4.4 kg, 3.7±0.7 vs. 3.8±0.5, respectively). However, volleyball players were significantly taller (175.2±6.3 cm vs 166.9±4.7 cm, p<0.001) with lower BMI (21.8±1.8 kg/m² vs. 23.2±1.9 kg/m², p=0.011). In addition, handball players were significantly more mesomorphic (3.7±1.0 vs. 2.7±0.9, p<0.001) and less ectomorphic (1.9±0.9 vs. 3.0±1.0, p<0.001) than the volleyball players.

Discussion and Conclusions. The main findings in this study were that volleyball players were significantly taller with higher value in endomorphic component and lower in mesomorphic than handball players. These findings could be explained for a more strict selection of young athletes in volleyball and by a higher demand for jumping movements. The mean somatotype of the volleyball players was balanced endomorph (3.7-2.7-3.0), whereas handball players were characterized as mesomorph–endomorph (3.8-3.7-1.9). These data could be added to the reference bank of anthropometric characteristics for future testing and evaluation of young female athletes.

References:

ATTENDANCE AT INDOOR CHLORINATED SWIMMING POOLS IS ASSOCIATED TO ASTHMA: RESULTS OF THE SANA (SALUS NATATORUM, SWIMMER HEALTH) SURVEY

Ferrari, M., Mantovani, W., Papadopoulou, C., Tonellotto, L., Posenato, C., Schenk, K., Tardivo, S., Coppo, C., Ferrari, P., Lo Cascio, V.

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The Sana (salus natatorum, swimmer health) survey was started in 2005 targeting to investigate the possible relationship between indoor swimming pool environment and respiratory, dermatological disorders. Aim of the present analysis was to evaluate the association between attendance at chlorinated pools and asthma prevalence. We examined 1136 subjects (18-55 years of age, 59% women) attending public indoor swimming pools of the city of Verona, Italy. Individuals agreeing to take part in the survey were asked to complete a modified version of the ECRHS questionnaire. Some questions concerned the age at which asthma began, and, eventually, subsided. Participants were divided into two groups on the basis of the median of cumulative hours of pool attendance during life (first group <=320 hours, second group >320 hours). The prevalences of hay fever (22.3%), past asthma (8.7%) (positive answer to the question Have you ever had asthma?, in a subject without symptoms and not taking medicine for asthma in the last 12 months) and current asthma (13.5%) (a positive answer to the question Have you ever had asthma? in a subject having had an attack of asthma in the past 12 months) and/or using asthma medication were similar in the two groups. On the contrary, incident asthma (IA, asthma arisen at least 12 months after the beginning of pool attendance) as well as subsided asthma (SA, asthma present at the beginning of pool attendance, but subsided from at least 12 months at the time of interview) were shown to be significantly higher in the second group. In the multivariate analysis, adjusting for age, sex, family history of allergic diseases and smoking habits, only IA resulted independently associated with pool attendance (p<0.0001).

Our results suggest that the incidence of asthma is associated to the attendance of public indoor swimming pools.

PRESCRIPTION FOR POSITIVE EXERCISE EFFECTS ON IMMUNITY IN CHILDREN

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Purpose: Exercise is encouraged in children to improve fitness and as an intervention for obesity. Intense exercise is known to impair immunity in high performance athletes, but there is little evidence of how much exercise can be prescribed without impairing immunity in children. The purpose of this study was to determine the effect of exercise at different intensities on the salivary IgA (Sal-IgA) responses to acute aerobic exercise in children. The possible influences of age, maturation status and aerobic fitness level was also investigated.

Methods: Twenty-nine children aged 8-12 years old completed three cycle exercise tests: an incremental (maximal) exercise test to exhaustion, and submaximal exercise tests at workloads that elicited 75% and 50% of the child's VO2peak. Saliva samples were collected immediately before and after each exercise test, and after one hour of recovery. Saliva samples were analysed for Sal-IgA, albumin and osmolality to assess changes in mucosal immune function. The children were classified into groups based on gender (15 boys, 14 girls), stage of maturation (prepubertal or peripubertal), and aerobic fitness level (lower or higher aerobic fitness). Boys with VO2peak values ≤ 41 ml.kg-1.min-1 and girls with VO2peak 37 ml.kg-1.min-1 obtained from the incremental exercise test were classified as having lower aerobic fitness.

Results: There was a significant suppression of Sal-IgA after maximal exercise, with slight recovery one hour after exercise. Exercise at 75%VO2peak caused no immediate change in Sal-IgA, but suppression was observed after one hour of recovery. Suppression of mucosal immunity occurred after 50%VO2peak, with significantly higher Sal-IgA levels that returned to baseline levels after an hour of recovery. Aerobic fitness level influenced the degree of mucosal immune stimulation following exercise at 50%VO2peak. Children with higher fitness levels had greater increases than those with lower fitness levels. Children with higher fitness levels had greater benefit than those with lower fitness levels. Gender and maturation status had no influence on the immune responses to exercise at any intensity.

Conclusion: Exercise at maximal and high intensities suppressed children's mucosal immunity, potentially leaving them at increased risk of mucosal infections. In contrast, moderate intensity exercise stimulated mucosal immunity. Children with higher fitness levels had a greater benefit than those with lower fitness levels. Increased aerobic fitness levels and regular moderate intensity aerobic activity may improve mucosal immune protection in children and can be safely prescribed. Higher intensity exercise has the potential to impair immune protection and if undertaken caution should be advised in the recovery period to avoid potential infection.

THE USE OF CONTACT LENS DURING WATER POLO PLAY: A 15-YEAR PROSPECTIVE STUDY

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Doshisha University, Japan

Introduction

Water polo is a heavy contact team sport, which is why it is also regarded as rugby football being played in water. The rules of water polo prohibit players from wearing eyeglasses and swimming goggles. This rule forces players with low visual acuity to use contact lenses during play. However, the status of contact lens use in the pool among water polo players has not yet been reported.

The purpose of this study was to investigate contact lens use in the pool with respect to competitive water polo players from Japanese colleges in 1991, 1996, 2001, and 2006.

Methods

We investigated the following four groups of male water polo players from Japanese colleges: a group of 114 players in 1991, 118 players in 1996, 121 players in 2001, and 118 players in 2006. Information about the use of contact lenses during water polo play, the different types of contact lenses, the frequency of losing contact lens, and any previous cases of ophthalmopathy was obtained by administering a self-report questionnaire.

Results

Fifty-four percent of the players were using contact lens during water polo play in 1991; more than 74% in 1996 (p < 0.01); 87%, in 2001 (p < 0.01) and 84%, in 2006 (p < 0.01). While 96% of the contact lenses used by the players in 1991 group were soft type (SCL), 74%, 91%, and 86% of the contact lenses used by the 1996, 2001, and 2006 groups, respectively, were disposable type (DSDL). The problem was that the players using contact lenses during water polo play had sustained significantly higher corneal and conjunctival damage than players using vision correction devices in their daily lives and players without vision correction devices (p < 0.05).
Conclusions
These findings demonstrated that a high percentage of players were using vision correction devices during water polo play between 1996 and 2006. It is regarded that this is related that there were a lot of users of disposable type contact lenses. In conclusion, this study suggests that increasing contact lens use for water polo players may induce beneficial effects in terms of scoring and winning.

References:

MILK PEPTIDE INTAKE MAY REDUCE MUSCLE DAMAGE AFTER ECCENTRIC EXERCISE

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Eccentric exercise causes muscle damage. Treatments for reducing muscle damage have been introduced and a number of nutritional supplement treatments have also been examined. Of these, it has been reported that pre- and/or post-exercise intake of protein sources, which include protein, peptide, and amino acid, might be useful for muscle recovery following exercise. One possible reason for this is that intake of protein sources might attenuate exercise-induced muscle protein breakdown and stimulate muscle protein synthesis. Milk peptide, hydrolyzed casein, is known to be a source of protein with excellent digestive and absorption qualities. Our previous research has confirmed that pre-exercise intake of milk peptide reduced muscle soreness after stepping exercise. However, because the exercise lacked intensity, it did not induce elevations in muscle damage markers. Therefore, in this study we increased the intensity of exercise to induce muscle damage in order to determine whether intake of milk peptide decreased eccentric exercise-induced muscle damage.

Healthy male volunteers performed calf-raise exercise by shouldering a bar with weights, equal to each volunteer’s body weight. Blood creatine kinase (CK) activity and magnetic resonance imaging (MRI) of the calf were measured at pre- and immediately post-exercise (no MRI performed immediately post-exercise), and on day 1, 2, 3, 5 and 7 following the exercise to evaluate muscle damage. Transverse relaxation time (T2) of the calf, used for evaluating intramuscular water content and an indirect measure of muscle injury, was measured from T2-weighted image at proximal 75% of the length between the head of the fibula and the lateral malleolus on the right leg. Muscle soreness was evaluated pre- and immediately post-exercise, and every 2 hours from the night of the exercise to 5 days after the exercise, using a visual analog scale (VAS). The supplement included 5g of milk peptide, taken 13 times for a total of 65g in this test. 1h before exercise and immediately after exercise, and twice a day for 5 days starting the night the exercise was performed. This was a cross over comparison between with and without peptide supplement, separated by at least an 8-week interval. The VAS score of muscle soreness increased from 12 hours after exercise, and it reached a peak in the 60 hours following exercise.

In conclusion, we found that milk peptide intake may be effective for decreasing muscle damage after eccentric exercise.

HORMONAL REACTIONS TO ACTUAL TRAINING IN SWIMMING WITH RESPECT TO SEX AND TRAINING STATUS

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Hormonal Reactions to actual Training in Swimming with Respect to Sex and Training Status

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Aim of present investigation was to register blood values of the adrenocortical hormone aldosterone (ALDO) and renal excretion rates of the catecholamines during and after an actual swimming training (ST). Beside training reactions a comparison of the results between different sex and performance capacity of the subjects should be done.

With 15 male and 12 female swimmers of different performance capacity an extensive interval training ranging from 3500 to 4200 m in front crawl was conducted in water of 26 °C. Before, at the end and 1.5 and 3 hours after ST blood and urine samples were taken for determination of the hormones. Increase of plasma ALDO concentration induced by ST was less pronounced compared to equivalent exercise on land, a result of the competitive suppressive effect of immersion to ALDO (Skipka et al 1979). In males ALDO is increasing significantly from 161±83 to 263±118 pg/ml, in females however individual changes are differing strongly. Before ST their ALDO is higher than values of males (p<0.05) and only 1.5 hours after end of ST a significant elevation of ALDO can be stated (324±156 to 398±191 pg/ml). In both sexes training induced changes of ALDO are correlating significantly positively with the actual training performance. Basicallly and during ST renal catecholamine excretions display a significant dependence on sex and physical fitness. In males lower trained subjects are reacting during ST with an intensified increase of catecholamine excretions, while in females a corresponding augmentation of values is to be seen in the well trained group. The effects might be explained with similar behaviour of lactate values. Though the Noradrenalin/Adrenalin-quotient in females generally is significant greater compared to males, their training induced elevation of this value is equivalent.

References:
CYCLOSPORIN A DIFFERENTLY AFFECTS CORTICAL BONE AND CANCELLOUS BONE IN EXERCISE TRAINED MOUSE

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Immunosuppressive drugs like cyclosporin A (CsA) and FK506 had become a lifesaving treatment after alloplast organ transplantation. Immunosuppressive drugs like cyclosporine A and tacrolimus potently inhibit calcineurin activity which plays an important role in modulating osteoclastic activity and calcified tissues homeostasis. Systematic administration of calcineurin inhibitor such as Cyclosporin A usually performed severe osteoporosis in rat and human. The purpose of this study is to investigate the effects of Cyclosporin A administration on bone mechanical properties and whether exercise can alter such effect.

Methods: Forty-eight BALB/c mouse randomly assign into six groups which treat with 0, 10 or 20mg of CsA daily combine with or without exercise training, respectively. At 8 weeks of age, mouse of exercise groups began running 3 days per week on motor-driven treadmill with initial speed of 10 m/min, 0% grade for 10 min/day. Training intensity gradually increased to 18m/min and maintain 0% grade for 60 min/day within three weeks and maintain such training intensity until the end of training period. After eight weeks of exercise training, left femur and L4 vertebrate of all mouse were dissected and removed all connective tissues for mechanical test. The mechanical strength of the cortical bone tested by three-point bending at the mid-diaphyseal region of the femora and L4 vertebrate were tested by vertical compression test. Load-displacement curve was created for every sample and stiffness, maximal failure load, failure displacement and energy to failure were determined.

Results: Maximal failure load of femora were adjust by body weight. Mouse treated with CsA have higher maximal load/bodyweight ratio (10mg: 72.609±2.651 kgf/kg-bw, 20mg: 81.197±2.651 kgf/kg-bw) compared with untreated groups (0mg: 63.346±2.683 kgf). Stiffness and total energy load of femora also affected by CsA administration but only slightly affected by exercise training. Maximal failure load of vertebrate slightly decreased in mouse treated with CsA (10mg: 3.6164±0.7979Kgf, 20mg: 3.3931±0.7014Kgf) compared with untreated groups (0mg: 3.7977±0.8591 Kgf). Energy to failure significantly and dose-dependently decreased by CsA administration.

Conclusions: Administration of Cyclosporin A shows controversial effects in different bone tissues and such effects are not altered by exercise training.

PSYCHOTROPIC SIDE-EFFECTS OF ANABOLIC STEROIDS

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Anabolic-Androgenic Steroids (AAS) are abused both in high level-sports and in mass sports like leisure sports. The motivation and the attitude of this drug abuse as well as the biomedical side effects of anabolic steroids are widely documented. Here we report on the rather neglected issue of their psychotropic effects.

In this regard it has to be taken into account that for doping purposes anabolic steroid hormones are frequently taken in supraphysiological doses during the so called stacking periods. The link between this abuse of AAS and psychotrophic effects is still under discussion. Therefore we analyzed scientific databases e.g. Medline, Spolit focusing on the description of psychotropic effects correlated to AAS intake. The hits and also related articles detected in review articles, together more than 80 original papers including more than 1200 test persons were evaluated.

The papers were specified into three categories:

- Clinical trials with Abusers and Non-Abusers or defined administration of AAS
- Field studies in fitness clubs comparing the frequency and severity of psychotropic side effects between abusers and non-abusers of AAS
- Case-studies, medical observation and follow-up monitoring

To identify the psychotropic effects the Diagnostic and Statistical Manual of Mental Disorders criteria and other evaluated specific questionnaires were widely used testing the psychological inventories.

The most frequently used methods to examine psychotropic effects by now are to ask the abuser about the abused substance and diagnose the psychotropic effect by a standardized questionnaire. In field and case studies this comprises a high grade of uncertainty because of the mixtures of AAS usually consumed during stacking and the uncertain nature of the preparations administrated (unreliable sources of supply).

During clinical trials like application studies the administered doses have to be ethical maintainable and therefore have to remain from the supraphysiological doses, meaning that they can show only weak effects.

Psychotropic effects like mood alterations, enhanced aggression, depression, some forms of psychoses and dependence are considered to be linked to the abuse of AAS by all papers retrieved by our research except one.

While the alkylation on C-17 position of the steroid and liver toxicity are closely related no evidence of a correlation between a derivative of testosterone and a special psychotropic effect is described.

Further approaches are biological and pharmacological experiments regarding the correlation of AAS, central nervous receptors and behaviour. Further research seems necessary to describe the overall relevance of the side effects of AAS to human health.

ENDOTHELIAL FUNCTION IN ACTIVE INDIVIDUALS WITH AND WITHOUT INDUCIBLE AXILLARY ARTERY COMPRESSION

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Background: Some individuals demonstrate inducible axillary artery compression when the arm is placed in overhead positions. Repeated and forceful compression of the axillary artery by the head of the humerus has been linked to case reports of aneurysm and thrombus in overhead throwing athletes. However, the pathological significance of inducible axillary artery compression has not been investigated. Objective: The aim of this study was to investigate the local (3rd portion of the axillary artery) and downstream (brachial artery) effects of inducible axillary artery compression in active, asymptomatic adults. The key outcome variable, indicative of arterial health, was flow mediated dilation (FMD), a non-invasive assay of endothelium-dependent and nitric oxide mediated conduit artery vasodilation. Methods: Following ethical approval and written informed consent, subjects underwent screening for cardiovascular related conditions and upper limb injuries. Individuals previously tested for inducible axillary artery compression were placed in the “compressor group” (COMP: N=8, 2 males, 6 females, mean±SD age: 23±4 yrs) or the “non-compressor” control group (NONCOMP: N=8, 2 males, 6 females, 26±4 yrs). In a supine position with the dominant arm rested at 45° abduction, an 8-10 MHz linear array transducer recorded...
arterial diameter and blood flow velocity via a high-resolution ultrasound machine. A rapid inflation/deflation pneumatic cuff placed distal to the site of measurement, and inflated for 5 min, induced reactive hyperaemia. Custom designed wall tracking computer-software with synchronised Doppler waveform analysis detected changes in arterial diameter and blood flow velocity from baseline to 3 min following cuff deflation. Shear rate and blood flow were calculated continuously and automatically. Results: No differences in FMD were observed locally at the 3rd portion of the axillary artery between COMP (6.3±4.9%) and NONCOMP (10.3±4.5%) groups (P>0.05). However, the downstream brachial FMD response was significantly (P=0.006) diminished in the COMP (6.3±3.2%) compared to the NONCOMP group (10.3±4.2%). Shear rate i.e. the stimulus for dilation was comparable between groups (COMP: 81.9±44.5 s⁻¹, NONCOMP: 83.1±40.0 s⁻¹, P=0.05). A significant negative correlation (r=-0.52, P=0.038) was demonstrated between the FMD response and percentage of arterial compression when groups were merged. Conclusion: The diminished brachial FMD response observed in the COMP group indicates a statistically and clinically significant deleterious effect of transient axillary artery compression on arterial health. The similar shear rate between the groups confirms that this response is not a result of a reduced flow stimulus, but probably represents a chronic change in vascular function. The additive effect of forceful, repetitive overhead motion on arterial health in “compressing” individuals, as well as the long term consequences, needs to be investigated.

**Poster presentations (PP)**

**PP-SS02 Social Sciences 2 Economics**

**CRITERIA OF SUCCESS OF CHILDREN AND YOUTH SPORT DEVELOPMENT IN RUSSIA**

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**Introduction.**

The number of people involved in sport activities in Russia is increasing but makes not more than 12% total. However, the schoolchildren and youth's health condition and their physical fitness are rated as insufficient. According to the experts, more than 2/3 of the children and youth get to school practically healthy. But only each fifth pupil leaves it in the same condition. The number of children and youth involved into practising sports has decreased by more than 1.5 min.

**Methods.**

The legislation of children and youth sports has not been formed. The children and youth sport school system is supervised by different departments and institutions. It excludes a possibility to conduct an integrated public policy in the sphere of children and youth sport development. The number of professionally trained coaches has half reduced in the last 20 years. Children and youth sport development isn't financed by the federal budget. The children and youth sport basis is developing only at the expense of regional budgets. Shortage of means hinders reconstruction and renovation of the sports institutions material basis. At present, only 57.9% of the institutions are adequately supplied and have a sport basis at their disposal. Degradation of the sport basis leads to deterioration of the educational and training process quality. The children and youth sport schools are not included into the current national project “The Education”. The current system of medical control of young sportsmen’s activities limits the participation of the children with cardiovascular system pathology in sport activities only to some extent.

**Results.**

Small amount of sport events of different level for the schoolchildren, low financing and increase of the transportation fare tariffs can lead to degradation of the present day children and youth sport system. Furthermore, it will entail the qualitative deterioration of sport schools work, loss of interest of the children, youth and trainers to exercising and training since they can’t assess the results of their work as required.

**Conclusions.**

For further successful development of children and youth physical training and sports in the system of education attention should be focused on the following issues: search of new effective ways to attract school children and youth to various sport activities; creation of an integrated policy and implementation of the concept of the schoolchildren and youth sport development in Russia; solving problems of the children and youth sport as a priority of national projects; the usage of the state system opportunities for participation of the popular sport institutions in the improvement of the children and youth's health condition.

**THE COACH’S ROLE IN THE HUMAN RESOURCE MANAGEMENT IN THE PROFESSIONAL PORTUGUESE LEAGUE OF FOOTBALL**

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To be a coach is a complex job and requires flexible competences that can adjust to several situations and professional contexts. The coachman, as a people manager, has an important and a decisive action in sport organization performance.

The general objective of our study goes from the understanding of the football coachman’s role on managing the human resources in the Portuguese professional football teams. From this main objective, several specific objectives emerge, such as: i) to understand the coachman’s role in the players’ attraction and withholding; ii) to identify the main difficulties/obstacles to face to achieve the proposed objectives and produce results and understand the coachman’s role when facing this; iii) to understand the team’s cohesion as a decisive factor in the sportive performance; iv) to understand the importance of the results.

We have interviewed twelve coachmen from Portuguese professional league. Afterwards, we submitted the transcriptions of the interviews and the articles newspapers and magazines to a content analysis. We established four main categories: i) The coachman’s role in the players’ attraction and withholding, II) Difficulties/Obstacles, III) Cohesion, IV) Results.

The main conclusions from this study were: i) every interviewed coachmen have a decisive power when it comes to recruiting and integrating the players, and from these, 34% also have a decisive power when it comes to select the players. In the definition of objectives and in the definition of the most used reward (money), all coachmen’s power is just a consulting one; ii) being pointed by 75% of the interviewed the main difficulty/obstacle is the lack of positive results in a short period of time; iii) the cohesion takes a determinant role in
the coachmen’s work philosophy, it’s always present in their minds and pointing it as a vital factor to face/deal with the difficulties/obstacles; iv) the results are the factor that interfere most with the coaching role.

SPORT MANAGER'S SKILLS AND PROFESSIONAL PROFILE
Maçãs, V., Claudino, R., Serôdio-Fernandes, A., Quaresma, L., Maia, M.
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The Sport Manager is important in the management of sport organizations. He's activity allows the definition of professional profile. The Sport's Manager human capital assumes a decisive importance in sport organizations. It is considered as one of the most valuable resources in organizations, given its correlation in results and the role in the future organizations competitiveness.

The theoretical model used by Maçãs (2006), able us to characterize the perception of management activities nature developed by 124 Soccer Sport Managers (professional competition n=68) and no professional competitions n=56).

The data was obtained by documentary analysis, interviews and questionnaire (adapted and developed from Danylchuk and Chella-durai, 1999), concerning different activities of management of the Sport Managers. The data treatment was possible through content analysis and statistical procedures in SPSS.

To build the Sport Manager professional profile, was used the INOFOR (2002) recommendations and norms, based in a deductive and interpretative process, from the activities developed for the Sport Managers by considering five items: (i) job referential; (ii) skills mobilized; (iii) education and experience; (iv) work market specificities; (v) prospective elements.

The professional profile is a tool that allows: (1) to guide the educational system; (2) to determine professional itineraries; (3) to guide recruitment politics and careers management; (4) professional certification.

Sport Manager is a new profession of sport, with vital importance in the improvement of the functioning and competitiveness of sport organizations, as well as in strategic definition of its politics and missions.

References.

AN EMPIRICAL ECONOMIC ANALYSIS OF LAW ON ATHLETES’ PROPERTY RIGHTS: TAKE THE PERFORMANCES OF ARCHERS IN TAIWAN FOR EXAMPLE
National College of Physical Education and Sports (Taiwan), Taiwan

Both assistance fund and image rights fall under the property rights. However, what lays the groundwork for the existence of these athlete-concerned rights? Where do their property rights go and how are they divided? People’s answers to these questions remain varied. This research outlined some possible reasons for the existence of above rights in terms of natural rights of property, utilitarianism and economic efficiency through literature review. Players with more than 8-year experiences in participating in national archery competitions held these ten years in Taiwan (including one game of President Cup, Youth Cup, and Master Cup, respectively) were selected for this research, with their competition records about standard outdoor target archery rounds collected. Their statistical data were also arranged on a gender basis. Taking the each athlete’s scores for qualification rounds of each game as response variable, and the athlete thereof as well as his/her coach for the game as two explanatory variables, the researcher conducted an analysis by using General Linear Model. The result indicates a statistical significance observed in three sources the athlete, the coach and the interaction between them, either statistically or practically. This research bases itself on this empirical analysis to draw a conclusion for the bases of justifying these rights: natural rights of property or utilitarianism are merely the necessary conditions of the existence of these rights, while economic efficiency (transaction cost) is the very sufficient conditions. This conclusion can serve as a reference for future legislation.

References.

PORTUGUESE GOLF CONSUMERS’ ECOLOGICAL PROFILE
Baptista, M., Pires, G., Colaço, C.
Faculty of Human Movement, Portugal

This study aims to highlight the relevant features of the Portuguese Golf Consumers (PGC), in order to design the respective ecological profile. The ecological approach to the satisfaction of environmental needs has been largely treated by the green marketing theory [1], [2], [3]. The ecological approach implies an ecological awareness and a practice of choosing the product based on environmental characteristics [1], [2], [3]. Therefore, the authors intend to obtain PGC’s green profile through two consecutive phases: a) the evaluation of the environmental theme in the golfers’ everyday life and b) the assessment of the way the ecological component is perceived in the particular choice of golf consuming. The analysis model is formed by dimensions endorsing golf’s pleasure factors, national problems, ecological information, environmental quality, ecological responsibility and consumers’ ecological behaviour, as well as the perception of golf’s ecological impact, causes of golf’s ecological impact, awareness of golf’s environmental procedures, eco-label and golf’s environmental activities.

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References.
Each one encloses characterization variables (age, gender, educational level, type of practice) and dependent variables (organized by the alternative choices given for each pre-defined dimension).

The sample comprises 108 respondents to a questionnaire and represents the universe of the federated golfers who consume the service in the big Lisbon. A data base has been created, using the SPSS statistical programme and the gathered data was treated according to the exploratory character of the study, through descriptive parameters and adequate statistical graphics and tabulations.

Among some of the most important conclusions, the present study reveals that the environmental awareness of the PGC is high and above the average of the Portuguese population, however, they appear to have some difficulty to view the potential of the game’s negative environmental impact and often confuse the artificial green fields as good environment. Therefore, the authors defend that the ecological consciousness is a necessary step to alter golf consumers’ behaviour.

References.

LEADERSHIP OF VOLUNTEERS IN SLOVENIAN SPORT
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Sport in Slovenia represents 2.33% GDP (Bednarik, Kolenc, & Monik, 2001) and its constantly increasing trends are similar to that of developed countries. One of the important characteristics of Slovenian sport in non-governmental sports organizations is a large share of voluntary work (65% of total work). Evaluated economic strength of voluntary work in Slovenian sport, based on the average monthly salary, represents 0.311% GDP (Jurak & Bednarik, 2006); this make volunteers a very important source to manage.

A research about the leadership style has been conducted on the stratified 3% sample (N=190) of leaders in non-governmental sports organizations, which act in various segments of Slovenian sport.

In order to measure the styles of leadership, a questionnaire, based on Hersey-Blanchard situational model of leadership has been used. Questionnaire has been supplemented with questions about the characteristics of sports organization, about the work with volunteers within this organization and about the characteristics of the leaders. Reliability of the questionnaire has been analyzed with Cronbach alpha test. Significance of differences between individual variables has been analyzed with discriminant analysis, variance analysis and Pearson 2 test.

Leaders mainly use selling (in 42% of cases) and participating style of leadership (in 37% of cases). Telling style (12%) and delegating (9%) are used rarely. Leaders quite often adjust their style of leadership according to the circumstances; however, they do not use styles of leadership appropriate to the followers’ readiness.

Leadership style does not have a direct impact on the indicators, which measure the success of sports organizations. Similar conclusions have also been reached by other authors.

Furthermore, characteristics of the leader, type of sports organization or the way in which the voluntary work is being organized do not influence the style of leadership. Analysis of differences and correlations on the general level as well as on the level of particular variables within the listed segments lead to the conclusion that the leadership in sports environment is a rather unnoticed but existing reality.

Research indicates that the styles used for leading and managing the voluntary workers, are unsuitable. It is advisable that Slovenian Olympic Committee Union of Sports Associations prepares and performs expert training and guidance programs for sports organizations about the leadership styles of volunteers.

References.

SPORT LEVEL OF THE EUROPEAN INSULAR REGIONS. SPORTIVE DEVELOPMENT AND POLITICAL AUTONOMY OF THE INSULAR REGIONS OF PORTUGAL, SPAIN, ITALY, FRANCE AND GREECE
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Europe is not only made of continental countries. It is also an insular space with hundreds of islands and millions of people. European Union is nowadays formed by twenty seven State-members that have two hundred eighty six inhabited islands, representing 3.2 % of European territory and 3% of all European population. Each insular region has their own social and human development models, influenced in many ways by the autonomy levels and the type of relationship, under the constitutional law, with the continental country it belongs to.

Those social and human development models are not equally and we are faced with the question of knowing if the differences are a consequence of different autonomy levels. This reality motivated a study, in course, in order to determine the Sport Level in the European Insular Regions and compare that level with the same sport indicator of each of the corresponding countries. Sport Level is an indicator which allows a global vision of the sportive development stage reached by a certain country or region. This indicator expresses the connection between elite athletes and common athletes, known as basis.

The study focused on a descriptive analysis of data. It allowed the comparison between the Sport Level of five different countries (Portugal, Spain, France, Italy and Greece) and ten of their regions (Madeira Island, the Azores, Canary Islands, Balearic Islands, Corsica, Martinique, Guadalupe Island, Sicily, Sardinia and Crete). The focus was on differences and similarities through the analysis of human development indicators and levels of political autonomy of each region concerning their countries’ own capital. This last indicator was measured through an original quantification model. That original quantification model of the Autonomy Level regards Regional Competences, State Political Power and type of State Permanent Representation on the island.
The study also will allow to establish a connection between the Sports Level of each region and their sportive assessment concerning their results on the Jeux des Îles promoted by the COJI (Comité d’Organisation des Jeux des Îles). Through the use of Spearman Rho’s correlation technique and Wilcoxon Z’s comparison it will be possible to associate the results of all the variables.

Poster presentations (PP)

PP-TT03 Training and Testing 3

MONITORING TRAINING IN TEAMGYM GYMNASTS
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Introduction
The ability to monitoring training is critical to the process of quantifying and correctly planning training. Session RPE method has proven to be successful in monitoring training load during steady state, high-intensity and multiple types of exercises (Foster C., ‘96, ‘98, 2001). In Teamgym training sessions, gymnasts practice skills or sequence of skills within a specific apparatus (floor, trampoline, tumbling) and work on strength and flexibility. No previous studies were conducted to evaluate the session RPE method capacity to quantifying training in this kind of sport. The aim of this study was to evaluate the ability of the session RPE method to quantifying training during teamgym practice.

Methods
Ten female gymnasts (age=21.7±1.1 yrs; height= 164.9±6.6 cm; weight=54.6±5.4 kg) participated in the study. Three different training session (floor, tumbling, trampoline) were the object of our study. Each subject was monitored during training sessions with an Heart Rate (HR) monitor (Polar Team System); and the RPE rating was obtained using the category ratio (0-10) RPE scale of Borg. The subjects were asked to provide a rating of the overall difficulty of the training session 30 minutes after the end of the session to avoid that different difficulties of the exercises toward the end of the session would influence the subject’s rating. An exercise score for each training session was computed by multiplying the overall difficulty of the training session by the RPE (Session RPE).

As an objective reference method for quantifying each training session the summated HR zone method (Edwards S., ‘93) was used. The HR monitors were downloaded using software that allowed evaluation of the accumulated time in each of 5 HR zones based on 50-60%, 60-70%, 70-80%, 80-90% and 90-100% of theoretic HR peak (220-age). Time in each zone was used to calculate the training score (TRIMP) by multiplying the accumulated duration in each HR zone by different factors (50-60%=1; 60-70%=2; 70-80%=3; 80-90%=4; 90-100%=5) and summating the results.

Results
Pearson’s correlation coefficient was used to evaluate relationship between TRIMP scores generated using the summated HR zone method and the session RPE method of monitoring the training session. Results (Trampoline r=0.87*; Floor r=0.72*; Tumbling r=0.92*; overall r=0.84*; *p<0.05) showed high correlation coefficients between the two methods.

Discussion
Results of this study are consistent with previous observations of high correlated relationship between session RPE and the summated HR zones methods of evaluating training sessions.

Our results suggest that the session RPE method may be used as an easy method of creating a TRIMP score for evaluation of exercise training in teamgym sport.

References.

ENERGY COST AND POLE FORCES DURING NORDIC WALKING UNDER DIFFERENT SURFACE CONDITIONS
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Introduction. The purpose of the study was to identify the effect of three different surfaces on energy consumption and the forces acting on the walking poles during ground contact in Nordic walking (NW).

Methods. Thirteen female NW instructors (age: 26±4 years, weight: 58.5±4.2kg, height: 168.1±4.6cm) volunteered in the study. Each subject walked a distance of 1200m at a constant speed of 2.2ms-1 on each of a concrete surface (C), an artificial athletics track (A) and a naturally grown soccer lawn (G). They used NW poles with inbuilt strain gauge force transducers to measure ground reaction forces acting along the long axes of the poles. Oxygen uptake, capillary blood lactate (La), heart rate (HR) and rate of perceived exertion (RPE) were measured before and after the tests.

Results. Impact forces, maximum forces, force rates during ground contact identified from the registered force time histories displayed significant differences related to the surface conditions. However force time integrals did not show surface related differences. Relative oxygen consumption showed significant differences between NW on C and on G while no surface related differences could be identified between the surface conditions for the parameters i.a. HR and RPE.

Conclusion. Our results suggest that the impulse which is generated by the subjects through the poles is identical between the varying surfaces. Since there are differences for the oxygen uptake between C and G the main regulator for the propulsion must be the musculature of the lower extremities. The work of the upper extremities seems to be a luxury effort for Nordic walkers with a proper technique.

THE DEFENSIVE PERFORMANCE IN HANDBALL ANALYSIS OF THE THREE FIRST-PLACED TEAMS IN MEN'S EUROPEAN CHAMPIONSHIP 2006
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Introduction
The defensive performance in handball is considered as one of the most important team efficiency factors. However, the majority of notational studies still focus on game offensive process, limiting the information about defence to few performance indicators. Therefore, this study aims to analyse and describe the Defensive Process (DP) of the best European teams, classified in three first places in the Men’s European Championship 2006.

Material and Methods

In total, 23 matches were analysed (France - 8, Denmark - 8 and Spain - 7). A specific computer program (ORAND) was created to register a total of 1854 defensive actions from 1042 DP. The 68 defensive performance indicators were grouped in 9 categories: defensive process duration, time of the game, game result, player, defensive action, defensive zone, process result, defensive system, phase of game. Data was analysed through descriptive statistic.

Results

The main conclusion drawn from this study was that all teams had some characteristics in common, as well as distinctive particularities. In common was registered the high defensive efficiency: France - 55.6%, Spain - 51.7% and Denmark - 47% and, particularly, the high goalkeeper efficiency: France - 46.4%, Spain - 54% and Denmark - 52.5%. These three teams had a high percentage of their DP in position defence phase: France - 77.2%, Spain - 74.7% and Denmark - 81%. Interruption of ball circulation with fault was the defensive action with highest frequency of registers: France - 35.2% of all defensive action, Spain - 27.5% and Denmark - 37.6%.

The failure percentage in 1x1 was the most frequent reason for the defensive failure: France - 16.2% of all defensive actions; Spain - 22.3% and Denmark - 17.5%.

The defensive success was essentially associated with the interception ability: Interceptions represented 5.4% of all defensive action of France, 6.0% of Spain and 5.1% of Denmark.

The capability to interfere with the opponent-shot was represented by frequency of blocks and shot pressure percentage. France used blocks in 4.3% and shot pressure 12.6% of all defensive action, Spain in 4.3% and 12.7% and Denmark in 2.9% and 10.2%, respectively.

The most important difference between the teams was the diversified interpretation of the defensive system of each one. The dominant defensive system of France was 5:1, during 64.3% of the DP. Spain and Denmark used the 6:0 with 40.8% and 45.6% respectively.

Although Spain and Denmark used the same defence system, they had a very unique realization of the schematic figures. Spain used the second’s defenders of the 6:0, to press the opponents’ throwers; Denmark made this pressing with the central players. The French advanced centre player made a large pressing under the playmaker and the back centre player had the best block percentage.

The results suggest that for assessment of defence play of teams it is necessary to consider their particular defence organization.

REPRODUCIBILITY OF AN ISOKINETIC ECCENTRIC MUSCLE ENDURANCE TASK

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Despite the widespread use of isokinetic eccentric muscle endurance protocols there appear to be no studies that have examined the absolute and relative reliability of such tests. The aims of this study were to examine the reliability of a repeated isokinetic eccentric knee muscle endurance task. Fifteen healthy untrained males volunteered to take part in the study and written informed consent was obtained.

The study received ethical approval from the University Research Ethics Committee. Subjects visited the laboratory on 3 separate occasions; 2 weeks prior to testing to familiarise them with the experimental procedures, and on 2 separate occasions, 2 week apart and at the same time of day. Isokinetic eccentric knee extension and flexion of the dominant limb were measured using a calibrated Biodex system 3. Range of motion during testing was set using voluntary maximal full extension (0 rad) to 1.57 rad of knee flexion and testing occurred at 1.56 rad/s-1. Subjects performed four maximal efforts to determine maximal peak torque (PT). A 120s rest period was then given before the endurance test of 50 continuous eccentric repetitions. Subjects were encouraged to give a maximal effort for each action. Data were gravity corrected and windowed to only include constant velocity periods. Data were analysed using SPSS for Windows. Repeated measures ANOVAs were used to investigate differences in maximal peak extension and flexion torque and the maximal torque measurement recorded during the endurance test. Reproducibility was assessed through calculation of intra-class correlation coefficients (ICC), repeatability coefficients (RIC) and 95% limits of agreement (LOA) using the methods described by Bland and Altman for torque fatigue index (TFI), work fatigue index (WFI) and total work (TW).

PT difference between the strength test and the endurance trial were found to be non-significant for both quadriceps (323 Vs 323 Nm) and hamstrings (1183 Vs 178 Nm). ICCs indicated significant (p < 0.05) positive moderate to strong correlation between test 1 and 2 for all pain thresholds except hamstring torque fatigue (p = 0.11) and hamstring work fatigue (P = 0.08) index. RCs and LOA indicated systematic bias for both TFI and WFI for extensors and flexors, ranging from -3 to -10, with less fatigue evident in the 2nd test. There was also systematic bias for TW with more work performed during the 2nd test compared to the 1st. The random error was large for all variables and there was greater variability in the hamstrings compared to the quadriceps. Along with moderate to strong ICC’s, these data suggest that there is small systematic bias in repeated eccentric muscle actions for both the quadriceps and hamstrings, however the random error is large despite extensive habituation procedures.

Therefore, data from an isokinetic eccentric muscle endurance task should be viewed with a degree of caution.

CONSEQUENCES OF SWIM, CYCLE, AND RUN PERFORMANCE ON THE OVERALL RESULT IN OLYMPIC-DISTANCE TRIATHLON

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Purpose: Olympic triathlon is a multidisciplinary sport that comprises three different modalities (swim, cycle and run) which are conducted in succession. Overall triathlon time consists of the three legs and the two transition times between the three legs. In order to achieve the fastest overall time possible, the times needed for each leg have to be minimized and athletes have to consider the aspect of marginal return when deciding how to use their resources in training and competition. The purpose of this analysis was to find out which of the three disciplines is of superior significance for overall finishing times and rankings.

Methods: Overall times and rankings as well as rankings and times for each of the three modalities of all athletes who competed in the Olympic-distance triathlon world championships in 2007 (junior women, n = 59, junior men, n = 77, U23 women, n = 30, U23 men, n = 62, elite women, n = 60, elite men, n = 66) were analysed. By calculating correlations and multiple linear regressions beta weights for each of the three modalities were calculated. Calculations were carried out for all athletes who participated in the above mentioned competitions as well as for the 20 highest-ranked finishes.
Results: There was a significant correlation between the times of all modalities and overall finishing times for all finishers (all p < 0.01: junior women: swim 0.61, cycle 0.84, run 0.84; junior men: swim 0.81, cycle 0.88, run 0.85; U23 women: swim 0.47, cycle 0.66, run 0.83; U23 men: swim 0.47, cycle 0.80, run 0.80, elite women: swim 0.62, cycle 0.83, run 0.83, elite men: swim 0.51, cycle 0.76, run 0.85. For the junior athletes the highest beta weights were found for the cycle (Beta ≥ 0.50), for the U23 athletes as well as for elite women and men the highest beta weights were found for the run (Beta ≥ 0.57). When limiting the analyses to the 20 best overall finishers, no significant correlation between modality times and overall finishing times could be found for junior athletes whereas for U23 athletes as well as elite athletes there was a significant correlation between run time and overall time. The highest beta weights for the 20 best overall finishers were on the run (Beta ≥ 0.82) in all subgroups.

Conclusions: Since drafting is allowed in Olympic-distance triathlon races, the run has been upvalued whereas the swim and the cycle have been devalued. Except for junior athletes it can be stated that the most decisive factor for winning or not winning an Olympic-distance triathlon is the time needed for the run whereas an athlete’s placing after the swim or the cycle has no prognostic relevance for his or her final placing. Judging from an efficiency-oriented perspective, triathletes should emphasize training the run rather than emphasizing the swim or the cycle.

**INFLUENCE OF VARIABLE RECOVERY INTERVAL PATTERNS ON FATIGUE DURING REPEATED SWIMMING SPRINTS**

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The effect of recovery duration on repeated short cycling sprints has a significant effect on performance (2). A recent study (1) has shown that during repeated 6s cycling sprints, an increasing recovery interval results in a smaller decline in peak and mean power output, but lower total work compared to decreasing recovery intervals. Although variable recovery intervals are commonly used in swimming training, there is a lack of informing performance. Moreover, the drop in performance during repeated sprints is much less in swimming compared to cycling (3)(2). Therefore, the purpose of the present study was to examine the influence of two different recovery interval patterns on performance and fatigue during repeated swimming sprints. Ten male elite water polo players (age: 24.5 ± 1.8 yrs, height: 183.3 ± 1.8 cm, body mass: 85.7 ± 4.9 kg, mean±SE) participated in this study. Participants performed 6x50m sprint swimming test in two different occasions in random order. On one occasion, the recovery interval after each sprint was decreased from 30s to 10s in 5 s steps (condition D) while on the other occasion the interval was increased from10s to 30s (condition I). Differences between the two conditions in performance time for each sprint and fatigue during each protocol (percent increase of performance time from the first to the last sprint) were analyzed using two-way ANOVA. Results are presented as mean ± SE. There was a condition vs. sprint number interaction in performance time (p<0.01). Performance time in the 6th sprint was better maintained in the I compared to the D condition (31.8 ± 0.3 vs. 34.6 ± 0.6, p<0.001). Consequently, the drop from sprint one to sprint six was half in the I compared to the D condition (10.2 ± 1.6 vs. 21.0 ± 3.4%, p<0.01). The results of this study suggest that the recovery patterns influence performance despite the fact that the total recovery time was the same in the two conditions. An increasing recovery interval may be more effective in maintaining higher performance during swimming training, while a decreasing interval may be used when a greater stress is desirable.

References.

**IL-6 AND TNF-α RESPONSE TO HIGH VOLUME TRAINING PERIOD IN HIGHLY TRAINED MALE ROWERS**

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Excessive musculoskeletal stress associated with insufficient rest and recovery may induce a local acute inflammatory response that may evolve into chronic inflammation and produce systemic inflammation and is suggested as a cause of overtraining and further the overtraining syndrome (Smith 2000). It has been shown that IL-6 and TNF-alpha increase during endurance exercise, as an acute inflammatory response (Ostrovski et al 1999). Robson-Ansley et al (2007) indicated elevated IL-6 levels after intense interval training program. In contrast, Stewart et al (2007) showed that a 12 week training program had no effect on fasting concentrations of IL-6 and TNF-alpha in physically active and inactive subjects. Limited data is available on the cytokine response on high volume, low intensity trainings that are prevalent during the preparatory period. The aim of the study was to investigate the response of the IL-6, TNF-alpha and leptin concentrations during high volume training period in male rowers.

Eight male rowers (age 20.2±1.6, height 183.9±4.6, body mass 81.0±5.4) participated. During the four week period of high volume low intensity, training volume increased from 587.3±149.9 min/week, with the intensity kept constant. Long distance rowing at 80% of anaerobic threshold for 2 hours was carried out after the day of full rest at baseline (T1), after high two weeks of high volume period (T2) and after recovery period (T3). Venous blood samples were obtained before (PRE), immediately after (POST) and 30 minutes after (POST30) long distance rowing. Leptin concentration significantly decreased at POST and POST 30 compared to PRE during T2. At T2 POST 30 leptin concentration was significantly decreased to POST 30 value at T1. IL-6 concentration increased significantly at POST and POST 30 test compared to PRE test values during all the tests. POST 30 level of IL-6 at T3 was significantly higher than POST value during T1. TNF-alpha concentration increased significantly at POST compared to PRE only during T2.

In conclusion, high volume training decreases exercise-induced leptin concentrations and increases TNF concentrations, with no effect on IL-6 concentration.

References.
DYNAMIC VISION OF TOP ATHLETES

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Due to their high motion and action speeds most sport activities demand an outstanding capacity and precision of vision. Especially dynamic visual functions are required in successful sports performance, but also in accident and injury prevention. Conversely, visual performance might benefit from physical strain (1).

PURPOSE: The present study aims to assess dynamic visual performance of top athletes compared to visual reference values of non-or-leisure-time athletes. Recent findings suggest improvement of dynamic vision following physical exercise (cycle ergometer), an activity largely unrelated to particular visual demands (1). Here we ask whether dynamic visual performance might be more specifically linked to the respective sport activity or profession.

METHODS: A total of 152 male top athletes (29 baseball players, average age: 24.2 ± 3.9 years, 56 football players, average age: 25.4 ± 4.4 years, and 67 hockey players, average age: 21.1 ± 3.0 years) of different German national or first league teams participated. Dynamic vision was tested by a form-from-motion analogue to the Landolt test as developed by Wist et al. (2). Within a random-dot display, Landolt rings of the same average luminance as their surrounds become visible only when the dots within the ring are moved briefly while those of the surround remain stationary. Thus detection of gap location is based upon motion contrast (form-from-motion) rather than luminance contrast. With the size and exposure duration of the centrally presented ring held constant, motion contrast is manipulated by varying the percentage of moving dots within the ring. Subjects report gap location (left, right, bottom, top).

RESULTS: Compared to the reference sample (299 unselected, non-or-leisure-time athletes, healthy males between 20 and 34 years), taken from a previous study (3) with a mean score of 81.9 (± 2.26 SE), baseball players and hockey players showed a better performance (87.3 ± 2.41 SE; 83.3 ± 1.60 SE), whereas football players resembled the reference (81.7 ± 1.74 SE). Thus, with the reference set to 100%, the raise in performance level for baseball players amounts to 6.6%. The difference between baseball players and football players was significant (p < 0.05). The three groups did not differ with respect to static visual acuity (p > 0.70; VA between 2.03 and 2.11).

CONCLUSION: The data provide the basis for applications which include differential assessment of dynamic vision of athletes. They further suggest that the improvement of visual performance is specifically related to the respective sport activity.

References:


COMPARISON OF TWO BODY FAT PERCENTAGE MEASUREMENT METHODS (BIA VS SKIN FOLD) ACCORDING TO SEX IN SWIMMERS

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This research is carried out in order to determine the differences between two body fat percentage (BF%) calculation methods, that are Bioelectrical Impedance Analysis (BIA) method and skin fold (SF) measurement tests. The data of 32 swimmers (22 male and 10 female), who are at top 10 in Turkey among their age groups and attended the competition of Selection of National Team which was held on January 19-20, 2008, Ankara are collected. The age, height, weight and BMI measures for female and male swimmers are 17,00±3,16 years, 166,00±5,58 cm, 56,80±5,89 kg, 20,62±1,91 kg./m2; 16,22±1,77 years, 176,14±7,61 cm., 67,54±10,76 kg. 21,68±2,38 kg./m2 respectively.

The data are taken 15 minutes prior to the performance. Tanita BC-418 body composition analyzer and Holltain brand skin fold caliper, which provides 10 g/m2 pressure in all angels, was used for BIA method and skin fold measurements respectively. BF% with SF is obtained by using Jackson-Pollock(U-Pi) formula. Repeated measurements ANOVA test was used to investigate the differences between two methods of BF% measurements. The difference between two measurement methods is evaluated with DUNCAN test. Consequently, according to BF% measurement with BIA method, no statistically significant difference was found between male and female subjects (M=14,39±3,92; F=20,10±3,05 (P<0,05). On the other hand, there was found statistically significant difference in SF method (P<0,05). It is found that, M subjects’ BF% values (12,26±6,00) are lover than the F subjects’ (24,23±3,24).

References.

EFFECTS OF A SPECIFIC TRAINING PROTOCOL ON BODY COMPOSITION AND BALANCE IN HEALTHY ELDERLY WOMEN

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Equilibrium disorders are frequent symptoms of aging because of both sensorial perceptive and neuromuscular system decay [1,2]. They might be responsible for the postural control failure and falls of elderly subjects under adverse environmental factors. Physical activity is one of factors that contribute to improve postural control and reduce the risk of falls [3]. The aim of our study was to evaluate the effects of short-balance-training-program (SBTP) on body composition (BC) and several balance control indicators (BCI) in elderly women.

Ten healthy and active elderly female subjects (age: 68.67 ± 5.50 year; mass: 63.74 ± 7.83 Kg; height: 1.50 ± 0.03 m) were trained for 5 weeks by SBTP that consisted of 2 sessions/week in the first three weeks and 3 sessions/week in the last two weeks. Training intensity increased in the forth and fifth week by the addition of new exercises. Every session included a warm up pattern for 15 minutes (min); a circuit of balance training including a standard sequence of exercises performed with the hands along hips and cool down model for 10 min. Subjects followed the training circuit once in the ﬁrst week and twice in the next weeks. BC was analysed by a multi-frequencies (5, 50 and 250 kHz) bioelectrical impedance analysis system (inbody320). Balance control indicators such as mean speed (MS), anterior-posterior mean speed (MS-y), sway path (SP) and ellipse surface area (ESA) of the BMC were analysed by Sway Test (unipedal or bipedal test with eyes open or closed) on the stabilometric platform. All data were acquired before and after the experimentation. Results were compared using nonparametric and paired Student’s t-test and the statistical signiﬁcance was set to value of P<0.05.

BC did not change in response to SBTP. Instead, impedance index (height squared divided by impedance) of both lower limbs showed a signiﬁcant increase in trained subjects. All BCI decreased after the SBTP; however only MS, MS-x, MS-y, SP in bipedal condition with eyes open and ESA in left and right unipedal conditions with eyes open and closed were statistically signiﬁcant. Our results suggest that SBTP may develop the eye-foo coordination in elderly women. Moreover, the increase in lean body mass of lower limbs may contribute for improved postural stability. Therefore, SBTP appears to be suitable for improving the balance control systems in elderly women and may be an efficacious method to decrease equilibrium disorders.

References.


OPTIMISING THE EVALUATION INSIDE PHYSICAL EDUCATION THROUGH INTERDISCIPLINARY METHODS

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Introduction

The sport performance is determined by multiple factors and no one can say for certain which factor has a greater balance when its numbers are reaching the superior limits of the sportsmen’ capacity. The novelty of this research will consist of the following:

A new approach of the work methods inside the new female volley players’ training.

Elaborating a test containing the psycho-motrical elements which are the object of research inside ball work.

Using a new method of evaluation-the method of the genetic algorithm, for evaluating the psycho-motrical aptitudes;

The appeal to Mathematical improved methods for calculating efficiency inside the game of volleyball.

The basic idea for choosing and structuring this paper is the fact that under the actual conditions, the complex study of the sport activities becomes interdisciplinary, being realized both with the help of classical research methods, but also by using those methods borrowed from other fields of activity. Thus, the genetic algorithms method was used to evaluate some components of the psycho-motricity. Coordination, balance and space orientation are taken into account, being included in a test created in such a way as to include all of them, inside ball work. In order to calculate the efficiency inside the volley game there already existed some mathematical formulas applied by considering the number of ball-touching inside a set or a game. As a novelty element, an improved mathematical formula was used by introducing the time parameter, the number of ball-touching-s being reported to the time spent on the fi eld. It is considered that the efficiency value is much closer to reality, being this way objective.

Conclusions

The three psychomotricity components treated during this research are very little used during the selection process, but there are many means of instruction which can be used with a view to educating the psycho-motrical components, the psycho-motical components-coordination, balance, space orientation-contribute to the efficient learning of the volley game as a whole. For the final evaluation of the game, there are means to calculate the efficiency of the players in function of their evolution. The method of the genetic algorithm was adopted by our system on the background of having an evaluation as complex as possible of the above mentioned relation. Its use contributed to an increase of the efficiency and quality of the training, especially in what concerns the operational strategies applied.

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OPTIMISING THE EVALUATION INSIDE PHYSICAL EDUCATION THROUGH INTERDISCIPLINARY METHODS

Charakterization of 32 swimmers; Association between anthropometry and performance

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The aim of this study was to analize possible relationships among anthropometric data and performance in age group swimmers. The best 32 swimmers were selected out of the best performance in 400Free and 200Medley of Leiria’s district. The sample comprised 16 girls (9-11-y-o) and 16 boys (10-12-y-o). A total of 38 measurements were taken in a weekend. Differences among genders were obtained in span/weight, length of upper extremity length, upper body flexibility, hand strength (p<0.01) and in span, biacromial breadth, curl-ups
%fat mass, critical velocity and slide (p<0.05). To analyze correlations Pearson factor was used. Positive correlation was found between: (i) weight and span, length of hand and foot (p<0.01) showing that taller boys and girls have bigger propulsive segments; (ii) body mass index and the sum of 6 skinfolds (p<0.01), slide (p<0.01) and horizontal fluctuation (p<0.05) showing that fatter swimmers increase their buoyancy getting bigger fluctuations; (iii) length and width of hand with hand strength (p<0.01) measured with a dynamometer. Negative correlation was found in: (iv) 50m freestyle time and hand width (p<0.01) and span (p<0.05) making us assume that width and length of the propulsive segments play an important role in short distance events; (v) this assumption is even more evident when analyzing the negative correlation among hand strength and time in short events (50F, p<0.01, 100F, p<0.01, 200F, p<0.05, 400F, p<0.09). As expected (vi) critical velocity showed a negative correlation (p<0.01) with time in 50F (-.767), 100F (-.794), 200F (-.866) and 400F (-.991). These results are similar to Papoti et al. (2005) with 17-y-o swimmers. As the distance increase, so does the association between critical velocity and aerobic capacity, meaning that the latter plays a major role in longer distance performance. Critical velocity is an easy method of evaluation. However studies developed with this range of age are scarce and must be taken in order to assume these conclusions.

References.

A NEW LOW COST GADGET DESIGN TO MEASURE THE WEIGHT BAR VELOCITY IN A BENCH PRESS USING CHRONOJUMP

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The proposal of the present study was to determine a new gadget validity to assess the average velocity and the displacement of a weight bar using Chronojump (De Blas, González-Gómez, 2005). The new design is based in a contact bar simple and low cost mechanism that detects the conductivity of electrical potentials (Svala) through a precision chronograph (Skypic 1.0). This system allows the coaches to assess speed, power and strength parameters to control the training process. The validation study was carried out between a Chronojump (ChJ) utility (chronopic and software) and MicroMusclelab® engine (mML®) to measure the concentric action parameters of bench press bar displacement. A number of 75 actions from 13 subjects were recorded using the two methods in the same action and some values were compared: bar displacement with the new gadget (Displ. B), time with ChJ (T CJ), bar displacement with mML® (Displ ML), time with mML® (T ML), power with mML® (W ML), average velocity with mML® (Av V ML). Besides, the work, power (W ind) and the average velocity (Av V) were calculated taking the ChJ time values and the displacement statically measured with the new contact gadget. The Pearson correlation between T ML and T CJ was r=.964 (p=.00), between W ML and W ind was r=.945 (p=.00), between Av V ML and Av V was r=.966 (p=.00) and the correlation between Displ ML and Displ B was r=.922 (p=.00). We also take into account the correlation as the displacement statically pre-measured with the new gadget and the values obtained from mML®. The high correlation values are not as high as the other parameters but high enough to be worth studying the error in the measures for the whole sample and each different loads. Relative error of 2.26% (+ 1.04%) was found. Observing the correlation values for each load, a high assessment problem was detected in the lowest one (20kg). According to this fact, a new relative error of 1.83% (+ 9.8%) was calculated excluding the 20kg actions. According to these findings, same correlation and error magnitudes were reviewed in Weiss et al. (1998), Markovic et al. (2004) and other authors. For the future, more sensors to assess new mechanical parameters are developing. In addition, new applications has been included in the latest software version available ChJ web site.

References.

TRENDS IN THE APPLICATION OF PUNCHES AND KICKS IN K-1 SPORT

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Various observations and analyses of fights by experts of different profiles have resulted in broadening and strengthening knowledge of different possibilities for applying and making technical components of K-1 sport more concrete (Kapo, 2006, Kapo, 2007). The research has been carried out on a sample of 96 top level super heavyweight (over 91 kg) male fighters participating in final K-1 tournaments in Japan from 1993 to 2004 (in 84 matches and 205 rounds). The objective of the research was to analyse the application of technical elements during the fights of the most successful K-1 fighters in the world. This paper is based on an explorative approach to K-1 phenomena in situational conditions. The situational aspect has been provided through video recordings of all fights. This resulted in a thorough sectional view of the most successful fighters, helping to determine an absolute criterion for defining what a quality fighter is, as the final tournament gathers only the 8 best fighters in the world. The gathered data on technical elements have been processed with the descriptive static method and presented according to the total frequency of their application. By means of trend analysis we examined the development trends in the application of technical elements (delivered both with hands and legs) in the sense of their increase and decrease in the period of 12 years, as to obtain data on the average application of technical elements. By analysing fights at the final GP K-1 tournament in Tokyo Dome we obtained information on which techniques are frequently applied in K-1 (low kick right, direct left, techniques rarely applied (kakato geri, direct punches in the stomach) and those applied very rarely or almost never. These findings are highly important as they not only point out the arsenal of the most efficient techniques and its hierarchy, but they can also indicate the only methodologically right manner of teaching K-1 fighting techniques. These data help shorten the time period needed to create a top quality K-1 fighter (as we all know, in all martial arts and, consequently, K-1 a fighter is at its best usually around the time when his age is already becoming a problem, forcing him to stop fighting) by only informing the fighter about inefficient techniques, not teaching him these techniques at all. The most efficient techniques in K-1 are direct punches, hooks, uppercuts, low kicks, knee kicks, etc. Trend analysis indicates that the application of following variables tends to increase: left and right direct punch, right hook and right uppercut, and high and lower circular kicks as well as knee kicks.

References.
ASSESSMENT OF THE EFFECT OF INSTABILITY RESISTANCE TRAINING ON BALANCE, MOVEMENT SPEED, AND STRENGTH IN ATHLETES WITH PREVIOUS ACL INJURY: A FIELD-TEST APPROACH

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The assessment of efficacy of instability resistance exercises, that have become a part of both athletic training and rehabilitation, is based namely on laboratory techniques. However, experience showed that coaches prefer easily applied field-tests that may provide actual information on effectiveness of exercise program. The study deals with alternatives of such evaluation of balance, movement speed, and strength prior to and after instability resistance training in athletes with previous ACL injury. A group of 14 soccer players (age 21.8±3.4 y, height 182.2±5.6 cm, and weight 76.7±4.8 kg) underwent two months after rehabilitation combined resistance and balancing exercises (in duration of 30 min) for a period of 12-weeks (4-5 sessions/week). Postural stability was evaluated under both static and dynamic conditions (wobble board and antero-posterior / medio-lateral tilted platforms) during bipedal and one-legged stance. COP velocity was recorded at 100 Hz by means of posturography system FITRO Sway check based on dynamometric platform. Speed of FTO Dyne initiation and the soccer kick was measured using FITRO Force plate was applied to measure height of the squat and counter-movement jump. Pre-training measurements showed the non-injured-to-injured leg percent differences of 15.7% for static and 24.5% for dynamic balance. Following the training there were no changes in static balance on both legs (from 18.2±3.3 mm/s to 15.8±2.8 mm/s), on non-injured leg (from 41.3±8.8 mm/s to 38.2±7.8 mm/s), and on injured leg (from 49.0±8.9 mm/s to 43.2±7.7 mm/s). Likewise, the dynamic balance did not change while standing on both legs (from 93.2±19.0 mm/s to 86.7±17.8 mm/s) and on non-injured leg (from 112.3±25.0 mm/s to 101.2±21.8 mm/s), however a significant (p<0.01) improvement on injured leg has been found (from 148.7±22.8 mm/s to 138.0±20.0 mm/s). In addition, sway velocity significantly (p<0.05) decreased during bipedal stance on ML tilted platform (from 134.2±20.1 mm/s to 110.6±18.2 mm/s) but not on those A-P tilted (from 120.6±19.7 mm/s to 104.7±18.0 mm/s). Moreover, mean run-out speed significantly (p<0.05) increased on injured leg (from 347.4±42.3 cm/s to 385.3±38.8 cm/s) but not on non-injured leg (from 378.1±42.1 cm/s to 371.8±47.1 cm/s). In contrast, no changes in mean kick-off speed on injured and non-injured leg have been found (from 474.0±38.5 cm/s to 515.6±43.3 cm/s and from 475.9±40.7 cm/s to 499.5±37.6 cm/s). Unfortunately, no information on changes in jumping performance is provided because during pre-training testing most of the subjects were not able to perform SJ and CMJ. It may be concluded that evaluation the efficiency of instability resistance training in dynamic conditions more sensitively reflect adaptation changes in postural control system than on stable platform. Also measurement of movement speed seems to be suitable method, whereas using explosive power tests in an early stage of post-rehabilitation is limited.

EVALUATION OF K-1 FIGHTERS’ APPLICATION OF TACTICAL MEANS

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From the structural point of view, K-1 is a combination of different martial arts: Karate, Kempo, Kickboxing, Taekwondo, Kakutogi, Box, Muaythai. The best characteristics of those motion structures have been merged and that resulted in a dominant, top-of-the-pyramid motion structure called K-1. All advantages of martial arts have been shaped in unique K-1 rules which do not limit fighters from fully employing all available technical and tactical elements. K-1 sport requires the application of rapid, perfect and efficient techniques and complex technical and tactical combinations, leaving out slow techniques and passive defending (Hong, 2003., Kajmovic et al., 2005., Kapo, Radijo, Kajmovic, & Bonacini, 2006). This research has been carried out on a sample of 96 top level super heavyweight (over 91 kg) male fighters participating in final K-1 tournaments in Japan in 84 matches and 205 rounds. The age of the examinees varied from 21 to 39 years. The objective of the research was the evaluation of tactical means applied during the fights by the most successful K-1 fighters in the world and identifying dominant tactical means on the basis of achieved results. The gathered data on technical elements have been processed with the descriptive statistic method and presented according to the total frequency of the ratings and average ratings of individual variables. By means of trend analysis we examined the development trends in the application of technical means in the sense of their increase and decrease as to obtain data on average behaviour of fighters. The research results indicate that the following variables have the highest level of application in K-1 fights: distance (which allows a fighter to both defend himself and attack the opponent efficiently), feinting (used in order to confuse the opponent, as well as to divert his attention from the actual intentions i.e. the blow that is to be delivered), and combination. The richness and possibilities of the latter are considered to be the strongest tactical weapon among the factors essential for attaining success in K-1 sport. Trend analysis indicates that the application of following tactical means such as speed of FTO Dyne initiation and the soccer kick was measured using FITRO Force plate was applied to measure height of the squat and counter-movement jump. Pre-training measurements showed the non-injured-to-injured leg percent differences of 15.7% for static and 24.5% for dynamic balance. Following the training there were no changes in static balance on both legs (from 18.2±3.3 mm/s to 15.8±2.8 mm/s), on non-injured leg (from 41.3±8.8 mm/s to 38.2±7.8 mm/s), and on injured leg (from 49.0±8.9 mm/s to 43.2±7.7 mm/s). Likewise, the dynamic balance did not change while standing on both legs (from 93.2±19.0 mm/s to 86.7±17.8 mm/s) and on non-injured leg (from 112.3±25.0 mm/s to 101.2±21.8 mm/s), however a significant (p<0.01) improvement on injured leg has been found (from 148.7±22.8 mm/s to 138.0±20.0 mm/s). In addition, sway velocity significantly (p<0.05) decreased during bipedal stance on ML tilted platform (from 134.2±20.1 mm/s to 110.6±18.2 mm/s) but not on those A-P tilted (from 120.6±19.7 mm/s to 104.7±18.0 mm/s). Moreover, mean run-out speed significantly (p<0.05) increased on injured leg (from 347.4±42.3 cm/s to 385.3±38.8 cm/s) but not on non-injured leg (from 378.1±42.1 cm/s to 371.8±47.1 cm/s). In contrast, no changes in mean kick-off speed on injured and non-injured leg have been found (from 474.0±38.5 cm/s to 515.6±43.3 cm/s and from 475.9±40.7 cm/s to 499.5±37.6 cm/s). Unfortunately, no information on changes in jumping performance is provided because during pre-training testing most of the subjects were not able to perform SJ and CMJ. It may be concluded that evaluation the efficiency of instability resistance training in dynamic conditions more sensitively reflect adaptation changes in postural control system than on stable platform. Also measurement of movement speed seems to be suitable method, whereas using explosive power tests in an early stage of post-rehabilitation is limited.

RELATIONSHIPS BETWEEN THE PHYSICAL ABILITY AND GAME INTELLIGENCE OF YOUNG ELITE WATER POLO PLAYERS

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In order to assess the physical ability of water polo players, many types of battery tests have been developed. On the other hand, game intelligence, which refers to the ability of athletes to effectively solve the problems faced during sports activity, is routinely assessed by coaches. However, little is known about the relationships between the parameters of physical ability and game intelligence. This study aims to clarify the relationships between the physical ability and game intelligence of young elite water polo players. Twenty-six experienced male water polo players (aged 18-20) excluding goalkeepers, participated in this study. 11 players were members of the Japanese national junior team (JUN) and 15 were unseated group of the JN (JUC). The physical abilities included the following: multi-
stage shuttle swim test (MSTT), ball-throwing distance in water (BTD), 30 m sprint swim including jumps anddouble back movements (30S), and vertical floating with 20 kg weights (VFW). Game intelligence parameters included perimeter offensives (POI), man-up offense (WO), counter offense (ICO), perimeter defense (PDI), man-down defense (WMD), and counter defense (CDI). In each situation, four water polo experts including national team coaches assessed every player on a scale of 0 to 5 in an official water polo match.

The result of the paired t-test or Welch’s test (p < 0.05) revealed that the results of MSTT (99.9 ± 8.9 vs. 88.5 ± 13.6), VFWM (37.0 ± 15.0 sec vs. 21.6 ± 9.0 sec), and 305 (44.5 ± 4.5 sec vs. 53.6 ± 6.1 sec) were statistically significant in both groups. However, BTD (30.0 ± 1.9 m vs. 28.8 ± 1.8 m) did not reveal any statistical difference. The scores of the game intelligence parameters for both groups were as follows: PO (17.0 ± 1.8 vs. 11.1 ± 4.7), WO (15.0 ± 1.1 vs. 11.0 ± 4.6), CO (16.0 ± 1.4 vs. 11.2 ± 4.7), PD (15.5 ± 1.5 vs. 10.8 ± 4.5), MD (14.0 ± 1.0 vs. 10.5 ± 3.74), and CDI (14.6 ± 1.1 vs. 10.6 ± 3.4). All regard to the correlation between physical abilities and game intelligence in all participants, Spearman’s correlation coefficient indicated that VFWM (r: 0.59 for PO, 0.45 for MO, 0.63 for CO, 0.61 for PD, 0.64 for MD, and 0.72 for CDI) and 305 (r: -0.55 for PO, -0.52 for MO, -0.54 for CO, -0.42 for PD, -0.47 for MD, and -0.53 for CDI) had significant relationships (p < 0.05) with all parameter. BD had a significant relationship with PO (r = 0.40). MSTT had a significant correlation with MD (r = 0.41). These results revealed that the parameters that were assessed in this study were good criteria for assessing the physical ability and game intelligence of young water polo players. It should be noted that parameters such as leg strength for keeping the body vertical in water and 30 m sprint swimming with specific movements have strong relationships with game intelligence. Ball-throwing ability is associated with game intelligence in the perimeter offense, while aerobic ability is connected with game intelligence in the man-down

**FITNESS CHARACTERISTICS OF A NATIONAL GREEK ALPINE SKIING TEAM: CORRELATION WITH RACING PERFORMANCE**

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Alpine skiing performance depends on several fitness parameters such as aerobic and anaerobic capacity as well as lower limb strength. This study aimed to characterize the aerobic and anaerobic power and strength parameters of the Greek men’s national alpine skiing team and to investigate the correlations of these fitness parameters with their racing performance in slalom (SL) and giant slalom (GS), as assessed by the International Ski Federation (FIS) points.

The Greek national alpine skiing team (height=174.9±7.2 cm, body weight=73.4±6.6 kg, body fat%=11.1±1.8%) performed a maximal incremental test on a treadmill for determination of VO2max and a Wingate test for determination of peak and mean anaerobic capacity. Participants also underwent isokinetic (angular velocity 60°/s) and isometric testing as well as various types of vertical jumps for the assessment of lower limb strength. All data were analyzed using descriptive statistics and Pearson correlation coefficient.

The mean value for VO2max was 56.5±5.3 ml/kg/min (45.8-65.2 ml/kg/min) and for peak power, mean power, and fatigue index were, 10.4±0.7 W/kg (8.5-11.2 W/kg), 8.1±0.5 W/Kg (6.8-8.8 W/kg), and 42.6±6.2% (28.1-48.8%), respectively. The relative maximum force that developed during isometric testing averaged to 68.8±5.9 N/kg extensors knee muscles ratio of 67.4%. Therelative maximum force that developed during isometric testing averaged to 68.8±5.9 N/kg extensors knee muscles ratio of 67.4%. The relative maximum force that developed during isometric testing averaged to 68.8±5.9 N/kg extensors knee muscles ratio of 67.4%. The relative maximum force that developed during isometric testing averaged to 68.8±5.9 N/kg extensors knee muscles ratio of 67.4%. The relative maximum force that developed during isometric testing averaged to 68.8±5.9 N/kg extensors knee muscles ratio of 67.4%. The relative maximum force that developed during isometric testing averaged to 68.8±5.9 N/kg extensors knee muscles ratio of 67.4%. The relative maximum force that developed during isometric testing averaged to 68.8±5.9 N/kg extensors knee muscles ratio of 67.4%. The relative maximum force that developed during isometric testing averaged to 68.8±5.9 N/kg extensors knee muscles ratio of 67.4%. The relative maximum force that developed during isometric testing averaged to 68.8±5.9 N/kg extensors knee muscles ratio of 67.4%. The relative maximum force that developed during isometric testing averaged to 68.8±5.9 N/kg extensors knee muscles ratio of 67.4%. The relative maximum force that developed during isometric testing averaged to 68.8±5.9 N/kg extensors knee muscles ratio of 67.4%.

The result of the paired t-test or Welch’s test (p < 0.05) revealed that the results of MSST (99.9 ± 8.9 vs. 88.5 ± 13.6), VFWM (37.0 ± 15.0 sec vs. 21.6 ± 9.0 sec), and 305 (44.5 ± 4.5 sec vs. 53.6 ± 6.1 sec) were statistically significant in both groups. However, BTD (30.0 ± 1.9 m vs. 28.8 ± 1.8 m) did not reveal any statistical difference. The scores of the game intelligence parameters for both groups were as follows: PO (17.0 ± 1.8 vs. 11.1 ± 4.7), WO (15.0 ± 1.1 vs. 11.0 ± 4.6), CO (16.0 ± 1.4 vs. 11.2 ± 4.7), PD (15.5 ± 1.5 vs. 10.8 ± 4.5), MD (14.0 ± 1.0 vs. 10.5 ± 3.74), and CDI (14.6 ± 1.1 vs. 10.6 ± 3.4). All regard to the correlation between physical abilities and game intelligence in all participants, Spearman’s correlation coefficient indicated that VFWM (r: 0.59 for PO, 0.45 for MO, 0.63 for CO, 0.61 for PD, 0.64 for MD, and 0.72 for CDI) and 305 (r: -0.55 for PO, -0.52 for MO, -0.54 for CO, -0.42 for PD, -0.47 for MD, and -0.53 for CDI) had significant relationships (p < 0.05) with all parameter. BD had a significant relationship with PO (r = 0.40). MSTT had a significant correlation with MD (r = 0.41). These results revealed that the parameters that were assessed in this study were good criteria for assessing the physical ability and game intelligence of young water polo players. It should be noted that parameters such as leg strength for keeping the body vertical in water and 30 m sprint swimming with specific movements have strong relationships with game intelligence. Ball-throwing ability is associated with game intelligence in the perimeter offense, while aerobic ability is connected with game intelligence in the man-down

**EFFECTS OF OFFICIAL TAEKWONDO COMPETITIONS ON ALL-OUT PERFORMANCES OF ELITE ATHLETES**

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Introduction

Official Olympic Taekwondo competitions include qualifying sessions, semi-finals and finals organized during a day. Each session consists of three 2-minute rounds with a 1-minute rest in between. Since research focused on simulated competitions only (Bouhlel et al., 2006, Buitos & Tisaka, 2007), this study aimed at investigating the Taekwondo athletes’ capability of all-out performances during a National Championship in relation to the load of their matches.

Methods

The physical load of the Italian Taekwondo Championship was evaluated in 15 (4 women and 11 men) elite athletes by means of heart rate (HR) recordings during the match and blood lactate (La) measurements performed before and at the end of the three rounds. In relation to the percentage of individual HRmax five activity categories were considered: 1) maximal effort (>95% HRmax), 2) high-intensity (86-95% HRmax), 3) low-intensity (76-85% HRmax), 4) active recovery (65-75% HRmax), and 5) passive recovery (<65% HRmax). Counter-movement jump (CMJ) and handgrip performances were measured before and at the end of the competitions. A preliminary analysis ascertained that no difference (p<0.05) emerged between qualifying (i.e., six-teen, eighth, and fourth rounds) and final (semi-final and final) competitions. Then, a 4 (intensity) x 3 (round) analysis of variance for repeated measures was applied to time (s) spent at the activity categories. A 2 (gender) x 2 (session) analysis of variance for repeated measures was applied to CMJ (cm) and handgrip (N) performances, and La values (mM).

Results

During the competition, a difference (p<0.01) emerged for intensity and for the interaction intensity x round (p<0.01), with higher frequency of occurrence for the high intensity category (7±10%) with respect to low intensity (9±4%) and maximal effort (20±13%) ones. After the match, La values increased (p<0.01) to 5.2±2.0 mM and 7.0±2.6 mM for female and male athletes, respectively. Jump performances showed main effects (p<0.01) for gender and session, with best performances after the competition (men pre: 40.8±4.9 cm, men post: 43.9±5.2 cm).
cm; women pre: 28.2±2.5 cm; women post 30.8±2.3 cm). Grip strength showed main effects (p<0.01) for gender and session, with worst performances at the end of the competition.

Discussion
The results showed that Taekwondo competitions impose a high load on athletes. The lack of difference between qualifying and final sessions indicates that athletes are able to recover between matches. The better jump performances observed at the end of the matches might be due to the effect of an increased arousal from the intermittent activity of the lower limbs during the match. Instead, the decreased grip strength might be due to fatigue developed by the athletes continuously competing with clenched fists to defend and to be ready to attack.

References.

PREDICTION OF MAXIMAL OXYGEN UPTAKE IN 12 - 18 YEAR-OLD ADOLESCENTS: DEVELOPMENT AND CROSS VALIDATION OF A NEW EQUATION, AND COMPARISONS WITH OTHER PREDICTION EQUATIONS
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The aims of this study were: 1) to develop and cross-validate a generalized equation to predict VO2max in adolescents 12-18 yrs. based on a maximal running exercise test, 2) to compare the new equation with the previously published ones for the prediction of VO212 and VO2max in adolescents, and 3) to cross-validate the previously published equations.

Eighty-eight male adolescent athletes performed a maximal exercise test on a treadmill to assess the actual VO2max and a 20m shuttle-run test. The incremental exercise protocol started at 6 km/h and the speed was increased by 1km/h every 2min until exhaustion. Then, the subjects were divided into a derivation (n=70; age=14.9±1.4 yrs.) and a cross-validation (n=18; age=14.8±1.7 yrs.) groups. Multiple-regression analysis was used to develop the equation from the derivation group using combinations of age, height, body weight, running velocity and exercise duration as independent variables. The derived equation was cross-validated using: correlation coefficient (R) between the actual and predicted VO2max, constant error (CE=actual VO2max - predicted VO2max), standard error of estimate (SEE), total error (TE), and the similarity between SEE and TE.

The following equation best attained the above criteria and most accurately estimated VO2max: VO2max [ml/min] = -597.9 + 73.5 x Exercise Duration(min) -45.7 x BW[kg]. Cross-validation statistics are: R=0.94, mean difference (CE) = -24 ml/min, SEE =157 ml/min (4.8%), and TE = 164 ml/min (5.1%) between the actual VO2max and predicted VO2max. When the absolute values of VO2max were converted to relative values, CE = -0.5 ml/kg/min (1.1%), SEE = 2.4 ml/kg/min (4.5%), and TE = 2.6 ml/kg/min (4.8%). The cross-validation analysis for the 4 published equations showed CE from -1.3 to 4.8 ml/kg/min, SEE from 3.0 to 3.9 ml/kg/min and TE from 3.6 to 6.1 ml/kg/min. Tukey tests revealed differences between the actual and Bonnen’s predicted VO2max (53.6±2.6 vs. 48.7±3.1; p<0.01), while there were no differences between the actual and the Bonnen’s predicted from equations of this study [54.1±2.9], Shuttle-test (51.7±3.4), Walker’s (54.9±4.4), and Leger’s (51.2±3.6). Mean CE was different from zero in Bonnen’s and Shuttle-test equations (p<0.05).

In conclusion, the equation of this study accurately predicts VO2max in 12-18 yrs. males demonstrating lower values of CE, SEE, and TE vs. other equations1-4. The equations of Walker et al. and Leger et al.1 are also suitable for the prediction of VO2max in children 12-18 yrs., despite that they were developed for prediction of VO2 at lower velocities, while the Bonnen’s equation appears to underestimate VO2max.

References.

VENTILATORY RESPONSE DURING A MAXIMAL BOUT OF 400 M IN CRAWL SWIMMING: ASSOCIATIONS WITH PERFORMANCE
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Introduction
The direct assessment of ventilatory indicators during swimming with breath-by-breath portable gas devices is a recent issue. Gas ana-lysers and specific valves for swimming have been designed as an attempt to improve the validity of field measures and minimize their influence in the technique. However, the data available is still scarce. The energy cost based on ventilatory measurements during the 400 m front crawl event is unknown, as well as its association with performance. Therefore, the purposes of this study were to determine the relative contribution of the aerobic and anaerobic metabolism during the 400 m front crawl event and to determine the relationship between the performance in the event and ventilatory and metabolic variables.

Methods
The sample comprised 8 national level competitive male swimmers. Each subject performed one submaximal and one supramaximal test, with 48 hours recovery between them in an indoor 25 m swimming pool. In both tests expired air was analysed by a K4b2 attached to an AquaTrainer® valve (Cosmed, Italy) and the VO2 values were registered every 20 s. The submaximal test comprised 5 intensity bouts with 6 min duration and recovery time between them. Blood samples were collected at the end of each bout. In the supramaximal test, each swimmer performed an all out 400 m front crawl swimming at maximal exertion. At the end of the 400 m bout blood lactate was measured each 2 min, until levelling-off.

Results
The swimming velocity corresponding to the lactate threshold of 2 mmol/l and the lactate threshold of 4 mmol/l were 1.04±0.11 m/s and 1.20±0.08 m/s, respectively. In the 400 m front crawl swimming the aerobic and anaerobic fractions of energy were 93% and 7%, re-spectively. No significant differences were found between the energy cost in the submaximal test (0.58±0.06 ml/Kg/m) and in the supramaximal test (0.62±0.06 ml/Kg/m). Significant correlations between the mean velocity in the supramaximal test and the ventilatory and metabolic variables measured in this test were not verified. Nevertheless, we found that estimated fat mass correlated with the swim-ming performance (r=0.78; p<0.05). Moreover, accumulated oxygen deficit correlated negatively with the velocity associated to the lactate threshold (r=0.82; p<0.05).

Conclusion

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The ventilatory response does not seem to determine the 400 m front crawl swimming performance among a homogeneous group of trained subjects. However, estimated fat mass does seem to play some role in this event. Other factors (i.e. biomechanical) may help to understand differences in the performance.

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ONTogenetic Variability of Dynamometric Properties in the Jumping Ability in Girls Practising Rhythmic Gymnastics
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Rhythmic gymnastics is one of the most difficult, and at the same time one of the most spectacular sport disciplines. For rhythmic gymnastics the level of jumping ability is of crucial importance. It is indispensable during the execution of complex arrangements and constitutes a condition for efficient and effective sport contest, correct execution of technical exercises, and furthermore it allows achieving good sport results. A high sport class gymnast executes on average from 8 to 12 jumps in each arrangement, which are evaluated by the jury who take into account the height of the leap, the technique and choreographic performance. High score is granted to a combination of a few complex jumps with simultaneous manipulation of accessories.

The conducted study was aimed at finding an answer to the question: how does the dynamometric structure of jumping ability change with age, does it depend on the degree of fitness coordination of the subjects, and do changes take place in the level of jumping ability endurance in the ontogenesis?

The study comprised 32 gymnasts, who were divided into two groups, each with 16 subjects. The first group was consisted of gymnasts aged 9-12 years (training period experience 3 to 5 years). The second group was composed of girls aged 13-16 years (training experience - from 6 to 10 years). Tests of the level of jumping ability was performed using the tensodynamographic method, which is used to evaluate parameters that characterize strength and speed capabilities of the human motor system on the basis of a vertical leap off on a dynamometric platform. The tested persons performed 3 tests: leap off with sweeping arm motion, leap off without sweeping arm motion, performing a series of ten single vertical leap offs - without sweeping arm motion with an interval of 3 seconds between the jumps. The course of component force of base reaction was used to calculate the following height of body mass centre elevation - height of upward leap off, maximum strength, maximum speed, maximum and average power, range of sweeping arm motion, force drive and performed work. The obtained results have shown that values of particular parameters: maximum and average power and maximum strength and force drive depend on the age of gymnasts at the significance level of p<0.05. The obtained correlation indices demonstrated rather significant relations (r = 0.83) between the level of jumping ability, and coordination abilities of the subjects. Considerable differences between groups were recorded also in an executed leap off series. In gymnasts of the older age group a high level and stabilization of values of particular indices (including also the height of jump) during performance of a series of 10 jumps was observed, while gymnasts from the younger group were characterized by a trend of decreasing values of the tested parameters.

Identifying Levels of Peripheral Vision Abilities and Complex Reactions in Basketball Players
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The role and importance of motor coordination abilities is much differentiated in each particular sport discipline. In sport games they ensure an effective realization of technical and tactic performance in varying conditions and constantly changing situations and tasks. Peripheral vision and the ability of quick reaction are closely related to sensor-motor functions of the psycho-physiology of the competitors such as: simple and complex reaction time to visual stimulus, as well as the accuracy of the reactions to the moving object.

A basketball player during the match has not only to cooperate with his fellow partners in the team but also has to effectively break in the rival's actions and undertake optimal decisions within a limited space of the playing field and under the constant pressure of the opponent. In contemporary team games, sport success is delimited by the control of the course of rivalry within the peripheral field of vision and by the quick and accurate technical and tactic operations.

The aim of the research was to evaluate the range of the peripheral vision and complex reactions of competitors practicing basketball through the use of the Vienna Test System.

This research was based on 42 male basketball players aged 18 to 26, who were members of the Polish National League's second and third division. The Test of Peripheral Vision of the Vienna Test System was applied.

The study revealed that in the group of players a big difference in the missed reactions was recorded, since the minimum number of missed stimuli is equal to 0 and maximum to 12, which accounts for 30% of all stimuli.

The analysis of the results of the research showed that the median of the reaction time and the number of correct reactions of the right eye, despite the smaller angle of vision, are larger than the values of such indexes in the case of the left eye.

The results of the field of vision of the tested players correlate with the median of the reaction time. The correlation shows high level (r = 0.723).

It was ascertained that the eye of the examined individuals, on the side of the dominating hand, has a smaller angle of vision. Whereas the time of reaction and the relevancy of the decisions taken on the emerging stimuli are better. This may be the effect of the character of the discipline, when since the throws are executed during the match, the vision of the eye on the side of the dominating hand is limited, as a result of which it does not possess a big angle of vision.

Indicator’s Differences in Situation Efficiency Among Junior Male and Female Competitors at the European Judo Championship U-20
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Judo is a sport of balance in which fighter has to maintain balance with his opponent who on the other side has his own balance. Fight in judo is developing into two main areas: standing and floor combat. Both areas of fight request different approaches in the process of training fighters for the championships and necessity for the analysis of the situation's efficiency monitoring in judo can give quality information about acting manner of the fighters and their efficiency during the matches. Researches analysis of the indicators of situation's
efficiency, which competitors realize during the competitions represent good base for the applying researching results of training in judo (Kajmovic and al., 2007). Main goal of this research represents confirmation of indicator’s differences of situation’s efficiency among junior male and female competitors at the European championships in judo held in Sarajevo, 2003. Specimen contents total of 246 male fights and total of 179 female fights in all seven categories for male and female juniors. Initial results were carefully recorded through watching of VHS tapes, what made the situational aspect of the research really credible. Analysis of the parameters of situation’s efficiency is based by 4 groups of judo techniques: 1)Groups of judo techniques: 2)Subgroups of judo techniques: 3)Quantitative indicators of judo-fights: technical points and penalties. 4)Efficiency of the separate throwing and grappling techniques. Comparisons were made trough Chi square test at the level of statistical importance (p<0,05) with contingency tables. For testing the importance of correlations between the used variables, the coefficient of contingency was used (C). The results of the Chi square test showed statistically important differences between male and female in groups of judo techniques (Chi square=12,4;df=1;p<,000;C=,13), in subgroups of judo techniques (Chi square=34,4;df=7;p<,000;C=,20) and in quantitative indicators of judo-fights points and penalties (Chi square=13,0;df=6; p<,042;C=,10). Techniques mostly used by male juniors is: Kata Guruma (15,7%), Sukui Nage (9,4%), Tani Otoshi (6,2%), Uchi Mata (6,1%), Ippon Seoi Nage (5,9%), O Uchi Gari (4,9%) etc., and techniques by female juniors is: O Uchi Gari (9,2%), Kesa Gatame (7,6%), Ippon Seoi Nage (7,6%), O Soto Gari (7,0%), Kata Guruma (7,0%) etc.

Monitoring and controlling of the efficiency of the relevant technical-tactical parameters in judo that are expressed by juniors could be directly applied into training process so that optimal choice of content and load for training could be assured. On that way it could be also compared with higher demanding levels of competitions, all in terms of achieving better quality of judo, as a martial art.

DOES CALLISTHENIC EXERCISE AFFECT THE RELATIONSHIP BETWEEN BODY COMPOSITION AND LUNG FUNCTION IN WOMEN?

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Introduction

Body composition changes with exercise, increases in skeletal muscle mass and declines in fat mass and visceral fat. On the other hand, lung function also increases with exercise. It was reported that respiratory muscle strength and lung function are closely associated with body weight and lean body mass in patients with chronic obstructive pulmonary disease (COPD). A central pattern of fat distribution is negatively associated with lung function in healthy adults2,4. The purpose of this study was to investigate the effects of relations between body composition parameters and lung functions including VC, FVC, FEV1, FEV1/VC, FEV1/FVC after 6-months callisthenic exercise program in healthy women.

Methods

Mean age and height of 35 healthy subjects were 41.69±7.69 yrs, 156.51±4.72 cm, respectively. All subjects took 50-minutes/sessions, 3-day per week and 24-week callisthenic exercises were performed to. The intensity of the exercise was determined with 80 % of heart rate reserve and contacts with each foot on a separate force plate (Kistler, Switzerland) and should be performed as soft as possible simultaneously with both feet. VGRF was measured (sampling rate of 1000 Hz) for each foot during drop-landing. For the peak and valley of the force-time-curves in drop-landings related to injuries reference data must be available. The current literature does not give a satisfying review on such data for vertical ground reaction forces (VGRFs) during a drop-landing. Therefore the purpose of the study was to evaluate the reliability of VGRF in a drop-landing series to have a basis for collecting a reference data pool. It was found that a negative relative in the BMI and FVC and MVV of subjects (p<0,01, r=- .03,. r=-.49). Also it was found that the reliability of VGRF in a drop-landing series to have a basis for collecting a reference data pool.

Discussion / Conclusions

In conclusion, there were positive effects as evident on women lung volume and capacity with callisthenic exercises. This study showed that the decrease level of fat percentage and BMI would be affected the lung functions in a negative way.

Key Words: Body Composition, Lung Volume, Exercise, Women.

References.


FUNCTIONAL TESTING: DO FORCE PLATES DELIVER RELIABLE PARAMETERS TO ANALYSE DROP-LANDINGS?

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Purpose: Landing from a jump is often reported to be the cause of noncontact injuries in competitive sports. To find characteristics in the force-time-curves in drop-landings related to injuries reference data must be available. The current literature does not give a satisfying review on such data for vertical ground reaction forces (VGRFs) during a drop-landing. Therefore the purpose of the study was to evaluate the reliability of VGRF in a drop-landing series to have a basis for collecting a reference data pool.

Methods: Eight male volunteers (27.5±6.14 years, 85.4±13.8 kg, 183.6±8.8 cm) participated in the study. Inclusion criteria required that all subjects were free of pain. The participants were asked to execute 40 drop-landings barefooted from a height of 25 cm. The ground was contacted with each foot on a separate force plate (Kistler, Switzerland) and should be performed as soft as possible simultaneously with both feet. VGRF was measured (sampling rate of 1000 Hz) for each foot during drop-landing. For the peak and valley of the force-time-curves the time points (Ipeak, Ifalley) and forces (Fpeak, Fvalley) were analysed. The test series was split in four sessions (M1-M4) each consisting of ten drop-landings. After normalising the VGRF by body mass, the coefficients of variation (CV) for force and point in time were calculated for each session. Statistical comparisons of sessions were done using an one-way ANOVA with repeated measures.

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Results: The mean CV for tpeak was 5.5% (SD 1.0%) while it was 15.90% (SD 3.4%) for Fpeak. The variability index of tvalley was higher with 10.1% (SD 3.2%) as well as 19.8% (SD 1.6) for Fvalley. The highest CVs of all parameters were consistently in M1. Statistical analysis revealed a significant difference of CV for tpeak of the left leg between M1 and M2 (p=0.02) and between M1 and M3 (p=0.02). No further differences in variability of all described parameters throughout the test series could be detected.

Conclusion: Force plates do deliver reliable parameters of vertical ground reaction forces in a drop-landing series related to time points (tpeak, tvalley). The significant differences in these parameters at the left leg between the initial session and the two following sessions were discussed as a familiarization effect. In summary the time characteristics during drop-landings could be a basis for reference values, but future studies should also focus on other force characteristics, the influence of gender and the instruction of the task to prepare the ground for a reference data pool.

A MODEL OF THE PROCESS OF REGAINING BALANCE AFTER PERTURBATION FROM QUIET STANCE: WITH APPLICATION TO TRAINING IN ELITE JUDO

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Using tools from dynamical systems [4] we investigate stability and the maintenance of balance in elite Judokas. We model and analyze the ground reaction forces resulting from an athlete being perturbed from quiet upright stance, for the two legged and single legged condition [1,2]. The maximum correctable angles between the resultant ground reaction forces and the vertical in the anteroposterior and mediolateral directions are obtained via a force platform. A closed critical curve [4] is fit through these maximum correctable angles outside which the perturbations cannot be corrected and the motion of the body back to the position of quiet stance is analyzed. We then analyze the curve to identify non-symmetric behavior caused by muscle imbalances, postural problems, structural problems and differences in the ranges of motion on either side of the body. We also show how the model can be used in elite judo regarding injury prevention [3] and identifying competitive strengths and weaknesses which may be addressed and corrected via training [5] once they have been discovered.

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FLEXIBILITY TRAINING AND PHYSICAL FITNESS PERFORMANCE IN YOUNG HIGH-LEVEL SOCCER PLAYERS

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The present study examined the effect of specific static long-term flexibility training on selective physical fitness components in young high-level soccer-players. Twenty three players (mean +/- sd) were randomly assigned into Experimental (E) and Control (C) groups (E group: n = 12, age 16.1 +/- 0.6 years, height 1.71 +/- .06 m, body mass 62.4 +/- 7.5 kg, peak oxygen uptake (V˙O2 peak) 55 8 +/- 4.1 ml kg-1.min-1); (C group: n = 11, age 15.9 +/- 0.6 years, height 1.73 +/- .07 m, body mass 61.5 +/- 5.6 kg, peak oxygen uptake (V˙O2 peak) 54 2 +/- 5.2 ml kg-1.min-1). The E group performed a specific static stretching-training-program before and after each training session, for four weeks (4 days/week). The two groups performed two series of anthropometrics and physical-fitness tests prior to and following the application of the stretching-training performed on the E group. Anthropometric characteristics, body composition, aerobic capacity, 10m sprint and standing horizontal-jump were not different between the E and the C groups. However, flexibility ([F(1-21) = 4.850, p = .039], 35m sprint ([F(1-21) = 4.962, p = .037]) and agility (U = 15.000, N1 = 12, N2 = 11, p = .001) performance as well as Deltas flexibility ([F(1-21) = 4.293, df = 21, p = .005]), agility (t = 8.15, df = 21, p = .005) and standing horizontal-jump ([U = 29.000, N1 = 12, N2 = 11, p = .002]) scores were significantly improved in E group compared with C group. Only in the E group, a significant negative correlation between post-training flexibility and post-training agility scores was observed (r = -.46, n = 23, p < 0.028, two tailed). In conclusion, the present results suggest that regular application of static flexibility training is effective in improving flexibility, short-distance maximum sprint and particularly agility performance in high-level young soccer-players.

EFFECT OF ADDITIONAL MENTAL WORK ON BLOOD LACTATE DISAPPEARANCE AFTER MAXIMAL EXERCISE

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The active recovery process plays an essential role in determining subsequent sports performance. The purpose of this study was to investigate the effect of additional mental work on the rate of blood lactate disappearance during recovery from maximal exercise. Eighteen sport students (both male and female) from the University of Beira Interior (mean age 20.7 +/- 1.6 years) participate in this study. Maximal exercise was performed on a treadmill with loads about 90-95 % FCmax during 5 minutes. After that, the students are divided in 2 groups. Group A completed an active recovery session performed at 40-50% FCmax for 10 minutes. Group B was submitted to the same recovery session, but with an additional task: response to simple mathematical calculations (involving the four operations and numbers 0-9), on an average rhythm of one per two seconds. Blood samples were drawn at the end of maximal exercise, at 3 and 6 min after recovery period. The results showed that at the end of active recovery, the blood lactate concentrations of the Group B (6.8 +/- 2.9 mmol/L) were higher than Group A (5.4 +/- 3.5 mmol/L). Furthermore the results indicated that an additional mental effort did affect significantly (p
less 0.05) the rate of blood lactate disappearance measured during active recovery. The decrease of the rate blood lactate disappearance can be attributed to the greatest demand of blood flow to nervous system, and in this way principal lactate removal processes (oxidation and gluconeogenesis) were not optimized. Our results suggest that coaches should consider avoid exercises or another test (conference, mental preparation) that require additional mental work during recovery among training sessions.

CHARACTERIZATION AND EVALUATION OF YOUNG RING HOCKEY TEAM
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The purpose of this study was to evaluate a ring hockey team, determine the strong and weak trainable capacities, and compare the results of the same protocol with and without roller skates.

Eleven 15,86 ± 0,54 year old boys took part in the study. Basic anthropometry determined body mass (BM), height (H), body surface area (BSA), body fat percentage (%BF) and fat free mass (FFM). Maximal aerobic power (VO2max), maximal heart rate (HR max), average heart rate (HR a), percentage of maximal theoretical HR and covered distance were determined with the 20 meters shuttle run test (Luc Leger, 1982) with (WRS) and without (WORS) roller skates. Average HR standard deviation, maximal and minimal value for all variables were determined. Mean values WRS were compared with those WORS using t tests for paired data. A correlation grid (person product – moment correlation coefficient) was established between results WRS and WORS. All the studies were performed by the same investigator.

Results of all statistical testes were considered significant if p< 0.05. The evaluated group (BM: 67,06 ± 7,18 Kg; H: 173,45 ± 5,42 m; BSA: 1,79 ± 0,10 m2; %BF 9,75 ± 2,25; FF M: 60,50 ± 6,48 Kg) obtained cover distance WRS (135,63 ± 17,07), and VO2max (64,36 ± 3,88 mlKg-1 min-1). The average HR was significantly higher WORS (172,91 ± 9,02 beats/min) than WRS (163,36 ± 7,57 beats/min). No difference was observed between HR max. In both groups only 98,01 % of the maximal theoretical HR was obtained. The 20 meter shuttle run test WRS, in the variables number of courses and VO2max, was highly correlated (p<0,01) to the test WORS. In terms of covered distance and VO2max the athletes reached better performance in the test WRS than WORS but higher HR WORS than WRS. No difference was observed in the HR max. The 20 meter shuttle run test, with roller skates, could possibly be used as a specific test to determine the cardiorespiratory capacity of ring hockey players.

DIFFERENTIAL STRENGTH AND NEUROMUSCULAR ADAPTATIONS FOLLOWING COMBINED SENSORIMOTOR AND STRENGTH TRAINING IN YOUNG SHORT TRACK ELITE ATHLETES AND STUDENTS
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Introduction
It has been proved that high-intensity strength training (HST) enhances maximum voluntary contraction (MVC), rate of force development (RFD) and neuromuscular activation (NA). Improvements in MVC, RFD and NA were induced by sensorimotor training (SMT) as well (Bruhn et al., 2006). The present study investigated neuromuscular adaptations of combined SMT and HST at different strength training levels.

Methods
14 subjects (male and female) were assigned to two groups of 7 persons respectively (young short track elite athletes, G1; age 17,0 ± 1,3, weight 67,7 ±7,0, height 176,4 ±8,2, students, G2; age 27,6 ±4,7, weight 75,3 ±7,1; height 179,9 ±6,9). Both groups had to go through a combined SMT and HST, which were performed successively in each training session twice a week for twelve weeks. Every training session consisted of 30min SMT followed by 45min HST. Before and after the training period MVC (in N), RFD (in Ns) were evaluated by standardized bilateral isometric strength testing on the legpress. The activations of mm. vastus medialis (VM), rectus femoris (RF) and soleus (S) were recorded unilaterally by surface electromyography (EMG) during the test. The parameters root mean square (RMS in mV) and median frequency (MF in Hz) were used to evaluate neuromuscular adaptations.

Results
Strength adaptations and EMG in G1. After the training period MVC was significantly enhanced (2332,7 ± a798,6 vs. 2620,5 ± 708,7; p = 0,037) accompanied by increased RMS in So [19,5 ± 10,76 vs. 22,37 ± 11,75], VM [53,96 ± 25,82 vs. 62,54 ± 30,12] and MF in So [50,83 ± 19,49 vs. 80,89 ±22,71], p = 0,021, RF [90,50 ± 33,96 vs. 93,33 ± 25,54]. RFD was also enhanced (10,12 ± 5,67 vs. 11,46 ± 4,33) as well as RMS in So (28,70 ± 31,38 vs. 37,11 ± 44,43). RF (52,27 ± 48,10 vs. 70,14 ± 46,57), VM (69,99 ± 29,84 vs. 81,99 ± 34,25). Strength adaptations and EMG in G2. After the training period MVC was enhanced (2482,4 ± 1002,9 vs. 2601,5 ± 736,1i) accompanied by major increased RMS in RF (38,66 ± 14,13 vs. 42,76 ± 12,91) and MF in So (78,57 ± 17,73 vs. 82,25 ± 22,66), VM (79,48 ± 27,16 vs. 83,39 ±17,35) RFD remained nearly unmodified [11,97 ± 5,41 vs. 11,76 ± 5,71] and RMS was decreased in RF (43,11 ± 20,02 vs. 35,37 ± 12,62), VM (69,57 ± 41,98 vs. 55,66 ± 30,95).

Discussion
In G1 increased MVC was likely induced by enhanced recruitment of VM motor units (MU) and improved firing frequency of the So motoneuronpool (intramuscular coordination). G2 revealed a moderate enhancement of RMS and MF. Therefore the improved MVC was likely induced by increased intramuscular coordination. Only G1 showed an improvement of RFD, which was probably induced by better recruitment of the MU of all three muscles.

Conclusion
Combined SMT and HST evoked different strong and neuromuscular adaptations in elite athletes and normal subjects.

THE INFLUENCE OF DRIBBLING ON REPEATED SPRINT TEST PERFORMANCE AND PHYSIOLOGICAL RESPONSES IN YOUNG BASKETBALL PLAYERS
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The study examined the effect of basketball dribbling on performance indices and physiological responses during repeated sprint tests (RST). Thirteen young (mean age 18 ± 0,7 years) male basketball players (7 backline players and 6 frontline players) performed two forms of RST. The RST included 6 X 30m maximal runs departing every 30s, with and without dribbling, in random order. Maximal heart rate and blood lactate concentrations were significantly higher in the RST without dribbling compared to the RST with dribbling (180 ±2,8 vs 171,5 ±2,2 b/min and 9,9 ± 0,8 vs 6,5 ±0,8 mMol/L, respectively, p<0,05). The fastest 30m sprint time and the total sprint time (sum of all 6
CHARACTERIZATION OF A SO-CALLED VELOCITY TRAINING SERIES IN SWIMMING

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Velocity training is not a simple task to be accomplished in swimming. As well as the other bioenergetics areas, developing velocity implies specific planning and periodization plus accurate training control. There is relatively less information on the response of swimmers to maximal exercise of very short duration, namely because the methodologies used for the evaluation of the effort supported by the immediate energy production system are scarce. However, velocity training series are widely spread in the technical community, evidencing that this conditional capacity is important for the overall development of swimming performance.

The purpose of this study consisted in the characterization of a typical swimming velocity training series, testing the contribution of the anaerobic glycolysis in a alleged "alactic" exercise. Since it is accepted that the time to maximal contribution of the phosphagenic energy system is about 6-8s (Di Prampero, 1981), it was hypothesized that there is an increase in the blood lactate concentrations [La-] within the training series, which lead to a decrease of velocity between repetitions.

Seven good level swimmers (5 males and 2 females) were studied. Subjects main physical characteristics were: 19.0±1.5 years old, 174.2±6.7cm, 67.4±5.1Kg, 20.0±1.4 years old, 175.5±12.0cm and 62.5±10.6Kg (male and female swimmers, respectively). The protocol consisted in a front crawl training set of 4x25m at maximal intensity, with 2min interval. Capillary blood samples were collected from ear lobe at rest and after each repetition (1, 3, 5 and 7min of recovery) to assess rest and post exercise peak [La-] Lactate Pro, Akrayl. After the normality of the distributions were verified, mean ± SD computations for descriptive analysis were obtained for all variables. Velocity and [La-] differences were tested using Friedman and Wilcoxon non parametric test. Statistical significance criterion was 0.05.

[La-] mean value increased significantly from rest to the first 25m repetition and throughout the training series: 1.7±0.4, 2.82±1.02, 6.51±1.02, 8.92±1.61 and 11.61±2.88 (respectively for rest values and 1st, 2nd, 3rd and 4th reps, all in mmol/l), which evidences a clear contribution of the glycolytic metabolism in supporting this specific type of effort. Regarding swimming velocity, it was not observed any differences during the protocol: 1.89±0.13, 1.92±0.11, 1.90 ± 0.10 and 1.90 ± 0.10, respectively for the 1st, 2nd, 3rd and 4th reps (all in m/s).

This fact seems to indicate that the installed muscle acidosis, and the consequent fatigue state, was not sufficient to inhibit the maintenance of very high swimming velocities.

The studied training series seems to be more appropriated for developing the glycolytic power bioenergetic capacity. For training velocity swimming coaches should diminish the duration of each repetition and/or increase the rest interval.

References.

ISOKINETIC FATIGUE PROTOCOL: ASSESSMENT OF SHOULDER ROTATOR MUSCLES

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Introduction

Up to now, resistance fatigue protocols were classically devoted to lower limb. Interestingly, it has been suggested that fatigue affects upper limb proprioception and entails impairment in movement accuracy [1]. Therefore, resistance fatigue assessment should also investigate shoulder muscle groups, which requires a methodological analysis. Shoulder isokinetic assessment is characterized by many possibilities of installation and protocols, without actual consensus into the literature.

Aim

To accurately design a protocol, our study aimed to clarify the influence of shoulder position on the isokinetic results, immediate and differed pain and cardiac frequency during isokinetic resistance fatigue evaluation.

Patients and methods

Twelve healthy male subjects (21.5 +/- 1 year old) sustained an isokinetic resistance fatigue assessment of the external (ER) and internal (IR) rotators of the dominant shoulder. Subjects were installed in lying supine position, the shoulder installed at 45° or 90° of abduction (Abd) in the frontal plane (order randomly assessed). The protocol consisted in 30 maximal contractions (range of motion - ROM = 120°) in the concentric mode at 180°/sec. Subjects also underwent Borg scale appraisal, shoulder ROM measurements, clinical tests and doliorometry evaluation on shoulder muscles. The cardiac frequency was measured during the isokinetic test and during recovery.

Results

The total Work IVN in JI developed by the IR was significantly higher (p<0.001) than VI measured on ER, whatever positioning. The ER WI increased at 90° Abd in comparison with 45° Abd (> 20%). The ER/IR ratio was higher at 90° Abd but remained relatively constant during the 30 repetitions. There was no difference in the evolution of heart rate between both positions. The start level was recovered one minute after the end of the assessment. Exercise at 90° Abd only entailed some delayed side effects. Being more specific of sport gesture, 90° Abd position may be recommended for isokinetic fatigue protocol. Nevertheless, therapists have to be knowledgeable of possible side effects on shoulder status.

References.
SUBMAXIMAL ENDURANCE MARKERS OF ELITE SOCCER PLAYERS DURING PRESEASON TESTING

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BACKGROUND: VO2max has been traditionally used to explain physiological differences among soccer teams of different ranking. However, the degree of predictive ability of VO2max in endurance events has been challenged, with velocity at lactate threshold being more strongly correlated with performance and running economy affecting performance even when VO2max remains unaltered. Thus, submaximal endurance markers may have greater discriminatory ability and provide additional information that will affect preseason training planning in soccer.

PURPOSE: To examine if velocity at lactate threshold and running economy can be used to better discriminate endurance characteristics of soccer teams of different level along with VO2max during preseason testing.

METHODS: One hundred twenty nine professional soccer players from the top three leagues participated in the study and underwent an incremental treadmill test to exhaustion with simultaneous expired gas analysis and blood lactate measurements. Velocity at lactate threshold was determined using the Dmax method and running economy was measured at 12 km/h. A one-way ANOVA with Tukey-Kramer adjustment for multiple comparisons was used to determine significant differences.

RESULTS: VO2max was 58.8 ±3.3, 56.4 ±3.7 and 57.6 ±3.2 ml/min/kg, velocity at lactate threshold 13.16 ±0.7, 12.61 ±0.7, 12.28 ±0.8 km/h and running economy 44.6 ±2.9, 44.4 ±2.8, 46.4 ±3.9 ml/min/kg for divisions A (First Division), B (Second Division) and C (Third Division) respectively. Velocity at lactate threshold was the only variable which was statistically different in between any two leagues. In every comparison, the higher division had the higher velocity at lactate threshold. VO2max was statistically different only between the top two divisions. Running economy was statistically different between leagues with similar VO2max, with better running economy for the higher league in each comparison. Lactate at threshold, heart rate at threshold and maximal heart rate did not differ between divisions with values 3.95 ±1.2, 3.77 ±1.2, 3.68±1.8 mmol/l, 170 ±10, 167 ±11, 168 ±11 and 191 ±9, 191 ±9, 191 ±8 beats/min for the three leagues respectively.

CONCLUSION: Velocity at lactate threshold revealed additional significant differences among divisions even when VO2 max failed to do so during preseason soccer fitness testing. Running economy can differentiate between divisions with similar VO2max. Preseason training programs should give more emphasis on lactate threshold training especially of the lower division teams as compared to top division teams, since velocity at lactate threshold appears to reflect the preseason training status of professional soccer players.

WINNING IN MIXED MARTIAL ARTS- A COMPARATIVE WEIGHT CATEGORY BASED MATCH-ANALYSIS

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Background. Mixed Martial Arts is a combat sport the proponents of which use techniques from various martial arts. The ‘Ultimate Fighting Championship’ or UFC®, which is one of the highest profile events on the sporting calendar, involves five competition weight categories (i.e. Lightweight (L): 66-70 kg, Welterweight (W): 70-77 kg, Middleweight (M): 77-84 kg, Light Heavyweight (LH): <84-93 kg, and Heavyweight (H): <93-120 kg). These categories have been monitored by the Nevada State Athletic Commission since 2001.

Purpose: To conduct a comparative investigation, by weight-category, of how fighters win competitions within the UFC®. Methods: A total of 52 consecutive competitions, conducted within the period 2001-2008, and involving a total of 437 combats, 308 fighters and an average of 87.2 ± 5.4 fights within each weight category, were included in the analysis. This involved an examination of the extent to which round, and which scores (i.e. decision, disqualified, knock-out KO, Submission or Technical KO) of a fight were most commonly associated with victory. The data were obtained from the official UFC® results as well as from ‘pay per view’ videos. Both a frequency analysis of qualitative variables and a Student’s t-test, for which the level of significance was set at P<0.05, were used to compare data.

Results. The median fight duration of weight category L exceeded that of H (367 ± 395 vs. 460 ± 381 sec, p<0.05). No significant difference in fight duration was shown in the remaining categories (i.e. W: 465 ± 313 sec, LW: 508 ± 353 sec, LH: 529 ± 381 sec). Category L and W fights most commonly finished within the 3rd round (47.5%, and 40.2%), in contrast to M, LH, and H fights, which usually finished in the 1st round (41.1%, 37.3%, and 51.6%). Within categories L, W, M, and LH, fights were most often won by 3rd round Judges’ Decision (L: 42.5%, W: 31.5%, M: 23.3%, and LH: 25.3%), and least often by first round Technical KO (L: 13.8%, W: 13.0%, M: 18.9%, and LH: 21.7%) and Submission (L: 12.5%, W: 15.2%, M: 16.7%, and LH: 10.8). However, combatents in category H most frequently won their fights via a 1st round Technical KO (19.8%) or Submission (14.3%), or Submission (16.5%).

Conclusion. In UFC®Light and medium weight fighters most commonly finish a fight within the 3rd round (47.5%, and 40.2%), in contrast to M, LH, and H fights, which usually finished in the 1st round. However, combatants in category H most frequently won their fights via a 1st round Technical KO or Submission, whilst heavier weight fighters most often do so via a 1st round Technical KO, Submission or KO.

CYCLOKEROGRANT TESTS IN THE ANAEROBIC CAPACITY DIAGNOSIS OF FOOTBALL PLAYERS

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Introduction. The contemporary football is characterized by the interval effort and training. The key element of players preparation is anaerobic endurance (Bangsbo 1994, Reily 1986, VdVtappen & Borens 1989). The methods of anaerobic endurance training in football player should include appropriate and specific tests. The aim of this study was the comparison analysis between three tests performed on cycloergometer (10 seconds Test, Wingate Test and 3760 seconds Test). Measurements used in the study allow for estimation of anaerobic lactate and non-lactate power and capacity. First test is designed to measure the peak anaerobic power based on anaerobic non-lactate metabolism. The two latter tests measure anaerobic lactate power and capacity.

Material and methods. Subject group was composed of 28 football players aged between 17-18 years (they had 5 to 6 years of training experience). The laboratory measurements of anaerobic endurance were conducted in three consecutive days, in the following order: 10 seconds test an effort with maximal intensity during 10 seconds and with the 10% of body mass workload, 30 sec test - Wingate test protocol with the 9% of body mass workload, 60 sec test an effort with maximal intensity during 60 seconds and with the 7.5% of body mass workload.

We measured the concentration of the lactic acid in subjects blood in the fourth minute after the cessation of an effort with the use of photometric method Dr Lange LP 20 and LKM 140 l.

Results. Statistically significant differences (p>0.001) were found between peak power (Pmax) and mean power (Pav) registered in 10s test and 30s, the same differences occurred between 10s test and 60s test. These differences indicate that one need to differentiate tests
depending on what area of metabolic changes one wants to evaluate. However such differences occurred in case of LAmax and DLA values (p<0.01). The 30 seconds effort is too short for the activation of the anaerobic, lactate metabolism. Therefore it is not an appropriate measure of metabolic potential of football players in the discussed range of metabolic changes.

Statistically significant dependencies (p>0.001) were found between all test in aspect of peak power. Significant dependencies between the registered values of 30 and 60 seconds test, such as: Pmax (r=0.656, p<0.01), WTOT (r=0.526, p=0.05), Pd (r=0.742, p<0.001), TUZ (r=0.588, p<0.05) and WOT1/SWOT1 (r=0.526, p<0.05), indicate that these tests assess similar range of metabolic adaptation of examined football players.

Conclusion. An interesting observation of this study is the statistically significant difference (p<0.05) in time the subjects reached their peak power in the 10s test comparing it to the 30 and 60 seconds tests. In case of the first one the time was shorter. Conducted comparison analysis of registered parameters in 30 and 60 seconds tests did not show statistically significant differences of Pmax, TUZ and TUT values.

EVALUATION OF ANAEROBIC EFFICIENCY OF ICE-HOCKEY PLAYERS WITH THE USE OF OFF-ICE TEST AND ON-ICE TEST

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The evaluation of ice-hockey performance is based on parameters registered during laboratory test, eg. Wingate (WAnT) [Watson & Sargant 1986] and on-ice test (Kostka et al. 1986, Volkov 1982). Off-ice tests allow for accurate registration of endurance parameters. On-ice tests are considered also very appropriate due to the specificity of the effort. During those test the analyzed parameter is the speed. The main aim of this study was the comparison of anaerobic endurance parameters of the off-ice and on-ice tests.

Material and methods. The experimental group was composed of 25 national team, ice-hockey players, aged between 19-20 years. Wingate test was performed on a cykloergometer the subjects were supposed to skate five times: the distance of 54m. The lever of lactic acid (LA) was estimated before and three minutes after the effort. The change in LA concentration was estimated (DLA), with the use of LKM reagent set 140 and photometer LP 20 Or Lange.

Results. Peak Power registered during the Wingate test in offence ice-hockey players was 11.21 W/kg-1 and in defense players 11.36 W/kg-1. Attack players work capacity reached the level of 275.64 J/kg-1 and defense players 274.13 J/kg-1. The change of the lactic acid level in attack players and defense players were accordingly 11.34 mmol/l-1 and 11.83 mmol/l-1. The time of the on-ice test performance for attack players was 42.74s and 43s for defense players. Even though the on-ice test duration was 13 seconds longer, there was no statistically significant differences in DLA between off-ice and on-ice tests. The statistically significant differences in Pmax between 30s and 60s cykloergometer tests were observed (p<0.001), such differences did not occur between offence and defense players. Statistically significant differences of DLA in both tests were observed (defense players p<0.05, offensive players p<0.001). There was significant dependency between LAmax in both player groups (r=0.328 r=0.370) and DLA (r=0.436 and r=0.537), and DHF (r=0.373 r=0.113). Significant dependencies were found between offence and defense players in the parameter of 30-s and 60-s tests: Pmax and Tw (r=0.894 and r=0.444), WTOT and Tw (r=0.894 and 0.444).

Conclusions. We showed statistically significant relations between endurance parameters registered with the use of cykloergometer which is the peak power (Pmax) and total work (WTOT) and parameters of on-ice skating on a specific distance 5x54m (1) W. However we did not noticed any relations between the range of body reactions as a result of an effort in both tests. This can indicate that even though both tests are supposed to measure the anaerobic endurance in consequence these tests could measure different areas of anaerobic metabolism. Wingate test assess power and volume of the anaerobic glycolysis and on-ice test estimates its effectiveness.

MAXIMAL POWER, MAXIMAL WORK AND HEART RATE OF THE SWIMMERS AGED BETWEEN 14-15 YEARS DURING THE ENDURANCE TEST PERFORMED WITH ARMS AND LEGS

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Introduction
The energy needed for the execution of the movement in swimming is based on the anaerobic and aerobic metabolism. Every type of metabolism is assessed with the use of different methods. Measurements of the functional state of the organism and maximal power measurements on the cykloergometers are very common (1).

The main aim of this study was an assessment of the differences between groups of female swimmers aged between 14-15 years. In this age one can observe accelerated development of anaerobic abilities in the aspect of the amount and characteristics of performance with maximal power performed in 30 seconds.

Material and methods
The examination was conducted on 16 female swimmers between 14 and 16 years old. They participated in regular swimming training and had approximately 5 to 7 years of training experience. The subjects have undergone an endurance test which was the modified Wingate test lasting 30 seconds. They performed it with their arms and legs in separate trials. The cykloergometer Monark 881 and Monark 824 was used in the study (2). The workload was assigned to every subject individually as the 5% of the body mass for arms and 7.5% for legs. The heart rate was registered with the use of Sport-Tester Polar Vantage.

Results
The statistically significant higher indices of peak power 3.27 W/kg, mean power 2.74 W/kg and overall work 82.21 J/kg as well as longer times of peak power maintenance reaching 0.26s (all p<0.001) were observed in case of legs performance when compared to arms. The high increase of heart rate (8.84-9.58%) in both tests during the first 3s of trials was observed. Between 3rd and 15th second we observed continuous increase of the heart rate with the decreasing gain tendency. It is characterized by the percentage values from 5.38% to 4.15%.

During the first 12 seconds the differences between arms and legs performance in the aspect of heart rate were statistically insignificant. The statistically significant dependencies were found in 15th second (r=0.454, p<0.05) of the trials, this is the point of decrease of peak power. Further time points which showed statistically dependencies in the aspect of heart rate were the following: 21st second (r=0.466, p<0.05), 24th second (r=0.434, p<0.05), 27th second (r=0.496, p<0.05) and 30th second (r=0.464, p<0.05).

Conclusions
High statistical dependency (p<0.01) between consecutive values of heart rate indicates that the test effort induced an expected cardiovascular reactions in the examined subjects. The reactions were independent of the muscle group. Therefore, cardiac adaptation to
increased effort performed only with arms or legs is similar in the groups of female swimmers that present approximately the same sports expertise.

 References.

METABOLIC AND VENTILATORY ANAEROBIC THRESHOLD DURING RESISTANCE EXERCISES
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Physiological effects from non resistance dynamics exercise such as running and cycling are well known. However, the resistance exercises still need more scientific studies to clarify its metabolic responses. The resistance exercises commonly use weight workloads and establish the base of strength, hypertrophy and power training, besides its importance in training program of almost all sports. The accurate identification of the ventilatory (V-AT) and metabolic (LAC-AT) anaerobic threshold (AT) is important to support exercise prescription due the change in the source of energy expenditure from oxidative to glycolitic pathways. The aim of this study was to analyze the ventilatory and metabolic AT of resistance exercises during the arm curl (BIC) and leg press (LEG) exercises. Thirty five healthy active male subjects had the fat mass determined by skinfold protocol and aerobic power (VO2peak) measured on a maximal treadmill graded exercise test. The maximal workload for one repetition (1RM) was identified for each exercise and applied on a discontinued and incremental workload resistance exercise protocol. The protocol consisted of several 20 repetitions/minute stages, starting at 10% of 1RM with increases of additional 10% in each stage. A two minutes rest interval was used between the stages when 25μL venous blood sample was collected from ear lobe. LAC-AT was determined by the point of abrupt increase in lactate levels and the non-linear rise in blood lactate concentration. Oxygen uptake (VO2), CO2 output (VCO2), and minute ventilation (VE) were measured with a portable telemetric system (K4B2). The V-AT was obtained from the non-linear rise in VE and ventilatory equivalents of O2 and CO2. High values of correlation were found between LAC-AT and V-AT for BIC and LEG exercises based on absolute (kg) (0.870-0.701), relative (%1RM) workload (0.750-0.534), and relative VO2 (0.964-0.796). LAC-AT was reached at 26.1 ± 5.6% of 1RM (10.5 ± 3.2 kg) for BIC exercise and 27.6 ± 7.1% of 1RM (84.0 ± 27.1 kg) for LEG exercise. Higher values of LAC (2.0 ± 0.8 mmol/L) were found on LEG exercise when compared to BIC exercise. Fatigue workload (FW), the load of concentric failure, also showed higher values for LEG (51.1 ± 12.9% of 1RM) when compared to BIC exercise (15.1 ± 5.5 mmol/L e 44.1 ± 10.1% of 1RM). This difference can be explained due a higher muscle mass used to perform multi-joint exercise in which others muscle groups certainly will be activated for exercise effort maintenance. There seems to be high correlations between LAC and V-AT for LEG when compared to BIC exercise. Therefore, it is possible to determine V-AT and LAC-AT during resistance exercise, which was reached at approximately 30% of 1RM in this study. It also appears that LAC and FW are muscle mass dependent. However, different incremental resistance exercise protocol should be tested to better understand the AT during resistance exercise.

THE DEFENSIVE ORGANIZATION IN FOOTBALL - A COLLECTION OF KNOWLEDGE OF PROFESSIONAL FOOTBALL COACHES
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This survey aims to create a series of representative enough premises that might be part of the training and competition system of a Football team Defensive Organization. The sample used on this research includes four professional coaches of the First and Second Portuguese football leagues, designated as A, B, C and D. They all have the professional UEFA license (4th Level). B and C coaches have a University degree in Physical Education and Sport Sciences. A and D coaches have acquired a relevant experience as professional and international players. All of them have a significant and large experience as coaches, but coach C has shown evidence of a larger experience in National Team. The data was collected through a questionnaire and the answers were analysed using a qualitative methodology concerning the practical knowledge.

Among other conclusions it was found that it is as difficult to coach the Defensive Organization as it is to coach the Offensiva Organization. The difference is based upon the willingness the players might have for their training. Concerning issues, such as where do I want to put pressure on, how do I want to put pressure on, and when do I want to put pressure on? along with the correct execution of the rules of the game may constitute themselves as an excellent reference of the evaluation for the Defensive Organization. The individual training of the tactic and technical actions of the first defense player may constitute an essential variable for the success of the Defensive Organization.

ENDURANCE TRAINING HISTORY INFLUENCES INDIVIDUAL RESPONSIVENESS TO RESISTANCE TRAINING
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Individual responsiveness to a resistance training program is influenced significantly by physical status and prior resistance training experience. The purpose of this investigation was to assess neuromuscular adaptation in untrained males (N=28) following 16 wks of progressive biceps brachii resistance training. Subjects completed a 4-wk progressive resistance exercise control period, and were evenly distributed among three experimental groups on the basis of one repetition maximum (1RM) strength gains: (EC) attempted explosive concentric and controlled 2-s eccentric; (SSC) attempted explosive concentric and controlled 2-s eccentric; and (C) controlled 2-s eccentric and concentric training. No significant differences in 1RM strength gain existed among groups: (SSC) 16.4 (±3.2%); (EC) 19.0 (±2.6%); (C) 15.6 (±3.5%). During experimental training, each group exercised 3 days per wk for 12 wk at 85% 1RM. ICI performed four sets of elbow flexion to repetition failure. IE2 (C) performed four sets of four repetitions. 1RM and MVC elbow flexion strength were assessed. Filtered electromyographic (EMG) data were sampled at 2 kHz (Digitimer, Neurolog). Peak and average root mean square (RMS) and mean frequency (MF, Spike 2 Ver5.13) were calculated over scrolling 250 ms windows with a 50% overlap. Data are means ±SE, with alpha set at 0.05. After the 4-wk control period, 1RM and mean biceps RMS significantly increased in high (24.7 ± 1.4%, 28.7 ± 0.8%) and low (9.2 ±1.5%, 5.4 ±6.3%) responders, respectively. Low responders were significantly more active generally (31.8%), of work (33.3%), engaged in endurance exercise more frequently (66.6%) and vigorous exercise more often (60%), despite no significant difference in resistance train-
ing history among the groups. No significant difference was observed in IRM strength between high [29.6 ±6.5%] and low [31.4 ±10.1%] responders after 12 wks of training. Low responders displayed significantly greater peak biceps RMS (28.9 ±34.7%) and mean biceps RMS (37.8 ±50.6%) compared to high responders [4.7 ±24.2] and [6.5 ±23.8%], respectively. High responders displayed significantly greater total IRM strength adaptation over 16 wks [62.1 ±9.4% versus 43.6 ±9.9%]. No significant group differences in peak or mean RMS were observed. These observations show that, since the rate of neuromuscular facilitation is affected by current and past exercise, pre-experimental (control) training is required to identify high and low responders prior to subject allocation within experimental groups.

THE EFFECTS OF TRAINING ON SPORTS PERFORMANCE IN ADOLESCENT VOLLEYBALL AND FOOTBALL PLAYERS

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Introduction

The performance tests are very important to follow the development some physical and physiological changes in adolescents who are interested in sports at this period and to evaluate sports performance for talent selection [1]. The purpose of this study was to determine performance differences in volleyball and football with comparing sports performance including some physical, physiological and anthropometric parameters in volleyball and football players between aged 13 and 16 girls.

Method

Mean age of all 33 subjects were volleyball players n=11,15.18±0.98yrs, football players n=11,14.91±1.04yrs and controls n=11,14.55±0.93yrs voluntarily participated in this study. Height, weight, body fat percent, fat weight, lean body weight, body mass index (BMI), somatotype, vertical jump, anaerobic power, sit ups test, press ups test, hand grip strength, flexibility, standing long jump, 30 m sprint, hexagonal obstacle test and zig zag test of volunteers were measured for all subjects at Sports Physiology Laboratory on behalf of School of Physical Education and Sports, Gazi University. Data's were analyzed with Kruskal-Wallis test.

Results

This study showed that height and body weight of volleyball players were significantly higher than the football players (p<0.05). Meso-morphy values of footballers were significantly higher than in volleyball players and controls. There were significant differences in sit ups, 30 m sprint, hexagonal obstacle test and zig zag test between football players and volleyball players (p<0.05). Except for flexibility and vertical jump performances, all the parameters of athletes were significantly higher than the controls (p<0.05).

Discussion / Conclusions

Melrose et al found that volleyball players (VPl) had lower body fat percentage (football players (FP 5.92±2, VP 4.6±1.6), higher flexibility values (SP 19.00±4.77, VP 32.7±5.96cm) and FP had higher hand grip power values than SP (35±7.6, VP 19.6±5.13kg). The results of this study are similar with our study. It can be concluded that higher performance parameters in volleyball and football adolescent players between aged 13 and 16 years reveal the positive effects of regular exercises done in this period. It might be mentioned that football match takes more time than volleyball, playing in greater field and continuously and speedily making attack. Also, defense players in football would be provided more improvements of speed, agility and some anthropometric parameters.

References


CARDIORESPIRATORY AND METABOLIC RESPONSE TO INTERVAL TRAINING OF VARIOUS DURATIONS USING MAXIMAL WORKLOAD FROM SPIRO-ERGOMETRIC EXERCISE

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Interval Training seems to get more important in the future as high intensity training was shown to be superior to constant load exercise in athletes and patients [Hawley, J. A. J Physiol 2008, 586 1-2]. However, there are no standard guidelines about how to set the optimal mode of intervals. Astrand, I. (Acta Physiol Scand Suppl. 1960; 49(169):1-92) presented that using the same workload intervals with 1:2 work to rest ratio (WRR) gave a completely different metabolic response dependent on the length of the work phases. Aim of the study was to investigate the cardio-respiratory and metabolic response to different intervals applying a WRR of 1:2 and using maximal power output from an incremental exercise test (IET).

Six young healthy male sports students (age: 26.2±4.4yrs; height: 180.3±4.2cm; weight: 74±6.0kg, VO2max: 53.2±7.0mlkg-1min-1) participated in the study. A maximal IET (40W, 20Wmin-1, 1min) was performed on an electronically braked cycle ergometer (Monark 839E, Monark, Sweden). Maximal power output was used as target workload for subsequent interval tests on the same cycle ergometer. Intervals applied were 10/20s (A), 20/40s (B) and 30/60s (C) for 30min each. Sessions were randomly assigned and interspersed by at least two days to guarantee sufficient recovery in between.

Results: Relative oxygen uptake (%VO2maxIET) was not significantly different both between treatments (A: 58.3±6.2%; B: 55.4±5.8%; C: 59.4±8.1%) and between treatments and IET at PmeanInterval (55.2±6.1%). Depended on workload duration relative heart rate (%HRmaxIET) differed significantly between interval types [A: 76.2±5.5%, B: 79.6±2.2%, C: 83.7±2.0%] as well as blood lactate concentration [A: 2.65±0.88mmol-l-1, B: 4.06±1.14mmol-l-1, C: 5.11±0.66mmol-l-1]. However, all subjects presented steady state lactate values throughout all interval sessions.

Conclusions: Maximal work load from IET may be used to apply hard interval training sessions maintaining lactate steady state as long as a WRR of 1:2 and a maximal interval of 30s is used. Even in 30/60 intervals, lactate presented a steady state indicating safe and steady state lactate values throughout all interval sessions. From a theoretical point of view hard aerobic interval training must be set at a mean workload below LTP2 (maximal lactate steady state), a recovery workload below LTP1 (maximal rate of muscular lactate elimination) and a WRR adapted to the maximal workload applied in the intervals. This theoretical concept will be evaluated in further investigations.
TOP VOLLEYBALL PLAYERS’ JUMPING ABILITIES

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Volleyball is a fast game with a ball. A player usually does 60 jumps per game. So to satisfy the needs of a modern playing style the players must be good in starting acceleration from zero velocity and have good jumping abilities. Jumping abilities can be measured in concentric conditions as a squat jump (SJ), slow eccentric-concentric conditions as a countermovement jump (CMJ), and in fast eccentric-concentric conditions as a drop jump (DJ). Players one of the best teams in past (USSR) had an average values for SJ 55 cm, for CMJ 61 cm, and 54 cm for DJ from 40 cm bench (Bosco, 1999). The aim of this paper was to find jumping abilities of top volleyball players. Eight players (height 195.5 ± 6 cm, mass 91.5 ± 5 kg, and age 24.5 ± 4 y) participated in this study. We measured SJ, CMJ, and DJ from 25 cm bench. In SJ we analyzed height of jump (SJH), take-off time (SJTO), starting power (mean acceleration in first 100 ms) (SJPP), and ratio between the velocities obtained during the second and the first half of take-off (SJIR). In CMJ we analyzed height of jump (CMJH), mean deceleration during braking phase (CMJD), mean acceleration during acceleration phase (CMJA). In DJ we analyzed height of jump (DJH). We calculate ratio between height of jumps in CMJ and SJ (CMJSJ). We calculate mean values and standard deviation for each parameter. We exclude the libero player since his tasks are different from other players. Mean values obtained in SJ were 43 cm (+-4 cm) for SJH, 341 ms (+- 34 ms) for SJTO, 1.6 m/s3 (+-0.9) m/s3 for SJP, 150 (+-50) for SJR. The mean values for CMJH were 47 cm (+-2 cm), while the mean values for DJH were 34 cm (+-5 cm). Mean values obtained in SJ were 43 cm (+-4 cm) for SJH, 341 ms (+- 34 ms) for SJTO, 1.6 m/s3 (+-0.9) m/s3 for SJP, 150 (+-50) for SJR. The mean values for CMJH were 47 cm (+-2 cm), while the mean values for DJH were 34 cm (+-5 cm).

Mean values obtained in SJ were 43 cm (+-4 cm) for SJH, 341 ms (+- 34 ms) for SJTO, 1.6 m/s3 (+-0.9) m/s3 for SJP, 150 (+-50) for SJR. The mean values for CMJH were 47 cm (+-2 cm), while the mean values for DJH were 34 cm (+-5 cm). We can see that jumping heights in each condition are much lower in ACH Volley players than USSR players (Bosco, 1999). Players from ACH Volley have poor starting acceleration from zero velocity which means they probably struggle to catch the ball when the ball is 1 or 2 m in front of the player. Poor starting acceleration cause long take-off time. So the player with poor starting acceleration need longer time to jump and block the attack. In playing situation this means that a player has less time to make a decision which action and in which position he has to do. Since the value of SJR is high we can speculate that front leg kinetic chain is dominant in SJ execution. The ratio CMJSJ shows that jump heights in CMJ are within the range that can be expected according to SJH so players works in slow eccentric-concentric conditions within the range that can be expected according to concentric conditions. From the height of jumps in DJ we can conclude that players have weak ankles. This is dangers for knee and hip since many landings with heel contact can cause knee and hip injuries. No matter the players involved in this research are top Slovenian players they were not in good jumping conditions.

References

THE IMPORTANCE OF SOME DIMENSIONS OF ANTHROPOMETRIC STATUS IN POLICE OFFICERS

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Our research is focused on some anthropometric measures in police officers that represent the characteristics of their body structure and composition, taking into account that appropriate morphological status and at the same time good physical fitness are not only an individual’s concern. Pealo (1993) finds that in police officers, the efficiency in terms of work and movement is to a large extent determined by morphological characteristics. Police officers with inappropriate morphological structure (obesity, muscle atrophy etc.) as a consequence of bad living habits are easier to attack and injure. After their arrest, robbers told, for example, that they decided to attack police officers on the basis of their overall image that conveyed vulnerability. Some anthropometric measures and relations between them were studied on a sample of police officers (162) aged between 25 and 48 years. In order to obtain relevant morphological information on the body, variables defining longitudinal (1) and transversal parameters (6), circumferences (6), skin folds (8) and body mass were used. The values obtained were compared with the respective values for workers engaged in machine maintenance covered by another study. The data were statistically processed with the SPSS programme of the Institute of Kinesiology at the Faculty of Sport in Ljubljana. For all variables, basic statistical parameters: the arithmetic mean, maximum and minimum results, standard deviation were calculated. Body density and subsequently the percentage of fat tissue were evaluated by regression equations according to Loeman, Sloan and Weir, Durnin and Womersley. It was found that workers have thinner skin folds on active segments (triceps and biceps), as a result of the nature of their work involving numerous operations performed by upper extremities, above all upper arms. Due to often very rapid operations there occur submaximal muscle stresses, resulting in the reduction in the biceps and triceps fat tissue, which reflects in a thinner subcutaneous fat layer. We conclude that larger circumferences and thinner skin folds in workers in production compared with police officers are a result of hypertrophy of the muscle tissue in the active segments of their upper extremities. The most obvious difference between the two samples is the difference in the mean values of the belly skin fold. A thinner skin fold in police officers is attributed to self-defence techniques training and other special training (final grips, floor fighting, tying and handcuffing, etc.) where repetitive power of the trunk dominates.

References

THE LACTATE MINIMUM TEST PREDICTS MAXIMAL LACTATE STEADY STATE, BUT IS DEPENDENT UPON THE METHOD OF LACTATE ELEVATION

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Surprisingly, the agreement between lactate minimum (LM) and maximal lactate steady state (MLSS) cycling powers has yet to be examined and was the first aim of this study (series 1). LM cycling power is insensitive to the blood lactate concentration ([LaB]) elevation protocol when the same exercise mode is used throughout the test (Smith et al 2002). However physiological responses to exercise differ depending on whether prior exercise is performed using like or unlike muscle groups (Fukuba et al 2002), thus the second aim of this study was to examine the effects of [LaB] elevation mode on [LaB] responses to the LM test (series 2). In series 1, 32 male subjects performed a LM test comprising a [LaB] elevation phase, 8 min recovery phase at 60W, and incremental phase at 45, 50, 55, 60, and 65% of the maximum power achieved during the [LaB] elevation phase. During the [LaB] elevation phase power was increased every 15 s by a constant increment chosen to elicit exhaustion in approximately 10 min. LM power was determined from the zero gradient tangent to a cubic spline function fitting the [LaB] (measured at the end of each stage) vs. power data. MLSS was determined using 30 min constant
power trials with [La]B determined every 2 min from 16-30 min. MLSS power was defined as the highest power at which a positive gradient of a linear regression fitted through the plot of [La]B against time was not observed. In series 2, 10 male subjects performed two identical lactate minimum tests (see series 1) (test 1 = LMLEG, test 2 = LMARM), except that during the second test the [La]B elevation phase comprised arm-cranking exercise with power increasing every 15 s by 4 or 5W until exhaustion. The powers performed during the incremental phase were identical in LMLEG and LMARM. In series 1, LM power (mean ± SD); (205 ± 22) W was not different from MLSS power (208 ± 21) W, with which it was correlated (r = 0.89, P < 0.01). The 95% limits of agreement were 24W and -20W. In series 2, all subjects demonstrated a U-shaped [La]B vs. power profile during LMLEG and LM power was 168 ± 21 W. Conversely, a clear U-shaped [La]B vs. power profile was not observed during LMARM. LM power during LMARM (157 ± 29) W was lower than that in LMLEG (P < 0.05). Although [La]B at the end of each stage of the incremental phase was not different between LMLEG and LMARM, the trial x stage interaction effect was significant (P<0.05). In conclusion, the LM test protocol utilised in this study provides a valid estimate of MLSS cycling power. Furthermore, our data suggest that the LM power is dependent on whether the [La]B elevation phase utilises like or unlike muscle groups. This latter observation may be explained by the dissimilar effects of prior exercise performed with like or unlike muscle groups on physiological responses to subsequent exercise.

References.

RELATION BETWEEN BASICS AND SPECIFICS FACTORS OF SELECTED MORPHOLOGICAL, MOTOR AND BIOMECHANICAL VARIABLES IN SKIJUMPERS

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The purpose of the research study was to establish in a sample of elite Slovene ski jumpers (N=67) a relation between basic’s and specific’s factors of referentiality of manifest area of the selected biomechanical (n=8), morphological (n=14) and motor variables (n=13). The research was conducted on 15 October 2004 on a sample of 67 Slovene ski jumpers. In ski jumping it is hypothetically assumed that the higher the value of specific factors is, the higher will be the potential performance. The factor analysis was made on the basis of the Principal Component Analysis. Six factors were ruled out. In the first dominant factor, accounting for 55% of total variance is the GENERAL MORPHOLOGICAL-MOTOR FACTOR OF SKI JUMPERS. The variables of the push-off explosive power formed a homogeneous structure of the second specifics factor of EXPLOSIVE PUSH-OFF POWER. On the third factor of ASYMMETRIC AERODYNAMIC CAPABILITY, the projection of morphological aerodynamic index (0.98) was prevalent. In the fourth factor of ASYMMETRIC PUSH-OFF POWER, accounting for 5.3% of total variance, the variables of asymmetric push-off power prevailed. In the fifth factor MORPHOLOGICAL INDEX OF TAKE-OFF ROTATION the following projections of morphological variables were predominant: morphological take-off index (0.93) and the related variables of the longitudinal dimension of legs. The projection of the variable AGE (0.95) was strongly prevalent in the last the sixth factor.

The results of the factor analysis made on a sample of 67 Slovene ski jumpers, aged 15 years and more, showed that the manifest structure of 35 variables was reduced to two basic and four specific factors. The results are interesting primarily because they reflect the specificity in expressing of skijumping factors, as it is conditioned by ski jumps i.e. their specific movement technique. The success rate in ski jumps is only in one part affected by the general morphological-motor factor and factor of age. All others specific morphological factors of ski jumpers have a strong impact on the success of ski jumping technique.

References.

SONIFICATION OF THE BOAT MOTION TO IMPROVE THE BOAT RUN DURING TECHNIQUE TRAINING AND RACING IN ROWING

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Introduction
Sonification of the production of movement defined sound sequences has become increasingly interesting for the technique control and optimisation in elite sport. Empirical motor learning studies of the movement sonification were already able to show effects of the complex movement acoustics information for learning new techniques (e.g. ergometer rowing) (Effenberg et al. 2007). The ability to perceive small deviations from the ideal motion are easier to detect with the auditory than purely visual sensors. Also, free perception capacity in the auditory sensors open more possibilities for receiving information. The following study utilises the rowing technique to investigate disconected hearing possibilities by filtering out deliberate and unaware perception differences of acoustic information and their influence on the boat motion in a single stroke and on the stroke by stroke basis.

Also, kinematic and dynamic movement parameters will be sonified to a polyphonic sound sequence to indicate differences to the athlete in regards to the calculated ideal motion.

Methods
Preliminary on-water rowing tests are planned in March 2008 (four male junior athletes (U-23) from the German national team), where the sound (sound pressure level and frequency composition) will be recorded close to the ear of the athletes with a precision-sound level meter (Narco 118). The boat motion (boat velocity and boat acceleration) will be collected with GPS (AstReX 1), velocity transducer, resolution 2cm/s and accelerometer (KB MMF 12F) at different stroke rates. Additionally, video will be taken. In the second set of testing the hearing perception of the athletes will be prevented by sound damping ear plugs and special hearing protections to determine the changes in the boat motion. The kinematics of the boat motion will be determined later in order to add sound overlays.

Expected results
The temporal trace of the sound pressure level and the frequency composition will be audibly disseminated and split into its various components of content to filter out areas/shares of the deliberate and unaware perception. Boat velocity and acceleration traces can detect faulty appearances of the boat motion to then calculate an idealised boat run. The ideal boat run produces a set music, which will be applied in training as acoustic reference. Synchronised with this there is the actual value of the boat movement as another set music fed back to the athlete.

Discussion

The complex movement-acoustics information is a new approach to add to the technique analysis and optimisation for rowing and to describe the ideal boat run. The additional information opens up new opportunities for technique training and racing tactics.

References


RELATIONSHIP BETWEEN LACTATE TURN POINT AND MAXIMAL PERFORMANCE IN YOUNG HEALTHY MALE AND FEMALE SUBJECTS OF DIFFERENT EXERCISE PERFORMANCE LEVEL

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Usually, the percentage of power output (P) or oxygen uptake (VO2) at the anaerobic threshold (AnT) was described to increase with exercise performance. This relationship is dependent on the method of AnT determination. Aim of the study was therefore to investigate the relationship between the second lactate turn point and maximal exercise performance in an age homogeneous group of healthy male and female subjects.

45 male (M) (age: 27.2 +/- 3.5 yrs, height: 180.2 +/- 6.8 cm, weight: 74.1 +/- 8.5 kg) and 30 female (F) (age: 26.6 +/- 2.4 yrs, height: 166.7 +/- 6.8 cm, weight: 61.4 +/- 7.0 kg) subjects were randomly recruited from routine diagnostics. All subjects performed maximal incremental cycle Ergometer exercise (40 (M) / 20 (F) W; 20 W.min^-1 (M) / 15 W.min^-1 (F)) until subjective maximal effort. Heart rate (Sporttester PE4000, Polar Electro, Finland), gas exchange variables (MetaMax I, Cortex Biophysik, Germany) were obtained at rest, throughout exercise and during recovery. Blood lactate concentration (Biosen S-line, EKF Diagnostik, Germany) was obtained from blood samples collected from ear lobe at rest, after each work load increase and during recovery. The first (LTP1) and the second (LTP2) lactate turn point were determined within defined regions. All calculations were performed using a computer supported analysis by means of a linear regression turn point model (Hofmann et al. Med Sci Sports Exerc 1997; 29: 762-768). Subjects were recruited according to maximal power output and divided in groups of low (Lo), medium (Med) and high (Hi) maximal exercise performance level (M-Lo: 256 +/- 24 W, M-Med: 341 +/- 114 W, M-Hi: 423 +/- 18 W, F-Lo: 167 +/- 10 W, F-Med: 209 +/- 8 W, F-Hi: 260 +/- 20 W) and maximal oxygen uptake (M-Lo: 3.4 +/- 0.4 l.min^-1, M-Med: 3.4 +/- 0.2 l.min^-1, M-Hi: 4.3 +/- 0.1 l.min^-1, M-Hi: 5.2 +/- 0.4 l.min^-1, F-Lo: 2.2 +/- 0.2 l.min^-1, F-Med: 2.7 +/- 0.1 l.min^-1, F-Hi: 3.2 +/- 0.2 l.min^-1).

Mean percentage of Pmax at LTP2 was found at comparable levels in male and female subjects (M-Lo: 67.8 +/- 3.8 %, M-Med: 71.1 +/- 2.8 %, M-Hi: 74.2 +/- 3.3 %, F-Lo: 72.4 +/- 4.3 %, F-Med: 71.2 +/- 2.1 %, F-Hi: 72.9 +/- 2.6 %). No sign. differences were found in F but in M where %Pmax at LTP2 increased with Pmax. The percentage of VO2max at the LTP2 was also found similarly (M-Lo: 71.2 +/- 4.0 %, M-Med: 73.6 +/- 5.5 %, M-Hi: 78.5 +/- 4.8 %, F-Lo: 75.9 +/- 4.0 %, F-Med: 74.4 +/- 4.0 %, F-Hi: 75.6 +/- 8.2 %). No sign. differences were found in F but in M where %VO2max at LTP2 increased with Pmax.

Mean percentages of power output and oxygen uptake at the LTP2 were found in a very narrow range around LTP2, a theoretically supported individual threshold concept, in an age homogenous group of male and female sports students. There were only slight gender differences and the mean whole group values for %Pmax and %VO2max were not significantly different between genders. Overall values were found at 71.5 +/- 3.8 % Pmax and 74.8 +/- 5.6 %VO2max which offer some possibilities for easy to apply performance diagnostics.

COMPARISON OF THE PHYSICAL AND PHYSIOLOGICAL PARAMETERS OF ELITE TURKISH SWIMMERS AND FINSWIMMERS

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In this research, we studied athletes who have reached elite performing stage in swimming and finswimming. The aim of the study was to compare the differences and similarities on physical and physiological parameters of these two different branches.

8 elite male swimmers and 8 elite male finswimmers took part in this study. Bone width and length, skinfold thickness, circumference measurements and some proportions were measured for physical characteristics while aerobic performance, anaerobic performance, vital capacity, force vital capacity and flexibility were tested for physiological and motor characteristics. Bruce protocol was applied using ergospirometer sensor medix 29 C in MaxVO2 measurement. Wingate test (Monark ergometric bicycle) was used for anaerobic power test and data spirometer was used for vital capacity. The results were evaluated in SPSS programme. Mann Whitney-U test was applied in order to determine the differences between groups.

As a result, it has been determined that there were significant differences in the parameters of weight, quadriceps circumference, biceps circumference, fat mass, lean body mass, vital capacity (VC), % vital capacity (%VC) at p< 0,05 level while there were significant differences in the parameter of shoulder circumference at p< 0,01 level. It has not been found any significant differences between the aerobic and anaerobic power and flexibility values of the athletes (p>0,05).

RELATIONSHIP BETWEEN ANTHROPOMETRIC, CORPORAL COMPOSITION AND PERFORMANCE IN YOUNG SWIMMERS, BOYS AND GIRLS

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The purpose of this study was to compare the differences in anthropometric and corporal composition (body mass (BM), height (H), body surface area (BSA), body fat percentage (%BF) and fat free mass (FFM)) between boys and girls, both young swimmers, and to analyse the relationship between those and the best times performed in 100/200 meters free style and 100/200 meters best stroke.
Anthropometric measurements, body composition estimation, the lap of 100/200 meters free style and best stroke (25 meters swimming pool) seven girl swimmers (GS) (12.57 ± 0.54 years of age) and nine boy swimmers (BS) (12.99 ± 0.33 years of age). All the studies were performed by the same investigator.

Mean values for GS were compared with those for BS using t-tests for unpaired data. Pearson product moment correlation coefficient was calculated to evaluate the relationships between anthropometric and body composition data and the performance on freestyle and best style. Results of all statistical tests were considered significant if p< 0.05. GS and BS were of similar age but different in their anthropometric and body composition characteristics. The BS group was significantly taller, had greater FFMs, owing to significantly reduced %BF (p<0.01) and showed greater BM, BSA and BMI, when compared to GS. BS had better performance on 100 and 200 meters free style (p<0.05). BM, H, FFMs and BSA correlated negatively and significantly (p<0.01) with the performance on 100/200 meters. Swimmers of this age, who are heavier, taller, with greater body surface area and FFMs had better performance, better time during 100/200 meters freestyle and best stroke.

COMPARISON OF THE INDIVIDUAL ROWING PERFORMANCE IN JUNIOR AND SENIOR WOMEN IN THE EIGHT
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Introduction:
To secure a long-term improvement of performance in young rowers, detailed specifications and standards for training fitness and rowing technique at each development level are of great importance. While such specifications already exist for strength and endurance training, from the rowing ergometer (Steinacker et al. 1998), such data are missing for individual rowing performances and technique in the boat. An analysis and assessment of these factors over 2000m in an eight are crucial: (1) for the selection of junior teams for the junior world championships, (2) to set and evaluate training goals for the crew and each athlete in preparation for the competition period, (3) to suggest prospects for development that exceed training recommendations. The study’s purpose was to compare individual rowing performances in the eight of elite senior and junior rowers by utilising cross and longitudinal section analysis.

Methods: From 2005-07 the national German Women’s Eights at the senior ((Ws), n=24) and junior level (Wj), n=24) were tested three times over 2000m at comparable times of the year (Ws): during international rowing regattas in Germany, (Wj): before the pre-competition phase in Berlin (July). The boats were equipped with a mobile measuring system (FES, Berlin). Handle force, footstretcher force and oar angle were recorded for each individual. The individual’s rowing performance, comprising handle pulling force, handle velocity, stroke length, and other selected technical characteristics were assessed and statistically analysed for mean differences (t-test) for all strokes over 2000m.

Results:
Body height (181±0.5m (Ws) vs. 178±0.5m (Wj)) and body mass (73±4.3kg (Ws) vs. 72±5.4kg (Wj)) between the two age groups were comparable. Significant differences were found in stroke rate (35.4±0.7str/min (Ws) vs. 33.4±0.5str/min (Wj)), handle power (238±21.5W (Ws) vs. 206±18.6W (Wj)), handle work (403±36J (Ws) vs. 371±34J (Wj)) and handle force (302±21N (Ws) vs. 270±21N (Wj)) during the drive phase and in footstretcher forces and handle velocity in the recovery. (Ws) obtained higher values and a better rowing technique during the catch and in connecting motions of the leg-hip extension, upper body exertion and arm pull. The outcomes of the cross section analysis were confirmed in the longitudinal section.

Summary and Conclusion:
The results of the anthropometrical and biomechanical parameters showed general and individual trends from the junior up to the senior level. Collated data provided recommended standards for the rowing performance and technique - guiding each athlete in their on-water training, regarding their fitness and rowing technique towards their season’s peak. Optimising an individual’s improvement could lead to maximising the performance of the crew boat.

References:

ELECTROMYOGRAPHIC PROFILES OF EXERCISES IN STRENGTH TRAINING AND STRENGTH DIAGNOSIS WITH ELITE RACE ROWERS
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Introduction:
Strength enhancing training measures in race rowing like training at rowing machine ergometers or barbell training have long since effectively served to develop specific strength proficiency [1, 2, 3, and 4]. Along with these training measures special performance tests have established themselves. To meet the increased demands for ever more effective training and testing methods the definition of an electromyographical profile of training- and training diagnosis exercises recommends itself to more precisely disclose a correlation pattern between training, diagnosis and the motor requirements profile of the target motion in contest rowing.

Methods:
During a training camp (in January 2008) the data of nine male senior elite athletes were acquired. By means of a biovision-EMG and a PEAK Motus 9 analysing soft-ware the surface electromyographic activities of nine chosen, power relevant mus-cles were evaluated with regard to the phased coordination pattern, the succession, the length and intensity of their activation in the motion in selected strength training exercises and exercises of strength diagnosis. The main focus was on 5 maximum arm pull and leg push movements at a Concept 2 rowing ergo meter (FES, Berlin, Germany) and a Concept 2 Dyno (FES, Berlin, Germany) both equipped with sensor technology. In addition, a medicine-ball-throwing test and a trunk-muscles test were performed as well as a 2000-meter-trial at the rowing machine ergo meter. Training exercises such as bench pull, knee squats with arm lift, counter-movement jumps, pull-ups and body lifts were also analysed.

Results and Discussion:
The coordination patterns generated by the training and diagnosis exercises have been used to establish some basic electromyographic coordination profiles, which reveal correlations with the movements at the rowing ergo meter. Based on this fact new potentialities will be shown which lie in categorising the training exercises as to general strength training on the one hand and special exercises on the other. Sec-ondly the functional coherence and independendence of the postulated aim in rowing and the diagnosis and training methods with which to achieve it will be dis-cussed.
HANDBOOK AND TIME OF PHASES OF A FULL SWING IN GOLF
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The comprehension of motion analysis of the complex move of a golf-swing can be facilitated by stable and reliable parameters. The pattern of single phases during the full swing is therefore not only for the beginner, but also for the skilled player of big importance. The times of different sequences of a full-swing depend on performance and sex.
32 golfers different levels: 11 players with low handicap (Mean 1.8), 10 players with medium handicap (Mean 18.4) and 11 beginners (no handicap). Full swing was recorded by a camera. 3 phases were defined (backswing, downswing and follow-through) and analysed. Duration in total was 1.71 +/- 0.26 seconds. The backswing took the longest time of the hole swing (approximately 1 second). Downswing was as long as the sequence of follow-through with shaft parallel to the ground (0.35 seconds). With rising performance-level the total time of the hole swing decreased significantly (p = 0.000, r = 0.412).
A comparison of sexes revealed highly significant difference in the backswing (p=0.000, r=0.268): this phase as well as the total of the swing is longer in female than in male golfers. Higher performance levels lead to shorter times of the full-swing and particularly the back- and down-swing.
Comparing male to female golfers the latter phase as well as the total time of the swing is longer in male athletes. To establish and strengthen a possible triple connection between handicap, swing-time and sex more golfers have to be examined. However, the phase of the back-swing seems to be of decisive importance for the whole swing as there were the biggest differences between 'good' and 'bad' golfers apparent.
The performance-level of a golfer as well as the sex influence times of the total swing and single phases of the swing.

APPARATIVES MEASUREMENT OF STRENGTH AND FLEXIBILITY OF GERMAN ELITE GOLF PLAYERS
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Unilateral strain in sport may be responsible for imbalances in strength and flexibility. Due to unilateral strain in golf sport golf players are supposed to have a specific profile in strength and flexibility of the trunk muscles. Knowledge of these profiles may lead to the development of training plans for strength and flexibility training especially for golf players.
Apparative measurement of trunk flexibility and strength are made. Tests were carried out in sagittal, frontal and transversal planes. The results are given in % of a given index value. 132 golf players of the German A and C national squads were tested. The golfers had an average age of 18,5 and an average handicap of 1,1.
On the average, a specific profile in trunk flexibility and strength was observed for the tested golf players. They were least flexible in the sagittal plane. The flexibility increased from the frontal to the transversal plane where the best flexibility was observed. The strength profile was exactly converse. Here, the best rates in strength were noticed in the sagittal plane, whereas the lowest rates occurred in the transversal plane.
The results of the study support the hypothesis that (first-class) golf players have specific abilities in trunk strength and flexibility. Hence, the current tendency to additional strength and flexibility training, especially of the trunk muscles, is highly supported.
The tested golf players showed a specific profile in strength and flexibility of the trunk. The imbalanced profile, which was identified for all tested players, illustrates the importance of accompanying strength and flexibility training as health protection.

COMPARISON OF THREE COMMERCIALLY AVAILABLE FACEMASK ON-LINE GAS ANALYSIS SYSTEMS THROUGHOUT IVO2MAX AND VO2MAX MEASUREMENTS
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Maximal oxygen consumption (VO2max) and maximal intensity of VO2max (iVO2max), criterion measure of cardiorespiratory fitness and physical performance are most commonly measured by indirect calorimetry during an incrementally graded exercise test to exhaustion using treadmill or bicycle protocols. Different commercial facemask models are used to estimate VO2max and iVO2max though indirect test, however, doesn't know influence on results. Therefore, this study proposed to verify different facemasks (mouthpiece, silicone and neoprene), developed by the MedGraphics VO2200® which is a portable metabolic measurement system (Medical Graphics Corp., St. Paul, MN), influenced on the VO2max and its iVO2max. Thirty 18 males, 5 females) healthy young subjects (age 20.8±2.5 years, body mass 62.2±10.8 kg, 166.5±8.6 cm) volunteered for the study. The subjects performed three maximal incremental tests using mechanically braked cycle ergometer (Monark88), until voluntary fatigue, changing the facemasks in randomly order. Prior to each test, the VO2200 was calibrated according to the manufacturer’s instructions which consisted of performing an auto-calibration routine to the oxygen and carbon dioxide analyzers. At the first stage subjects cycled at 50-60 rpm unloaded during one minute followed by 30 watts with increment in each minute. The great workload performed was used as iVO2max and the VO2 30-s average during the last stage of exercise was considered as VO2max. The one-way ANOVA for repeated measures did not show differences among the facemasks either to VO2max or to iVO2max: mouthpiece (44.1±7.7 ml.kg-1.min-1; 246.9±46.1 W), silicone (45.0±6.8 ml.kg-1.min-1; 244.6±42.2 W) and neoprene facemask (45.0±7.7 ml.kg-1.min-1; 244.6±45.6 W), respectively. In conclusion, the facemasks for this metabolic measurement system used to collect VO2 data did not influence on the VO2max neither on the iVO2max.
MAXIMUM DYNAMIC STRENGTH AND ENDURANCE RELATIONSHIPS IN TWO DIFFERENT RESISTANCE EXERCISES

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The relationship between % of load and number of repetitions changes with training (Braith et al. 1993). Also, it was suggested an influence of muscle mass involved in exercise (Shimano et al. 2006). The purpose of this study was to examine maximum strength and exercise load influence on the number of repetitions in two different upper body resistance exercises like bench press (BP) and seated arm curl in dominant side (AC).

Thirteen male participants (mass = 77.81 kg, and height = 178.77 cm), experienced in resistance training, were evaluated in repetition maximum (RM) in BP (MBP) and AC (MAC). The following days, with a minimum of 48 h between evaluations, they performed endurance tests in randomized order. The low-intensity endurance tests consisted of performing the maximum number of repetitions at an intensity of 70% of RM with 2 s rest intervals between repetitions until failure in both exercises (N70BP and N70AC). The high-intensity endurance tests consisted of performing the maximum number of repetitions at an intensity of 90% of RM with 30 s rest intervals between repetitions until failure in both exercises (N90BP and N90AC).

MBP was 93.62 ± 18.89 kg, and MAC was 20.19 ± 4.85 kg. N70BP resulted in 16.31 ± 2.59 and N70AC in 8.77 ± 3.01 repetitions. N90BP resulted in 21.85 ± 11.07 and N90AC resulted in 18.54 ± 12.85 repetitions. The CV values reflect a high variability between subjects, higher in high-intensity tests (CV = 0.506; CV = 0.693, in N90BP and N90AC, respectively; vs. CV = 0.159, 0.34, in N70BP and N70AC, respectively). A significant difference was found between N70BP and N70AC (p<0.05), reflecting a lesser number of repetitions in AC. Also, a significant correlation was found between endurance tests in AC (N90AC-N70AC, r= 0.714; p=0.006), with a trend in BP (r= 0.516, p=0.071). Finally, regarding maximum force parameters, only MAC and MAC divided by body weight (MACbw), correlated with endurance performance at low-intensity test IMAC-N70AC, r= -0.574, p=0.04, MACbw-N70AC, r= -0.596, p=0.031, showing an inverse relationship between maximum strength and endurance in AC in the low-intensity condition.

In summary, this study has shown that the number of repetitions at the same % of RM is exercise dependent. From these observations, it is suggested the use of the number of repetitions for training monitoring in contrast to the traditional %RM for a better effort characterization.

References


MONITORING OF ANTHROPOMETRIC AND BIOMOTOR ADAPTATIONS AND STRUCTURE MODELING OF SPORT PERFORMANCE ON VOLLEYBALL ATHLETES DURING A MACROCYCLE

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This study had as objective to determine the structure of sport performance through the anthropometric and biomotor adaptations on the athletes from the male volleyball team during the macrocycle of under-19 Brazilian National Team in preparation to the 2005 world championship. The sample was composed of 12 athletes (17.76±0.71 years old). Training volume analysis was according to the manuscripts recorded by the coaches. The athletes were tested in three different moments and the measured variables were organized as follows: Training volume quantification, anthropometry (height, body mass, sum of seven skinfolds, % body fat), muscle power of the upper extremities (3 kg medicine ball throwing); muscle power or the lower extremities (squat jump, countermovement jump, attack and block height).

The relationship between % of load and number of repetitions changes with training (Braith et al. 1993). Also, it was suggested an influence of muscle mass involved in exercise (Shimano et al. 2006). The purpose of this study was to examine maximum strength and exercise load influence on the number of repetitions in two different upper body resistance exercises like bench press (BP) and seated arm curl in dominant side (AC).

Thirteen male participants (mass = 77.81 kg, and height = 178.77 cm), experienced in resistance training, were evaluated in repetition maximum (RM) in BP (MBP) and AC (MAC). The following days, with a minimum of 48 h between evaluations, they performed endurance tests in randomized order. The low-intensity endurance tests consisted of performing the maximum number of repetitions at an intensity of 70% of RM with 2 s rest intervals between repetitions until failure in both exercises (N70BP and N70AC). The high-intensity endurance tests consisted of performing the maximum number of repetitions at an intensity of 90% of RM with 30 s rest intervals between repetitions until failure in both exercises (N90BP and N90AC).

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In summary, this study has shown that the number of repetitions at the same % of RM is exercise dependent. From these observations, it is suggested the use of the number of repetitions for training monitoring in contrast to the traditional %RM for a better effort characterization.

References


DIFFERENCES IN DEVELOPMENT OF MOTOR SKILLS AND PHYSICAL FITNESS BETWEEN A SPORT CLASS AND A REGULAR CLASS IN AN AUSTRIAN SECONDARY SCHOOL: A 3 YEAR LONGITUDINAL STUDY

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Introduction

Physical fitness of 10 to 13 years olds in Austria has been declining [Sandmayer, 2004]. The need for more physical education in schools should be examined. In Austria regular classes have physical education 2 hours per week, while sport classes have up to 8 hours per week. This study analyzed the differences in motor skill and fitness development between sport and regular pupils over three years.

Methods

53 school children (regular class (RC) n=26, sport class (SC) n=27) have been tested with a comprehensive motor skill and fitness testing battery twice annually since 2004. The tests are: 15 m sprint, counter movement jump (CMJ), maximal unilateral isometric leg press, maximal isometric core strength, complex reaction test, hurdle boomerang run, balance test (IMFT 53 Check), stand and reach, and...
Cooper test. Anthropometric data (height, weight and BMI) were also collected. A 2 factor ANOVA (SPSS 15.0 for Windows) was carried out to analyze differences between classes.

Results
As the children aged, the performance generally improved in the tests except in sprint, hurdle boomerang run and relative isometric leg strength left/right. These 3 tests showed no significant main effect for time. BMI was consistently significantly higher in RC, and the increase in BMI from year to year was also greater in RC. SC had significantly higher scores on all other tests except for stand and reach and absolute isometric leg strength and absolute core strength.

The sport class significantly improved in CMJ (p < 0.001), relative isometric core strength (p < 0.007) and Cooper test (p < 0.005) over the three years.

Discussion
The increased physical education in SC had a positive effect on the motor skills and fitness levels of the children. This study confirms other work (Ziroli et al. 2003) which stress the effect of activity level on BMI and fitness. If children do not have the necessary motor skills and strength for sport, they will eventually choose sedentary activities in their leisure time. This will in turn lead to even worse fitness levels. The strong correlation between physical inactivity and bad health (Dencker et al. 2006) suggests that RC pupils will be more susceptible to health problems in the future. The education system should seriously consider increasing the exposure of pupils to physical education.

References

THE EFFECTS OF PLYOMETRIC TRAINING ON JUMPING STRENGTH AND SOME ANTHROPOMETRIC FEATURES IN VOLLEYBALL PLAYERS AGED BETWEEN 14-16

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The aim of the present study is to determine the effects of plyometric training on jumping capacities of female volleyball players aged between 14 and 16. 22 Female volleyball players licensed at 2. Division. The subjects were given a pretest, a pre-mezosiklus test and a post mezosiklus test. According to the results of the pretest, the subjects were divided into two groups; a control group (n=11; ages: 15.18±0.60, weights: 53.00±4.89, heights: 163.81±6.41) and an experimental group (n=11; ages: 14.72±0.64, weights: 56.18±5.41, heights: 169.72±2.14).

While the control group was just given a volleyball training, the experimental group was given volleyball training and plyometrics training. In plyometric training, the box height was determined considering the breaking points of the players. In addition to the anthropometric features of the subjects, calf periphery (CP), thigh periphery (TP), and gluteal folding periphery (GFP) were measured with a tape measure. “Holtein” was used for the measurement of Calf skin-fold thicknesses and thigh skin-fold thicknesses. Heights were measured with wall meter method and weights were measured with an electronic weighing machine trademarked “Arzum”.

Jumping heights of the counter movement jumping (CMJ), squat jumping (SJ), drop jumping (DJ) and 15 second rebound jumping (RJ) were measured with Bosco Test Apparatus. Because of the differences on more than two measurement of the control groups and experimental groups and a lot of PI features were considered, a multivariate analyses of variance (MANOVA) was used for the analysis of results. Variance analysis (VA) was used for the double factor-repetitive measurements. Due to significant F value, the origin of the difference was determined by the Tukey Test.

At the end of the study it was observed that there was no statistically difference between groups (p>0.05).

It was observed that there was a statistically significant difference between the CMJ 1-2, 1-3, 15 second RJ 2-3, gluteal folding periphery 1-3, 2-3 and calf skin-fold thickness 1-3 measurements of the control group (p<0.05).

On the other hand, it was found that there was a statistically significant difference between CMJ 1-2, 1-3, 15 second RJ 1-2, 1-3, 2-3 gluteal folding periphery 1-2, 1-3 thigh skin fold thickness 1-2, 1-3, 2-3 and calf skin-fold thickness 1-2, 1-3, 2-3 measurements of the experimental group.

As a result, with the plyometric training, jumping strength could be improved however training programme have to be prepared by considering the developmental features of this age group.

FIT2DIVE- SPECIFIC PERFORMANCE TEST FOR DIVING

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To guarantee the highest possible safety in scuba diving most divers today use redundant systems and alternative air sources. In contrast, the impact of a suitable level of physical fitness on the safety in scuba diving is often easily forgotten. Deficits in physical fitness could strongly increase divers’ workload within a dive such that automatisms for easy skills like clearing a facemask or for more advanced skills as rescue of a diver become much more difficult. In the worst case, a rather small problem can escalate and lead to a real emergency situation.

So far, available methods to investigate divers’ physical fitness need considerable time and costs of material to come to representative results. Hence, a collaboration of the German Sport University and the company aqua med developed a test which can be carried out in the field of leisure sport by every diver without a lot of expenditure. Thus, the aim of fit2dive is an easy practicable performance underwa- ter test for divers which can be apply in diving clubs and training organizations.

There are only a few materials necessary to realise the construction of the test, beside a rope which has marks in defined points and will be placed in shape of a hexagon on ground of a swimming pool, a stopwatch and a timedata is needed. Depth limitation are 5m, the subject must be a certified diver with a minimum age of 16.

In combination of the timetable and the stopwatch the diver is forced to swim a step-test and reach markers every 10m within a defaulted range.
A qualified fit2dive-coach evaluates the divers while testing and makes comments due to equipment configuration, finswimming technique and body position in terms of swimming drag. Directly after the test the diver has to classify the strenuousness in a Borg scale. Furthermore the diver has to complete a questionnaire to receive his full demographic data, diving and medical history. Besides the fact that the diver will receive feedback about his personal strength in the specific underwater environment, the test should sensitise the diver and should help the diver to be able to find his own borders. Moreover, a long-term purpose is to setup a European-wide database to evaluate the fitness state of divers. This database could help to find out more about the relation between physical fitness and diving safety, and therefore can be used for the advancement and adaptation of decompression models.

**QUANTIFYING THE DISTANCE TRAVELED AEROBICALLY AND ANAEROBICALLY TO MONITOR TRAINING LOADS IN INTERMITTENT SPORTS**

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Intermittent sports such as soccer demand athletes to be able to perform at multiple intensities upon demand. Considering an individual has a finite aerobic and anaerobic reserve, quantifying the energy expended in each energy system may be effective for focusing and optimizing an athlete’s training program. Therefore, the purpose of this study was to develop a model that could quantify the distance traveled using aerobic and anaerobic energy systems by individual athletes through common monitoring systems.

The model developed quantifies the distance traveled aerobically (AD) and anaerobically (AnD) from velocity data obtained from time motion analysis. Critical velocity testing was performed for each individual to determine two parameters: anaerobic capacity and critical velocity (CV). Two main assumptions were used in the development of this model. The first assumption used CV to determine whether a work rate was aerobic (below CV) or anaerobic (above CV). The second assumption modeled oxygen consumption to determine how the oxygen deficit of a given work rate below or above CV contributed to AnD. Oxygen consumption was also used to model recovery periods, assuming the excess oxygen consumption needed to regenerate the anaerobic capacity. Oxygen consumption was modeled using one parameter kinetics. A series of equations were then built on these assumptions to quantify the training load.

In order to test the construct validity of the model, two theoretical running conditions were tested. The first condition involved a continuous maximal run above the critical velocity. The second test condition involved a continuous intermittent run that involved 15 s of running at an intensity of 105% CV, and 15 s of running at an intensity of 80% CV. The AD and AnD were quantified for these two conditions after 5 minutes of continuous activity. AD values were 80% and 90% for the continuous and intermittent exercise respectively, while AnD were 20% and 10% for the continuous and intermittent exercise respectively. This agrees well with information available in the literature. Sensitivity analysis was also performed on the oxygen kinetic parameters, with tau values adjusted by +10% and -10%. Differences in AD and AnD were < 3%.

The model proves to be valid for both the continuous and intermittent exercise roles. Due to its ability to quantify the intensity of training by energy systems specific to each individual, it offers greater advantages over current monitoring systems for intermittent sports.

**SPORTS INJURIES IN BASKETBALL: EPIDEMIOLOGY AND PREVENTION STRATEGIES**

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Purpose: Research related to sports injuries often has the aim to develop prevention measures for a respective kind of sport by means of specific analyses of accidents. Due to the fact that basketball injuries are ranking within the top ten of the sports injury statistics in nearly every European country, it seems to be necessary to develop sports specific prevention measures for basketball based on a detailed analysis of injury causing situations and mechanisms.

Methods: Athletes who report a sports injury receive a questionnaire containing questions about how the accident happened, about the injury itself and how it was treated. All athletes were actively participating in organized sports competition within Germany at the time of their reported injury. The response rate was 65%. To date, 170,000 accidents have been registered. Out of these, a sample of 5090 accidents resulting from basketball were statistically analysed and a free text analysis of the injury mechanisms and situations was carried out.

Results: Although basketball is a non-contact team sport by definition, approximately 80% of all accidents occur in competitive situations and during practice games. The accidents concern mainly four parts of the body. Injuries of the ankle joint are most prominent with about 45%. Knee, hand and head are each concerned in about 25 % of the cases. In case of the ankle injuries about 70% of the injuries occur either without ankle injury causing or because of landing on the opponent’s or teammate’s foot. Knee injuries mostly result from cutting or stopping maneuvers, collisions or happen when landing after a jump. Hand injuries are mainly contusions of the finger joints. Head injuries are mostly caused by the opponent’s elbow during actions under the basket e.g. rebound.

Conclusion: In order to reduce the risk of injuries, training should concentrate on the improvement of mobility (dynamic flexibility), stability and functional movement. Preventive training measures should focus on coordination and sensory motor training of the lower extremities as well as on low back and shoulders due to the overuse problem. Exercises are presented which focus on the specific mechanisms and situations in which knee and ankle injuries occur. Through very specific exercise prescription, it is possible to reduce the risk of injury by enhanced levels of physical conditioning. Guidelines are provided on how to integrate these exercises into a training session. In addition, an appropriate planning and dosage of the training as well as observance of sufficient regeneration periods after increased strains in practice and competitions help to prevent injuries.

**EFFECTS OF DIFFERENT WARM-UP STRETCHING PROTOCOLS ON 20 M SPRINT PERFORMANCE IN ASSOCIATION FOOTBALL**

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The purpose of this study was to establish the effects of both static stretching (SS) and dynamic stretching (DS) on the sprint performance of University standard association football players. 31 participants (17 males, age 21 ± 0.7years, mass 82 ± 23kg, height 1.79 ± 0.12m, 14 females, age 20 ± 0.5years, 67 ± 11kg, 1.72 ± 0.09m, mean ± SD) from the University of East London Association Football squad were randomly assigned into two groups (SS n=16, DS n=15). All participants performed a generic standardised 10 min cardiovascular warm-
up, which was then followed by 3 x 20 m sprints that were timed (Speedtrap II, Braver Timing System, Draper, UT, USA). There was a 5 min active recovery between each trial. This protocol was repeated two days later, however immediately prior to the sprints each group performed respective stretching of the principle locomotive muscle groups. SS group held each muscle stretch for 20 s to the point of mild discomfort, whereas the DS performed dynamic moves while maintaining a slow whole body movement. All testing was completed outside, with all subjects wearing football kit. This study was approved by the institutions ethics committee. Data was analysed using a paired t-test, with significant accepted as p<0.01.

There was a significant increase in the mean sprint times of SS following their respective stretching intervention (+ 0.08 ± 0.02 seconds). In contrast, there was a significant decrease in the mean sprint times of DS following their respective stretching intervention (+ 0.05 ± 0.016 seconds). It appears that DS may elicit performance enhancing benefits in association football through improved sprint performance. However, the use of SS within a warm-up routine may have a negative impact upon the sprint performance, and thus association football performance. It is hypothesised that the performance improvements obtained following the DS intervention trials are as a result of post-activation potentiation elicitation or an increase in core and/or peripheral temperature. Whereas performance decrements incurred from the SS intervention may be associated with increased musculotendinous unit compliance or decreases in core and/or peripheral temperature. Yet, such mechanism warrant further investigation.

ANALYSIS OF UNUSUAL ALTERNATIVE PATTERNS OF BREASTSTROKES TECHNIQUE

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Introduction.
Breaststroke is a continuously evolving technique. Several studies have been carried out about its biomechanics and its complex coordination structure, in particular analyzing continuity and frequency of propulsive actions [1, 2]. The aim of this study was to analyze the efficiency of some unusual alternative patterns of breaststroke's technique generally set by trainers during the training sessions, useful in elderly swimmers, people with disabilities, rehabilitation, leisure swimming.

Material and methods.
Nine swimmers (mean±SD, age 15.1±1.2 years, height 172.4±3.5 cm, body mass 61.5±3.4 kg) participated in the study. Firstly subjects experienced two alternative patterns of breaststroke's coordination: DA stroke, with a double arm stroke per stroke cycle (without breathing between the two arm strokes); DK stroke, with a double kick per stroke cycle. Then swimmers performed 25, 100 and 400 meters flat breaststroke (FB) and in the alternatives DA and DK patterns. Performances were collected and an index of efficiency (IE = velocity swim cycle length) was calculated from video recordings. We compared: the performances, the IE means for each swim distance and the IE in the three distances for each swim pattern.

Results.
No differences were found between FB and DA performances, whereas swimmers achieved better results in FB compared to DK pattern in all distances: 426.7±28.3 vs 442.9±32.5 s in the 400m (p=0.01); 94.4±8.9 to 100.9±8.7 s in the 100m (p=0.00); 20.4±1.8 to 23.2±1.9 in the 25m (p=0.01). Flat breaststroke showed also a higher IE in every distance both in FB-DA comparisons (25m p=0.005; 100m p=0.00; 400m p=0.00) and in FB-DK comparisons (25m p=0.003; 100m p=0.008; 400m p=0.00). With regard to the IE within each distance of swim, significant differences were found between: i) 400m and 25m both in FB (1.67±0.3 vs. 2.09±0.3, p=0.025) and in the DK pattern (3.04±0.6 vs. 4.09±1.0, p=0.014); ii) 400m and 100m in the DA pattern (3.61±0.6 vs. 3.92±0.5, p=0.01). Conclusion.
DA pattern is nearly as efficient as FB, whereas worse results were found in the DK pattern, perhaps due to a longer non propulsive phase per stroke (the two gliding after the two kicks). Therefore it seems that the DA pattern is more suitable when an alternative breaststroke is required, such as in elderly swimmers or people with leg disabilities. However, it should be noticed that as distance increases the lack of rhythm occurs more frequently and the maintenance of the DA pattern becomes more difficult.

References.

STRUCTURE AND EVOLUTION TRENDS OF THE EXTERNAL LOAD IN UNEVEN BARS. ANALYSIS OF THE FLIGHT ELEMENTS IN COMPETITION ROUTINES

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Introduction.
Specific literature in Artistic Gymnastics is rich in considerations about evolution trends of flight elements in uneven bars routines. Based on the analyses of total participants in world championships and Olympic Games we can observe that gymnasts performed more flight elements in last Olympic cycle compared with preceding cycles. In this way, the purpose of the present study was to analyse the trends in number, difficulty and direct combinations of flight elements in uneven bars routines in elite gymnasts.

Methods.
Through the observational methodology, we constructed and validated an observation category comprising seven variables considered as indicators of the external load concerning flight elements in uneven bars. We observed 83 uneven bars routines from world championships and Olympic Games finals between 1989 and 2004. 12 competitions were framed in 4 Olympic cycles with 2 world championships and 1 Olympic Games each one. It was observed the total number of flight elements, direct combination of 2 and 3 flight elements, difficulty, number of preparation elements and body position in this kind of elements.

Data was analysed with descriptive statistics (mean and standard deviation) using Kruskal Wallis test used to compare general significant differences in all cycles and Mann-Whitney tests with Bonferroni correction to analyse differences between each cycle. The level of significance was established in 5% or 1.25% depending of the tests used.

Results.
EFFECT OF THE TEMPO OF ATTACK IN ATTACK PERFORMANCE IN COMPLEX II OF THE 2004 OLYMPIC GAMES

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In a volleyball game, the action of every attacker is performed in cooperation with the setter and depending on the ball’s flight time, the attack can be performed in 3 tempos. It is generally believed that the shorter the ball’s flight time is the faster and the more efficient its performance will be. Previous studies have assessed the performance of attack actions in Complex I or II (Barzouka et al., 2005), however performance of the attackers as a function of the tempo of the attack has not yet been examined. The purpose of this study was to investigate performance of Olympic-level male athletes in attack in Complex II as a function of the attack’s tempo.

Volleyball games of male teams competing in the preliminary phase of the 2004 OG were videotaped. Assessment of players’ performance in attack in relation to 3 different tempos (1st-2nd-3rd) in Complex II in N = 2122 was based on the 5-point numerical rating scale (scores 0-4 with 0 indicating an error and 4 an excellent performance) as proposed by Eom & Schutz (1992). Average performance was defined as the performance calculated from mean values of the range of performance scores 0 to 4. Intra-rater reliability coefficients for the assessment of performance and the attack tempo were found to be r = 0.93 and r = 0.98, respectively. The calculation of percentages and frequencies among the 3 attack tempos in each performance rating score was made with the crosstabulation method with levels of 3x5. Possible differences in average attack performance among different attack tempos was examined with univariate ANOVA (p < .05).

From the total number of assessed attack actions in Complex II, results showed that 79% (37.6%) and 384 (18.1%) actions were assessed as errors, respectively. The remaining of the attack actions were assessed with excellent performance and 384 (18.1%) actions were assessed as errors, respectively. The remaining of the attack actions were assessed with performance scores from 1 to 3. The average attack performance of 3rd tempo attack actions (2.3±1.5) was significantly (p<.001) lower than the average performances of 1st (2±1.5) and 2nd (2±1.6) attack actions, respectively.

The results of this study indicate that in olympic-level male volleyball games for every 3 attack actions in the counter-attack process only one is efficient, whereas in every 6 attack actions an action resulting in a point won by the opponent takes place. Furthermore, it was found that the average attack performance during the counter-attack process is more efficient when attack actions are being performed with a fast (1st) or medium (2nd) tempo, while on the contrary, most erroneous actions occur when attack actions are performed with a slow (3rd) tempo. In conclusion, it can be speculated that when attack is performed in a fast tempo, it is efficient, in contrast with the higher incidence of erroneous actions that seem to result from an attack with a slower tempo.

References

HYDRODYNAMIC SKILLS IN YOUNG SWIMMERS: REPEATABILITY OF SOME GLIDING TESTS

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INTRODUCTION
Analysis conducted in swimming competitions of distances up to 400m pointed out that the first 15m play an important role for the result of the entire performance (1). Hence the hydrodynamic ability to glide underwater in a streamline position (2) should not be neglected during training, especially in young competitors.

AIM
The purpose of this study was to identify some tests to evaluate gliding skills in young swimmers, which might be repeatable and correlated to their performances in 15m crawl and breaststroke.

MATERIAL AND METHODS
Fifteen males (M, mean±SD, age 16.5±1.9 years, height 180±8 cm, body mass 69.3±11.3 kg) and sixteen females (F, mean±SD, age 15.6±1.5 years, height 170±6 cm, body mass 57.4±6.3 kg) at national level were tested. After familiarisation, participants were positioned on a starting block and asked to dive and swim for 15m crawl (CR) and 15m breaststroke (BR) in two different trials. Later subjects underwent a series of hydrodynamic tests such as: diving and gliding underwater in a streamline position for 8m (DG), pushing off from the wall and gliding underwater in a streamline position for 8m (PG), pushing off from the wall, gliding and swimming crawl for 12.5m (PGB), pushing off from the wall, gliding and swimming breaststroke for 12.5m (PGB), sculling while floating on the back for 10m (SC). Time was recorded and all tests were repeated five times on the same day and again on a different day to assess their repeatability.

RESULTS
Repeatability was assessed through intraclass correlation coefficient (ICC). DG: r=0.90 vs 0.84, PG: r=0.89 vs 0.88, PGB: r=0.85 vs 0.81, PGB=0.88 vs 0.76, SC=0.84 vs 0.63, M and F respectively. M performed significantly better than F in all trials (mean±SD, CR=6.16±0.4 vs 6.88±0.2 s, BR=7.74±0.4 vs 8.58±0.5 s, DG=2.16±0.3 vs 2.61±0.2 s, PG=4.10±0.6 vs 4.62±0.6 s, PGB=5.27±0.2 vs 6.06±0.2 s, PGB=7.07±0.4 vs 8.08±0.5 s, SC=9.52±0.7 vs 10.60±0.6 s, p<0.02, M and F respectively).

Tests significantly correlated with both CR vs DG r=0.83, CR vs PG r=0.68, CR vs PGB r=0.93, CR vs PGB r=0.76, p<0.01) and BR (BR vs DG r=0.77, BR vs PGB r=0.67, BR vs PGB r=0.84, BR vs PGB r=0.83, p<0.01) performances.

CONCLUSIONS
The tests carried out on the groups were repeatable and the male group performed better than the female group. According to the literature, these gliding tests correlated well with the performance in 15m crawl and breaststroke, factors which highly influence the results in sprint competitions.

References
DIFFERENCES IN HEART RATE AND LACTATE BETWEEN CLASSIC STROKES AND WATER POLO SWIMMING TECHNIQUES AT CONSTANT PACE

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INTRODUCTION

Water polo is physiologically a highly demanding activity (1). During a match players often swim in different ways that do not reflect completely the classic four strokes. Hence the aim of this study was to compare heart rate and lactic acid production during classic swimming and water polo swimming techniques at constant speed in order to identify possible differences in cardiovascular energy requirement.

MATERIAL AND METHODS

Nine agonistic swimmers (mean±SD, age 15±1.58 years, height 163.8±4.6 cm, body mass 55.4±7.3 kg) volunteered for this study. Each participant performed 30m trials at a constant speed of 1m/s in four classic strokes: crawl (CR), backstroke (BA), breaststroke (BR), and butterfly (BU) and in their water polo variations (WPT): i) head above the water, ii) head above holding a ball, iii) arm stroke - dolphin kick, iv) backstroke lower hip, v) symmetric arm stroke - breast kick, vi) crawl arm stroke - breast kick, vii) breast arm stroke - butterfly arm stroke - breast kick, viii) six crawl arm stroke and six breaststroke arm stroke. Acoustic and visual aids were used to help swimmers keeping the pace. At the end of each trial heart rate (HR) and lactate concentration ([La-]) were measured through Polar X-Trainer PlusTM and Arkray-Lactate ProTM respectively.

RESULTS

Polar X-Trainer PlusTM and Arkray-Lactate ProTM respectively.


CONCLUSIONS

Concerning our subjects (agonistic swimmers but not waterpolo players), crawl is the most economic stroke as expected (2) and shows similar values of HR and [La-] if compared to WPT vii and ix respectively (where crawl arm stroke is involved in both).

The high HR we found in iv as a variation of backstroke is likely due to the low hydrodynamic body position which probably elicits more cardiovascular effort.

In general it seems that swimming crawl and backstroke at a constant speed of 1m/s is less demanding in term of cardiovascular effort than some of their WPT variations, whereas it is the opposite in breaststroke and the same in butterfly.

REFERENCES


EFFECT OF PHYSICAL ACTIVITY ON STEREOSCOPIC VISION

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Visual perception is of crucial importance for successfully coping with the tasks set in sport. Of particular relevance is the question how far physical stress influences perception and reaction. From a practical point of view it is of particular interest to consider to what extent potentially positive effects on visual ability could be used to optimise performance, e.g. through appropriate warming up.

PURPOSE: The aim of the study was to analyse the possible changes induced by physical activity on stereoscopic vision.

METHODS: Changes of stereoscopic vision at close range were examined using the TNO test for stereoscopic vision (Laméris Ootech B.V., Nieuwegein, NL). This standardised test consists of plates (to be viewed with the red-green-spectacles) which carry figures (random-dot stereograms) that can only be seen when both eyes cooperate. For the exact determination of stereoscopic sensitivity discs with a sector missing at one of four possible orientations as test figures were used. These figures were presented at six different depth levels (two at each level). The corresponding retinal disparities (bino cular parallax) ranged from 15 to 480 seconds of arc.

The plates were presented at a distance of approximately 40 cm.

28 subjects (14 females and 14 males; average age: 24.2 +/-2.4 years, range: 20-31 years) with normal eyesight (minimum visual acuity <= 20/20) were exposed to different types of strain. Firstly all subjects performed a maximal step-wise incremental test on a cycle ergometer (initial load = 50 W, 3 min step duration, 50 W increment until exhaustion). This test was followed by a 10-minute and a 20-minute constant-load cycle ergometric exercise with 80% of P4 and a control test without physical activity. These three tests were performed by each subject within three test days. The quality of stereoscopic vision was determined before, directly after as well as 15, 30 and 45 minutes after finishing the exercise.

RESULTS: Initially significant differences were found in the course of the stereoscopic vision measurement between the exercise tests and the control test (p<0.05) were observed. Significant changes of stereoscopic vision could be found for the maximal ergometric test (p<0.001), the 10-minute (p<0.001) and the 20-minute constant-load cycle ergometric exercise (p<0.001). No significant changes in performance occurred during the control test (p=0.800).

Stereoscopic vision significantly improved after ergometric bicycle strain in each test and remained on a raised level up to the end of the test, 45 minutes after finishing exercise. The best benefit in stereoscopic visual performance resulted following physical strain in the maximal ergometric test.

CONCLUSION: Improvement of stereoscopic vision following moderate or intensive heart-circulatory activating exercise can possibly be due to a more comfortable general metabolic situation (e.g. increase of the retinal blood supply and the cerebral oxygen supply) along with an increase in vigilance.
**MAXIMAL LACTATE STEADY STATE FOR AEROBIC EVALUATION OF SWIMMING MICE**

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The maximal lactate steady state (MLSS) has been considered the gold standard method for determination of aerobic/anaerobic metabolism transition during continuous exercise executed by human beings. An important tool for exercise physiology studies and correlated areas is the use of animals, including mice. However, studies aiming to determinations of the exercise intensity and evaluation protocols in these animals are scarce. The aim of the present study was to determine MLSS for aerobic evaluation in swimming mice. Adult male mice (25 animals, with 90 days and weighting 51±2.0g) which were adapted to aquatic ambient by two weeks, in a cylindrical water tank with smooth surface and water temperature kept at 31±1°C. Later, the mice were submitted to five continuous exercises using loads equivalent to 3,4,5,6 and 7% of body weight (bw) tied to the back. The continuous exercise were executed by 25 minutes and separate for interval of 48 hours. Blood samples (25 µl) were collected from a cut at the tail tip during swimming exercise (rest, 5, 10, 15, 20 and 25 minutes of exercise) for blood lactate analysis and MLSS determination. The individual MLSS was considered as the highest intensity in which the increase on the blood lactate concentration was equal to or below 1 mmol/L from the 10th to the 25th minutes of exercise. The blood lactate concentrations in several times of exercise were compared by one-way Anova and Newman-Keuls post-hoc test (P<0.05).

The results showed that the 36% of the swimming mice presented MLSS at 4%bw, 20% at 3%bw and 6%bw, 16% at 5%bw, and 8% at 7%bw. The blood lactate concentration at the maximal stabilization was 5.78±0.29 mmol/L (4.40-6.77mmol/L). It was observed a progressive increase in the blood lactate concentrations at higher intensities (upper MLSS) and some animals reached exhaustion between the 10th and 25th minute of exercise, in a similar form as what is verified in human beings and rats. In this way, these results indicate that the protocol of MLSS can be used for determination of the maximal aerobic intensity in swimming mice.

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**KINEMATIC CHARACTERISTICS OF THE SPRINT START IN HIGH LEVEL SPRINTERs**

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**Introduction**

During the 100m final at the 1997 world championships the athletes reached 95% of their maximal speed before the 40 meters (Müller and Hommel 1997). The sprint start and subsequent acceleration are two extremely important phases which directly generate the results in a 60 m and 100 m sprint. However, few data have been published for high level sprinters. The purpose of this study was to describe the major kinematic parameters of a sprint start in high level sprinters. We compared the range of the knee joint angles, body centre of mass (CM) position and velocity, step length (SL), step rate (SR) to the available data from the literature.

**Methods**

Five high level sprinters took part in this study (their 100m best performances were comprised within 10.16 and 10.45s). Each subject performed 6 × 20m indoor block sprint start. The starting block phase and the three first steps were recorded with an opto-electronic Motion Analysis system (12 cameras). The body was modelled as 17 segments with 60 passive reflective markers (Wu, 2002, 2005). The 3D trajectories of the CM and horizontal velocities of the CM (VxCM) were computed (Dumas et al. 2007).

**Results**

20m sprint mean performance was 3.19 ± 0.05s. In the set position, the horizontal distance from the start line to the CM was 38.7 ±4.6cm. Front and rear knee angles were 99.9±7.3° and 123.0±8.1°. The horizontal velocities of the CM (VxCM) at the block clearance, the 1st, 2nd, and 3rd step were respectively, 3.40 ± 0.16, 4.84 ± 0.23, 5.60 ± 0.17 and 6.50 ± 0.22m.s-1. The first step was put at 53.8 ±9.8cm after the clearance of the block.

The correlations showed that to perform a good start, the sprinters must be able to create the greatest velocity during the three first steps (r = -0.39; p < 0.05 r = -0.36; p < 0.05; r = -0.71; p < 0.0001). SL of the 2nd, and 3rd step was 110.3 ± 8.8cm and 129.7 ± 13.2cm. Correlations were obtained between the VxCM at the push-off of the 1st, 2nd, and 3rd step and the 20m performance (r = -0.39; p < 0.05).

**Discussion**

In the set position, the horizontal distance from the start line to the CM was greater than that observed in other studies. This result did not confirm the hypothesis that positioning the CM as close as possible to the start line was important to a good start (Harland and Steele, 1997). Front and rear knee angles were in line with other studies. After the start signal, VxCM at the toe-off of the second step has been measured at 6.0 ± 0.2 m.s-1 for a sprinter (personal best time of 10.4s, oh et al.,2006). This is higher than the present results.

The correlations showed that to perform a good start, the sprinters must be able to create the greatest velocity during the three first steps after the clearance of the block.

**References.**


**INFLUENCE OF BONE AGE ON ANTHROPOMETRIC VARIABLES OF YOUNG SOCCER PLAYERS**


Federal University of Parana, Brazil

Bone age or Skeletal age assessment is used to identify and estimate the level of maturity which a child has attained at a given point in time (Malina, 2006). It's related to chronological age, and it has been shown to be an effective method to identify the actual biological maturation level of children, in order to compare it to chronological age to detect same pass, in differences mainly in size, strength and power, among children of same chronological age group, but different maturity level. The aim of this study is to identify variations on anthropometric variables among young soccer players from the same age group, but presenting different bone ages.

The sample included 30 U-15 young elite soccer players (15.03 ± 0.56 years) were assessed. Bone age and anthropometric variables were assessed as following: Body Composition height (174.1 ±0.71 cm), weight (65.18 ± 8.49 kg) and Body Mass Index (BMI) (21.48 ± 2.31)
COMPARISON OF PERFORMANCE IN ONE REPETITION MAXIMUM TEST USING TWO DIFFERENT PROTOCOLS

Lima, F., Chagas, M., Avelar, A., Diniz, R., Costa, H., Marcossi, D., Almeida, R., Carvalho, F.
Federal University of Minas Gerais, Brazil

The control of the improvement of maximum strength by means of tests represents an important aspect of planning and regulation of the training. One of the most known tests for measure the maximum strength is one repetition maximum (IRM) test and the procedures of
this test arise some differences. In the study of Abdessemend et al (1), the volunteers carried out two repetitions per attempt, while the most common recommendation is one repetition per attempt(2). As the prescription of intensity in strength training is traditionally based on percentage values of the 1RM test(3), distinct performances due to the differences in the procedure could provide different information for the initial determination of the training load. The objective of this study was to compare the performance in the test of 1RM using two different protocols in the bench press exercise. 17 male volunteers trained in strength training (>6 months of regular practice and 1RM test ≥ body mass) have participated in this study. The protocol A consisted of the accomplishment of a maximum of six attempts, with recovery of five minutes between the attempts and the weight should be moved only once by the determined range of motion. The protocol B followed the same procedures of protocol A, but it was suggested to the volunteer to try on to realize two repetitions per attempt, being considered the best performance the weight that allowed the individual to perform only one complete repetition with concentric failure in the second one. The volunteers were familiarized with both testing procedures 48-72 hours before their respective test protocols. The end of the procedures of a protocol was separated from the beginning of the other by a period of 5 days. The sequence that the volunteer has carried out (A-B/B-A) was balanced and the individual allocation in each sequence was randomized. Statistical comparison was accomplished with a Student T paired test. The 1RM performance was significantly lower in protocol B than the protocol A (A=103,2kg ±12,7 and B=100,2kg ±11,6; p<0.05). The difference between the protocols indicates that the choice of the testing procedure affects the representative value for the measuring of the maximum dynamic strength. Thus, a determination of intensity based on percentage values of 1RM test will lead to different stimuli and prescriptions of the training load.

References.

15:15 - 16:45
Invited symposia (IS)
IS-BN08 The point on the electrophysiological methods to study neuromuscular adaptations

INTERPRETATION OF THE SURFACE ELECTROMYOGRAM
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The surface EMG comprises the sum of muscle fiber action potentials as detected by electrodes placed on the skin overlying the muscle. Although the muscle fiber action potentials are the consequence of action potentials discharged by spinal motor neurons, the surface EMG does not provide a simple measure of the neural activation of muscle. Rather, the summation of the muscle fiber potentials is influenced by factors that are unrelated to the quantity of the output from the spinal cord. The purpose of the presentation is to review the influence of these factors on selected measurements of the surface EMG during isometric contractions and to discuss some of the unresolved issues on the interpretation of the signal. Because muscle fiber action potentials comprise positive and negative phases, the sum of multiple action potentials involves some signal cancellation that reduces the amplitude of the surface EMG relative to the absolute motor output from the spinal cord. When normalized to the amplitude at maximal muscle activation, cancellation results in EMG amplitude overestimating the magnitude of the motor output at intermediate levels of muscle activation. Similarly, the amplitude of evoked potentials, such as M waves and motor evoked potentials, can be reduced by small changes in the timing of the constituent muscle fiber action potentials and by the location of the motor units that are activated by the stimulus. As the amount of cancellation varies with muscle fiber conduction velocity, so too are the spectral properties of the surface EMG. Despite the sensitivity of the surface EMG signal to factors unrelated to the neural drive to the muscle, the action potentials of 84% of the motor units in a population can be recorded with electrodes (9 x 9 array) placed on the skin overlying the muscle. Standard bipolar recordings of the surface EMG, however, are relatively insensitive to modest changes in motor unit activity. For example, different decreases in motor unit discharge rate during fatiguing contractions can be associated with a similar increase in the amplitude of the surface EMG. This effect, however, appears to differ across muscles and may be related to factors that influence how the muscle fiber action potentials sum in the different recordings. Furthermore, the depression of the maximal surface EMG at the end of a sustained low-force contraction is likely caused by changes in the muscle fiber action potentials during the fatiguing contraction, such as an increase in the amount of signal cancellation and a reduction in the amplitude of the intracellular action potential. Changes in EMG amplitude, therefore, must be referenced to an appropriate control value. Although the surface EMG provides useful information about muscle activation, its interpretation can challenge even the most accomplished experimentalist.

ASSESSING CORTICOSPINAL EXCITABILITY DURING EXERCISE
Taylor, J.
Prince of Wales Medical Research Institute and the University of New South Wales, Australia
Corticospinal neurones travel from the motor cortex (and associated areas) to terminate on interneurones or motoneurones in the spinal cord to provide the major pathway for the control of voluntary movement in humans. However, corticospinal excitability is commonly used to refer not simply to the excitability of corticospinal neurones but more globally to the motor pathway from primary motor cortex to muscle. Changes at multiple sites in this pathway can influence responses in the muscle. These sites include cortical interneurones, corticospinal neurones, spinal interneurones and motoneurones. One technique to test excitability of the whole motor pathway in awake humans is transcranial magnetic stimulation (TMS), which activates corticospinal neurones both directly, and synaptically through activation of intracortical neurones. When TMS is used in combination with cervicomedullary stimulation, which activates axons in the corticospinal tract at a subcortical level and so does not depend on cortical excitability, changes in excitability can be localised to a cortical or spinal level.
If TMS is given during voluntary contractions, the response evoked in the muscle (motor evoked potential, MEP) is larger than with the muscle at rest. If the corticospinal axons are stimulated, the muscle responses (corticomedullary motor evoked potentials, CMEPs) are also larger during contraction than rest. Comparison of the changes in the MEPs and CMEPs shows that there is increased responsiveness of the motoneurones to descending input, but also increased cortical excitability (1).

With increasing contraction strength, complex changes occur in MEP size. From rest to moderate contractions the MEP grows, but with even stronger contractions it becomes smaller again. Similar changes occur in the subcortically-evoked CMEP, which suggests that these changes are dominated by the behaviour of the motoneurones (2). The changes are consistent with a decreased response of rapidly firing motoneurones to synaptic input. The relationship between CMEP or MEP size and contraction strength can be understood in terms of the different effects of increasing voluntary drive on active motoneurones and on unrecruited motoneurones, and the proportion of each in the motoneurone pool at each contraction strength.

The interpretation of any changes in the MEP or CMEP evoked during muscle activity must take this relationship into account. For example, if muscles are recruited at moderate forces during exercise, CMEPs (or MEPs) may be on the ascending limb of the relationship where more excitation leads to bigger responses. With fatigue, recruitment of additional motor units to maintain force could move CMEPs (or MEPs) to the descending limb where more excitation leads to smaller responses. The interpretation of an increase in response size would be completely different at the two moments.

References.

USE AND MISUSE OF THE H-REFLEX WHEN MEASURING NEURAL CONTROL
Cresswell, A.
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The Hoffmann reflex (H-reflex) is often used to measure neural changes at the spinal level. These changes are generally occurring as a result of some form of intervention, treatment or change of condition, e.g., strength training, fatigue and/or change of posture. The size of the reflex, which is evoked in the muscle of interest by a brief electrical stimulus to its innervating nerve, is dependent upon the intensity of the stimulus and the pre- and post- synaptic properties of the activated motoneurone pool. Increased drive to the motoneurone pool from descending and peripheral sources combine to increase motoneurone excitability, which alone can give rise to an increase in the H-reflex for a given stimulus. However, pre-synaptic inhibition of the Ia-afferent terminal via PAD-interneurones can have a considerable effect on the size of the test H-reflex while the activation history and/or the amount of ongoing activity in the afferent nerve is also known to affect the H-reflex amplitude, albeit in a passive muscle. It has also been shown that the size of the test stimulus can affect the responsiveness of the H-reflex in situations where the level of voluntary activation is systematically increased. First and foremost however, is the need to deliver a constant test stimulus to the mixed nerve, which is mostly assessed by monitoring the size and shape of the muscle response (M-wave) elicited via direct activation of the motor efferents. Muscle length changes can also affect the size of the H-reflex due to alterations in the muscle-electrode configuration. Despite these difficulties and limitations, it will be shown how the H-reflex can be successfully used to assess neural alterations, such as those occurring in response to weak and strong static and dynamic contractions. Alterations in neural activity with time, such as those occurring during fatigue tasks, and those occurring as a result of small changes in postural configurations, such as during the different phases of postural sway, will also be presented, along with some novel approaches to recording the H-reflex.

References.
Paillard (1950) Rev. de Physiol. 41, 682.
Haddow and Scott (1955) J. Physiol. 130, 497.

OFFICE TOOLS FOR MEASURING BODY COMPOSITION IN OBESE ADULTS
Fields, D.
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Identifying those who are obese is the single most important diagnosis a physician or health professional can make in the treatment of obesity. Shockingly, only one in five obese patients are given a diagnosis of obesity (i.e. body mass index of > 30 kg/m2) at the time of...
their primary care physician visit. The evaluation of obesity related comorbid conditions should be of major importance, more so than body composition per se, with the major concern being visceral fat. The single easiest measurement for the estimation of visceral fat is waist circumference. This is done easily and accurately in the office with a spring loaded tape measure. Site specific anthropometry (i.e. skin fold calipers) is useful to determine the accumulation of excess fat accumulation at specific depots (e.g. abdomen, triceps, high, and sub-scapular). Bio-electric impedance may have a role as an office tool in evaluating total body composition in obese individuals, though consideration should be given to gender and body weight. Additionally, air-displacement plethysmography provides a high level of sophistication, though cost may be prohibitive for many clinical settings. In determining the efficacy of a weight management programs an abdominal skin fold in combination with waist circumference can give an indication of fat loss location (i.e. visceral vs. subcutaneous).

**METHODS AND TECHNIQUES FOR ASSESSING BODY COMPOSITION IN CHILDREN**

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To promote obesity, both genetic and environmental factors must influence one or more components of energy balance. In this view, the traditional definition of nutritional status i.e., the introduction, absorption and utilization of nutrients has a new definition that underscores the relationship between nutritional status and health status. This view considers energy balance, body function, and specifically body composition as three interrelated entities. It is first important to note that children are not mature and that growth is the primary factor that influences pediatric body composition.

The measurement of body mass is extremely challenging. There are various indirect methods for measuring fat and fat free mass, all of which have assumptions and age-specific considerations. The value of understanding pediatric body composition methods and applications is manifold.

Body composition analysis provides a window into the complex changes that occur throughout childhood and a platform for evaluating their associations with metabolic and physiological measures. Currently overweight and obesity are defined on the basis of age-specific percentiles of Body Mass Index (BMI). However, measurement issues might be partially responsible for the results.

The central aim of our presentation is to discuss methods for body composition assessment that may provide new insights into the clinical practicality of pediatric obesity prevention/treatment. First we will analyze pro and contra of the different pediatric body composition measurements techniques that are used in the research setting. Second we will analyze simple and practical measurements that could be used in office or in clinical setting. Finally, we will discuss different measurements used in epidemiological studies.

Once refined body composition measurements are ascertained in large groups of healthy children, it will be possible to better understand the normal compartmental changes that occur during growth, as well as the effects of disease and medications on body composition.

We conclude that it is fundamental to search for more precise and sophisticated measures in order to identify potentially overweight/obese children as earlier possible.

**Invited symposia (IS)**

**IS-PS01 ECSS Position Statement: Testing of the physical condition in a population - how good are the methods?**

**OBJECTIVE MEASUREMENTS OF PHYSICAL ACTIVITY WITH SPECIAL EMPHASIS ON CHILDREN AND YOUTH**

Froberg, K., Brage, S., Andersen, LB., Jørgensen, T.
University of Southern Denmark, Denmark

Despite much progress with physical activity assessment, the limitations concerning the accurate measurement of physical activity are often amplified in young people due to the biomechanical and physiological changes that occur during natural growth as well as a more intermittent nature of habitual physical activity in youth compared to adults. This presentation describes and compares commonly used objective methods to assess habitual physical activity in youth and then moves on to discuss the main issues regarding the use and interpretation of data collected with these techniques.

Accelerometry and heart rate monitoring are currently the most frequently used methods for the assessment of physical activity and physical activity energy expenditure (PAEE) in epidemiological physical activity research. Non-linear modeling techniques of energy expenditure, using accelerometry perhaps in combination with physiological parameters like heart rate or temperature have the greatest potential for increasing the accuracy of energy expenditure prediction of habitual physical activity. Although multi-sensor systems may be more accurate, this must be balanced against feasibility, a balance which shifts with technological and scientific advances and should be considered at the beginning of every new study. A move towards more informed, investigator-controlled data handling strategies and away from proprietary monitor-based processing should aid transparency and comparability in the field.

In order to better understand the role of physical activity in the health and well-being of youth, methods of physical activity assessment and postmeasurement estimation techniques need to be further refined, methodological inconsistencies reduced and data reduction procedures clearly articulated.

**TESTING OF THE PHYSICAL CONDITION IN A POPULATION - HOW GOOD ARE THE METHODS**

Jørgensen, T., Andersen, LB., Froberg, K., Mäder, U., Martin, BW., Smith, LVH., Aadahl, M.
Research Centre for Prevention and Health, Denmark

A sedentary lifestyle has become prevalent in modern society and a poor physical condition, expressed as physical inactivity and poor physical fitness- is associated with development of chronic diseases and premature death.

The aim of this presentation is to evaluate the currently available methods for measuring physical activity and physical fitness in the general population.

Physical activity should be determined by duration, frequency and intensity and it derives from many different domains. Physical activity can be measured by objective and subjective methods. Of the objective methods accelerometry seems to be the most attractive technology, and is well enough developed for general use in large populations. The advantage of the method is that it is not dependent on memory of the individual, but the disadvantage is the fact that accelerometry seems to grossly underestimate energy expenditure, due to
the lack of registration of certain activities. This may be solved to a certain extent by combining it with heart rate measurement, an emerging technology. Of the subjective methods self-report questionnaires are feasible and easy to administer. Many questionnaires have been developed, and we are in need of further development of internationally standardised questionnaires, as e.g. IPAQ. Many questionnaires correlates well with biological markers and development of chronic diseases, but will always face a certain degree of misclassification. Remembering the duration, frequency and intensity of physical performed in the past can be difficult, especially if the recall timeframe is extensive. Furthermore, unstructured physical activity like e.g. housework may be subject to recall bias. So far no measurement seem superior to the other, and covering different aspects of physical activity it could be tempting to recommend the use of both objective and subjective methods. Advantages and limitations of subjective and objective measurements will be discussed at the seminar.

Physical fitness comprises several components with cardiorespiratory endurance as the most important, because of its strong relation to development of chronic diseases. But also muscle strengths and endurance will be discussed. As regard cardiorespiratory fitness, both maximal and submaximal exercise tests have been tested in the general population. Whereas the maximal tests do provide the most accurate results, they are also more costly or time consuming, and submaximal procedures, like cycle ergometer-test and a simple 2-km walking test, are still acceptable compared with the criterion measure: the direct measurement of oxygen consumption. As regard muscle strengths only test-retest reliability is available. The hand held dynamometers greatly facilitate field testing for maximal isometric strengths only test-retest reliability is available. The hand held dynamometers greatly facilitate field testing for maximal isometric muscle strength assessment, whereas force plate measurements can be used for the lower extremities. For endurance simple tests like push-ups and sit-ups seems reliable.

ASSESSMENT PHYSICAL FITNESS: EUROPEAN COLLEGE POSITION STATEMENT

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Physical fitness comprises several components including cardiorespiratory endurance muscle strength, muscle endurance, muscular flexibility, and body composition (Council of Europe 1993). This report will focus on simple methods for assessing cardiorespiratory endurance in larger populations. Direct measurement of maximal oxygen uptake is considered the golden standard, but only few studies have studied representative population samples using this method.

Tests can in principle be maximal or submaximal and protocols may use different ergometers, walking or running. Many equations estimate aerobic fitness from a number of associated variables and even equation without any exercise test have been published. These equations may quite accurately predict aerobic fitness in populations with great variability in age, gender, BMI and self-reported activity, but as variables such as age and sex cannot be changed it is important to find equations where to test result explain the variance in fitness. Submaximal tests have low reproducibility and are weaker associated to aerobic power than maximal tests no matter the type of exercise. Submaximal should mainly be used in older populations and groups of patients where maximal testing is perceived unsafe. Maximal cykel ergometer protocols have been validated and found reliable, and a number of running tests such as the Legër shuttle run test and the Cooper test are also good alternatives depending on the target group (Léger and Lambert 1982). A new intermittent running test, the Andersen test, will be presented. This test does not require any equipment. Ten to fifteen subjects can be tested in 10 min and participating children and young adults have reported they felt less exhausted than in the other maximal tests they tried even if maximal heart rate was achieved. Reproducibility was high and a correlation of 0.9 was found to maximal oxygen uptake.

References.

Oral presentations (OP)

OP-BN04 Biomechanics 4 - Injury

THE EFFECT OF ‘CONTROLLED’ SLIP ON MUSCULAR ACTIVITY AND GRF DURING CHANGE IN DIRECTION TASKS

Kersfing, U., Bulsink, V.
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Introduction: Ankle sprains are the most common injuries during sport games. They occur during fast cutting movements either with or without interference of an object or opponent. Often considered to be a minor injury an unrecognized high proportion of complications and associated costs were stressed by Larsen et al. (1999). Many studies assessed the effect of interventions, such as bracing or training, as well as risk factors, such as foot shape, surface and others. Across these studies many contradictory results were presented. Bahr and Krosshaug (2005) explained this by the fact that the underlying injury mechanisms are not understood. Therefore, better controlled epidemiological studies and systematic laboratory experiments are needed.

A robotic platform was developed allowing for fast and controlled perturbations around 4 degrees of freedom (DOF) (van Doornik & Sinkjaer, 2007) to a force platform. This device is fast enough to simulate varied amplitudes and velocities of ‘slip’ as found in sports on different surfaces.

The aim of this study was to assess the effect of small, fast slip episodes during ground contact in a change of direction task.

Methods: Nine subjects were asked to carry out 180 degree cutting moves while making contact with the robotic plate. The plate was covered with 2 mm thick rubber to generate maximum friction between shoe and surface. Randomly, five conditions where applied just after first contact. Amplitudes ranged from 0 - 6 cm over times of 30 - 60 ms. Ground reaction forces (GRF), electromyographic (EMG) data from eight lower extremity muscles (2000 Hz) and 3-dimensional kinematics (250 Hz) were recorded.

Results: Maximum horizontal GRF showed only slight differences between conditions. Vertical GRF decreased with increasing amplitudes of slip. Power generation was highly individual and did not systematically vary with slip. Pre-activation levels of the muscles of interest were consistent across slip conditions. Some muscles showed significant increases in activation at slower slip velocities.

Discussion: Results demonstrate that restricted amounts of slip are not necessarily performance limiting. Interestingly, vertical GRF and EMG showed significant changes which may have implications for joint loading and stability. It is obvious that this experimental approach will allow for further insights in how musculoskeletal loading is affected by slips. This will be highly relevant for assessing footwear, surface and ankle stabilizing interventions.
Peripheral sensory feedback is believed to play an important role in sensorimotor control processes that usually maintain balance and stability during locomotion. Especially plantar cutaneous feedback has been shown to be an important factor in dynamic balance control [1]. For example, the clear increased rates of falls in patients with sensory loss caused by peripheral neuropathy are well documented and occur mainly during disturbances while walking [2]. However, stability control can be modified resulting to feedforward (predictive) as well as feedback adaptive improvements on postural behaviour while perturbations. The purpose of this study was, therefore, to examine the effects of predictive and feedback adaptive locomotor improvements on dynamic stability while disturbed walking by reduced plantar cutaneous sensation.

Twenty-two healthy young subjects (20-29yr), including ten experimental group (EG) and twelve control group (CG), participated in the experiment. In the EG sensation from the weight-bearing surface of both foot soles was directly reduced through multiple intradermal injections of an anaesthetic solution [1]. Sensory perception threshold of the plantar foot was quantified for pressure touch and vibration. A Motion Capturing system was used to determine the whole body 3-D kinematics and ground reaction forces, respectively. The gangway consisted of one exchangeable element not visible for the subjects to vary the surface stiffness (hard/soft). The gait-protocol comprised 23 trials with soft and hard surface, arranged to detect predictive as well as feedback strategies over the repetition trials. Components of dynamic stability were calculated according to Hof et al. [3].

Plantar cutaneous sensation was in the EG reduced (p<0.05) at the level of sensory neuropathy. Both groups increased (p<0.05) within the gait repetitions similar the margin of stability at touchdown (TD) on the disturbed leg compared to baseline walking (EG: -2.8±5.1cm to 0.4±4.2cm, CG: -1.9±3.3cm to 0.9±3.8cm). This increase in margin of stability was realized by increasing the base of support at the step before the perturbation. In the step after the perturbation the margin of stability at TD decreased (p<0.05) in both groups (EG: -3.3±4.2cm to -4.2±6.7cm, CG: -3.0±2.4cm to -9.1±5.2cm) but stabilised after 2 to 4 repetitions to the baseline values. The EG showed a higher (p<0.05) increase of base of support in the first unexpected perturbation resulting to a lower decrease in the margin of stability compared to the CG. Summarizing, the reduced plantar cutaneous sensation does not affect the predictive as well as feedback adaptive improvements during disturbed walking. The higher increase of the base of support in the EG after the first perturbation suggest a modification of the descending corticospinal pathways.

References.

FUNCTIONAL EVALUATION OF ANKLE BRACING USING INJURY SIMULATION, BALANCE TESTING AND STABILITY PERCEPTION

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Introduction
Athletes use external ankle support (i.e. tape or braces) to either prevent ankles from being sprained or to reduce the risk of re-injury. The effects of external ankle support has been investigated by means of different trapdoor or tilt platform mechanisms using electromyometers for mechanical and surface electromyography (sEMG) for neuromuscular evaluation. The aim of the present study was to compare Injury Simulation, Balance Testing and Stability Perception with two different ankle braces and without brace.

Methods
Dynamic injury simulation (DIS) (Alt and Brand, 2007) has been used in this study. Subjects wore dummy or inversion soles under shoes, with no or 24 degrees of inversion to investigate stabilizing effects of two different ankle braces (Aircast® Brace AB and Active Ankle® AA) during landing tasks. sEMG of three ankle muscles has been used to evaluate neuromuscular effects of bracing during these different tasks. Single leg balance stability (sLBS) has been measured by means of stabilometry (GK1000®) and subjective stability perception (sSP) has been tested by questionnaire. A scale from 0 (no stability) to 10 (absolutely stable) has been used. In this study N=15 subjects with no history of acute ankle sprain within the last 12 months participated (mean age 23.7 ± 1.3, mean body mass index 22.0 ± 2.2).

Results
Both maximum inversion angle and inversion velocity during DIS has been reduced significantly by braces. However, only one brace (AB) reduced plantarflexion significantly. Inversion velocity mean ± s.d. was calculated: without brace 1083 ± 505 °/s; with AB 424 ± 248 °/s; with AA 680 ± 355 °/s respectively. There were no differences in neuromuscular effects between the two tested braces. Compared to 40 seconds single leg stance without brace both braces reduced body sway with significant differences between braces, too.

SSP was calculated to 7.3 ± 1.4 (AB) and 6.6 ± 2.0 (AA) during DIS and to 7.0 ± 1.9 (AB) and 6.5 ± 2.3 (AA) during balance test sLBS. No significant differences have been found.

Discussion
Functional testing with DIS revealed a clear reduction of inversion movements by bracing which is in line with results of Ubell (Ubell et al., 2003). Compared to previous studies reflex activity of ankle muscles during static injury simulation showed a lower level. From a functional point of view task-specific reflexes could be concluded. Balance performance was improved by bracing, but it is still unclear if this is a result of neuromuscular improvement or just a mechanical effect. Subjects’ perception of stabilizing effects by bracing was in line with objective measurements.

References.
EVIDENCE OF MECHANICAL LOAD REDISTRIBUTION AT THE KNEE JOINT WHEN PERFORMING RAMP AND STAIRCASE LOCOMOTION IN THE ELDERLY

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It is well established that the aging process is associated with an increased rate of progression of osteoarthritis (OA) particular in weight-bearing joints such as the knee[1]. Recent studies give evidence that the magnitude of adduction moment at the knee joint during daily activities develop joint pain and OA in the elderly[2]. It is also reported that the older adults due to their reduced musculoskeletal capacities decrease their external dorsiflexion and knee flexion moment when performing locomotion activities[3, 4]. However, altering the mechanics of a joint at one plane can affect the kinetics of the other planes[5]. Assuming a new distribution at the knee joint (i.e. a conversion of the reduced knee flexion moment to a knee adduction moment), the resulting higher adduction moment could be a potential mechanism for the development of knee pain and OA in the elderly population. Therefore, in this study we examined the external joint moments at the lower extremity in all three directions in a group of older and younger adults when performing incline walking as well as stair climbing.

Twenty-eight healthy older (aged 60-69 years) and sixteen younger adults (aged 23-32 years) ascended a purpose-built 2-step staircase as well as a 3-step ramp. Motion capturing system and three force plates were used to determine subject’s 3-D kinematics and ground reaction forces, respectively. Calculation of the leg kinematics and kinetics was done by means of a three-segment 3-D rigid body’s leg model.

Older adults had lower external dorsiflexion and knee flexion joint moments but higher hip flexion moments than the younger ones (P<0.05). Concerning the other two planes older adults showed higher (P<0.05) external adduction moments at the knee and hip joint and higher knee internal rotation joint moments. Furthermore, the older adults exhibited higher (P<0.05) internal rotation values of the tibia in relation to the femur during the two examined conditions. The findings show that older adults redistribute their muscular outcome at the lower extremity increasing the contribution of the muscles surrounding the hip joint affecting the mechanical load at the knee joint. The higher adduction and internal rotation moments at the knee joint combined with the kinematic changes in the transverse plane may result to a redistribution of the mechanical load within the load bearing regions of the knee and may increase the risk of knee OA in the elderly population.

References.

WALKING SPEED MODULATION IN YOUNG AND ELDERLY PEOPLE

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Human locomotion is certainly the most analyzed motor task and subject of a great deal of literature. However, conclusions drawn are not always consistent and this is often caused by the variability of mean speed of progression SoP, stride length (SL) and cadence (SF), which are not taken in due consideration. In addition, laboratory/experimental constraints impose values to these parameters that make walking non-spontaneous, possibly affecting the analysis. Moreover, second-by-motor tasks influenced gait parameters1 and differences were observed when subjects walked at maximum speed compared to a comfortable pace2. These aspects led us to hypothesize that, during walking, an increase in SoP, supported by an increase in gait parameters, could represent a pattern that becomes apparent until effort is perceived comfortable, hence, correlated to the subjects capability.

To check for this hypothesis, we tried to rule out any possible conditioning in the subject’s natural gait while walking continuously along a circuit, in the centre of which a GAITRite system was placed. Two groups of healthy elderly (EG, n=17, 67±4 years) and young (YG, n=28, 22±3 years) people volunteered for the study. They walked starting at their most comfortable speed, slightly increase SoP each 1’30, until they perceived the effort from hard to very hard. Then, they ran only one way test at the maximum speed. For each subject, the incremental test data was clustered in terms of the 33rd, 66th and 100th percentile of the Z-score speed values. This procedure allowed us to compare the data collected for the same exerted effort, even if the exerted speed could differ. The Pearson’s correlation coefficient was computed between the gait variables, for each speed condition, and for each subject. A linear hierarchical regression was conducted to highlight possible differences in the relationship between them, during the different walking efforts.

Both EG and YG supported the increase in SoP using SF more than SL, and the EG maintained the capability of exerting SF at a similar level as the YG. The SF and SL of both groups showed high correlation values with SoP only at the most comfortable speed. As SoP increased, these values tended to clearly decrease, differently progressing in the two sample groups. Above all, the linear hierarchical regression showed high significant differences of the regression models analyzed at each speed, in both EG and YG. Moreover, both EG and YG showed highly significant differences among the variances between- and within-subjects, for each parameter.

Our results confirm the hypothesis that during walking the increase in SoP is consistently determined by a linear increase of SL and SF, but only until the effort is perceived as comfortable. Beyond this limit, and irrespective of age, consistency among individuals becomes less robust.

References.
Wheels of the routes’ origin and destination points were accurate and reproducible. GPS tracings of actual commuting routes taken (n=19) tested for normality using a 2-sided goodness-of-fit Lilliefors test (p<0.05). After that, a one-sided paired t-test was performed to verify if the mean distances covered in the first half of the game were greater than in the second half. The total distance covered by the players ranged from 3522.3 to 5690.2 m (4563.3 ± 822.8 m). Because the duration of first (31.6 min) and second (35.7 min) halves were not the same, the mean velocity value was compared. The mean velocity of player movement in the first half was 1.21 ± 0.20 m/s. The mean velocity of player movement in the second half was 1.06 ± 0.20 m/s. The results of the Lilliefors test (p<0.05) revealed that the data were normally distributed. The mean velocity in the 1st half of the game was significantly greater (p<0.001) than in the 2nd half, with a decrease of 13%. Conclusion: These results show the feasibility of this methodology to analyze wheelchair rugby. In addition, the results provide important information regarding player movement patterns during the game that can be used by coaches to plan adequate training strategies.

References:

Oral presentations (OP)

OP-HF08 Health and Fitness 8 - Testing Protocols

A CRITERION METHOD FOR MEASURING ROUTE DISTANCE IN PHYSICALLY ACTIVE COMMUTING

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Introduction

Distance is a variable of pivotal importance for analysis of many different issues of physically active transportation. Thus, there is a need for accurate and reliable methods for determining route distances. The aim of this study was therefore to scrutinize if distances of commuting routes drawn by physically active commuters and measured with a digital curvimetric distance measurement device could serve such a purpose.

Methods

Participants were recruited when they walked or bicycled in the inner urban area of Stockholm, Sweden. Questionnaires and individually adjusted maps were sent twice to the participants (n=133). Commuting routes from home to work were drawn on the maps. These were measured using a digital curvimetric distance measurer which was carefully checked for validity and reproducibility. Marked origin and destination points were checked for validity using stated addresses and geocoded site search systems. 19 subjects were followed with GPS for validity checks of drawn routes. An analysis of the effect of any deviations between GPS route tracings and drawn routes on distance measurements was undertaken.

Results

The test-retest correlation coefficient was 0.998 (p ≤ 0.01) and the equation for the linear regression was y = -0.026 + 1.002.x. Thus the test-retest values accumulated along the line of identity. The typical percentage error for the method was 2.4 per cent. The map markings of the routes’ origin and destination points were accurate and reproducible. GPS tracings of actual commuting routes taken (n=19) displayed in six cases slight deviations from the routes indicated by the commuters on the maps. However, these deviations played an insignificant role (0.4 per cent) for distances measured.

Conclusion

Routes drawn on maps by physically active commuters represent a valid and reproducible basis for distance measurements in physically active commuting.

DETERMINATION OF PHYSICAL ACTIVITY LEVEL WITH DIFFERENT RESTING HEART RATE PROTOCOLS

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Purpose: The aim of this study was to investigate the effects of different resting heart rate (HRrest) protocols on definition of physical activity level (PAL) of adolescents assessed by heart rate reserve (HRR).

Method: Minute by minute heart rate (HR) were continuously monitored over one week in 51 healthy adolescents aged 14-16-yrs. Different percentages of HRrest (maximal resting) were calculated and evaluated as low (below 50% HRR), moderate (between 50-70% HRR), and vigorous (above 70% HRR) PAL. Maximal heart rate (HRmax) was measured with the shuttle run test and HRrest was determined with five commonly used protocols (minimal mean HR of 7 nights HRnight), all daily HR within lowest 3 beats (HRmin<3), means of the lowest 5
beats (HRmin5), lowest 10 beats (HRmin10), lowest 50 beats (HRmin50), and, thus, 5 different HRR obtained. Furthermore, moderate to vigorous physical activity (MVPA) sustained over 5-, 10-, 20-, and 30- minutes were also calculated as frequency and duration. The differences between variables were analysed with Repeated Measures ANOVA with Bonferroni. Regression analysis was used to determine the accuracy of HRmin+3, HRmin5, HRmin10, and HRmin50 with HRnight which was taken into account as a reference protocol. In addition, Bland-Altman plots were used for agreement between the protocols with HRnight.

**RESULTS**

The differences between protocols were found significant. HRmin5 values were found significantly lower than the other protocols except for HRmin+3 (p<0.05). Furthermore, HRmin10 were found significantly lower than HRnight (p<0.05). However, HRmin50 values were found significantly higher than other protocols except for the HRnight (p<0.05). HRnight protocol considered as a reference protocol and the regressions between HRrest by HRnight and other protocols did not significantly deviate from the line of identity. Bland-Altman analysis revealed no significant bias between HRrest measured by HRnight and other protocols. However agreement limits of HRrest were high for other protocols (+6/-9 bpm). PAL frequency which calculated from HRmin5 protocol of 10-19 minutes sustained MVPA were significantly higher than HRmin50 protocol (p<0.05). PAL durations which calculated from HRmin50 protocol of 10-19 minutes sustained MVPA were significantly lower than HRmin5 and HRmin10 protocols (p<0.05).

**Conclusion:** This study pointed out that, although, HRrest from different protocols overlapped with reference protocols, these protocols on estimation of physical activity levels of adolescents, which assessed by HRR, showed differences according to chosen protocol and cannot be used instead of each other.

**COMPARISON OF TWO ACCELEROMETERS FOR THE MEASUREMENT OF ENERGY EXPENDITURE IN FEMALES DURING WALKING**

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Objective and valid measures of Physical Activity (PA) are important for quantifying free living PA levels in different populations (Rowlands & Eston, 2007). One non-invasive method of estimating PA is collection of data from recording accelerometers, which allow several days of continuous measurement. Data from accelerometers can be used to estimate energy expenditure in activities such as walking.

The aim of the study was to compare the effectiveness of two accelerometers, the ActiVital Professional physical activity logger (PAL Technologies Ltd, Glasgow, Scotland) and the Actigraph accelerometer (LLC, Pensacola, Florida) in predicting Energy Expenditure (EE) during walking.

The study was approved by the University of Limerick Research Ethics Committee, and volunteers completed informed consent documents prior to participation. Seventeen females aged 23 (SD 2) yrs walked for 7 minutes at each of 5 speeds (3.2, 4.8, 5.6, 6.4 and 7 km per hour) on a treadmill whilst simultaneously wearing the ActiVital and the Actigraph accelerometers. Oxygen consumption and other variables were recorded for the last 2 minutes at each walking speed by expired gas analysis. Step counts were recorded every 15 seconds by the accelerometers and also by analysis of video recordings. Additionally, accelerometer counts were sampled by both accelerometers for each 15 second epoch.

Step count agreement r-value between ActiVital and Actigraph was 0.954. Correlations between ActiVital steps and Actigraph steps with manual steps count were 0.988 and 0.953 respectively. When comparing energy expenditure (kilojoules per minute) with the two accelerometer step counts, the agreement was 0.594 and 0.552 for the ActiVital and Actigraph respectively. Adjusting the energy expenditure for body weight increased the agreement to 0.632 and 0.581 for the ActiVital and Actigraph respectively. On comparing metabolic equivalent to step count of the two accelerometers, correlations of 0.543 and 0.528 for the ActiVital and Actigraph respectively were seen. Comparison heart rate at each speed to step count revealed correlations of 0.727 and 0.685 for the ActiVital and the Actigraph respectively. However, accelerometry counts correlated more closely with EE.

Both accelerometers accurately measured step count, though the Actigraph tended to underestimate counts at low speeds. Relatively low correlations between accelerometry and measured EE indicate that accelerometry can at best only approximate EE with the ActiVital outperforming the Actigraph in all analyses. However, raw acceleration data may provide a better predictor of EE since it is more sensitive to small changes in intensity.

**ESTIMATION OF LOAD INTENSITY WITH HEART RATE VARIABLES IN A SPECIFIC CIRCUIT WEIGHT TRAINING**

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**INTRODUCTION**

The estimation of exercise intensity through heart rate (HRR) has been studied several times (1, 2). However, the way to control the intensity in strength training has been traditionally the weight lifted, instead of using physiological variables. The aim of this study was to develop an equation to predict training intensity based on easily measurable physiological variables as HR, body weight or work load.

**MATERIAL AND METHODS**

Twelve subjects participated in this study, six men (23.7±1.6 years; 71.5±1.8 Kg.; 174.6±10.5 cm.) and six women (23.3±1.0 years; 56.4±2.8 Kg; 160.9±4.2 cm.) with the following characteristics: healthy students of Physical Education and physically active. The protocol consisted of evaluate a circuit training with seven exercise at six different intensities (40% to 85% of 15 repetition maximum (15RM)) with rhythm fixed at 1:2 (concentric-excencentric). The 15RM were calculated individually for each exercise. All cardiopulmonary variables were measured with a portable metabolic system (Jaeger Oxycom Mobile®).

A step by step regression analysis was used to predict load intensity in the test. Significant level was set at p<0.05.

**RESULTS**

The following variables were used to predict the intensity: HR relative to maximal HR (HRR%), mean HR measured during the circuit (HR), maximal HR measured during the circuit (HRmax), HR after two minutes of recovery, mean load moved during the circuit (Loadavg), intensity relative to the HR reserve and body weight. There were obtained three models, but these were the chosen equations that they predicted better.

For men:

\[ \text{I (\%)} = 57.265 + 0.512 \text{ HR} - 0.696 \text{ HRmax} + 1.035 \text{ Loadavg} + 0.188 \text{ Body Weight} \] (R²=0.92; SEE=4.9%);

For women:

\[ \text{I (\%)} = 4.036 + 0.412 \text{ HR}\% + 1.667 \text{ Loadavg} \] (R²=0.79; SEE=7.7%).

**DISCUSSION**
It is obvious that estimating the proportion of work load during circuit training is sometimes difficult. The relationship between HR and VO2 is different depending on the activity (3) and the implied body limbs (2). Using HR in EE estimation is not new in exercise (3, 4), although few studies have applied these techniques in circuit training (3). Rotstein et al. indicate a better prediction of intensity for running than for arm exercises. However, as Collins et al. pointed out, the relation HR/VO2 is linear for intensities between 40 and 70% of 1RM. But it is possible to emphasize that until the moment none have proposed estimation equations based on gender differences.

References:

BASE - A NEW CONCEPT FOR HEALTH PREVENTION FOR LOGISTICS WORKERS

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The demographic change in Germany increases the working life of employees. Therefore health prevention programs in companies become more relevant. There are many well designed programs to reduce lower back pain but only a few of them integrate participating elements. To prevent muscle-skeletal disorders in employees with manual boxlifting activities the concept BASE was created (BASE is an acronym in German for: B= “Bedarfsbestimmung” for requirements, A= “Arbeitsorganisation” for organisation of work, S= “Schulung des belastungsverträglichen Alltagshandelns” for coaching preventive behaviour at work, E= “Eigenverantwortung u. Selbstwirksamkeit” for self responsibility and self efficiency). This concept integrates a problem- and practical-orientated view of prevention. Currently the outcomes of BASE for (1) practicality, (2) outcome effects in box handling techniques and (3) lasting effectiveness are examined.

Methods: 38 workers (mean age 34.7± 9.9) of a Logistics company were tested. 18 workers started with a 10 week BASE-Intervention (45 min 1x a week during work time). Health related data was collected using the SF12 and the Nordic questionnaire. The mental representation of the boxlifting technique is measured by the SPLIT 0.56 software and calculated by the SDM-A method of Schack (2004). The PILE-test (Meyer et al. 1988) combined with video was used to collect data of the boxlifting process under resistance load. The PILE-test ended when the worker lifted the box in an dysfunctional way. 2D kinematics was used to collect information of the boxlifting technique.

Results: 22 workers had lower back pain (LBP) in the last 12 months. Workers with LBP showed a reduced physical wellbeing (p= 0.032, F=0.8319). The mental representation of the boxlifting process is not unique however the process is mostly unknown. The PILE-test ended at a weight of (14.8 ± 7.7 kg).

Discussion: The results showed the importance of a “technique-orientated” education of the boxlifting process to reduce lower back pain and to prevent muscle-skeletal disorders. Under stress conditions during the PILE-test it was shown that low technical expertise results in dysfunctional behaviour. The BASE concept integrates coordination, perception and technique factors. Workers learn to be aware of their body positions during the working process to be able to correct dysfunctional body positions. It is expected that increases in the PILE-test with optimised body positions after 10 weeks of the BASE-intervention will be recorded. Furthermore, we think that the mental representation will be more detailed.

References:

PHYSICAL ACTIVITY AND FITNESS OF CHILDREN AGED 9-10 YEARS: A-CLASS PROJECT

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Physical activity is an integral component of a healthy lifestyle, with positive relationships documented between physical activity levels, fitness and indices of health. The aim of this study was to investigate the baseline physical activity levels and fitness of children participating in the Active City of Liverpool, Active Schools and SportsLinx (A-CLASS) Project.

One hundred and fifty-four children (41% boys, 59% overweight) from 8 schools participated in the study. Children’s fitness was assessed using a discontinuous, incremental exercise test to volitional exhaustion, which involved walking (4 and 6 km.h-1) and running (8, 10, 12, and 14 km.h-1 or until volitional exhaustion). Participants exercised at each speed for 3 minutes with 30-s passive recovery between stages. Following volitional exhaustion participants actively recovered for 5 minutes at 3.5 km.h-1. Respiratory variables were averaged using uni-axial accelerometry over seven consecutive days. The main outcome variable was total physical activity (counts per minute (CPM)). Children were divided in to tertile groups based on VO2peak scores. Analyses of variance were used to determine differences in tertile groups and boys and girls’ total weekday, weekend and whole week physical activity.

Boys VO2peak (51.7 ± 6.7 ml kg-1 min-1) was significantly higher than girls (43.7 ± 6.5 ml kg-1 min-1; p > 0.01). Results revealed no significant differences between boys and girls weekday (boys = 589 ± 140 CPM; girls = 575 ± 313 CPM), weekend (boys = 667 ± 247 CPM; girls = 564 ± 211 CPM) and whole week total physical activity (boys = 611 ± 155 CPM; girls = 572 ± 253 CPM). A tertile group main effect was found for weekend physical activity, with the lowest tertile (532 CPM) being less active than the highest tertile group (1644 CPM; p = 0.04).

No other main effects were found for tertile group. No tertile group x sex interactions were significant (p > 0.05).

The results do not support previous studies where boys are reported to be more significantly active than girls both during weekdays and weekend days. In addition, this study suggests that weekend activity is greater than weekday physical activity, though differences are small (32 CPM). The finding that the least fit tertile were less active than the most fit tertile during the weekend in this study suggests that the weekend may be an important period in childhood for children to accumulate physical activity that may benefit fitness and health.
MIRROR NEURONES ON A BALANCE TASK: SELF-OBSERVATION AND IMITATION
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Mirror neurones fire both when the monkey observes an agent acting with the hand upon an object and when the monkey grasps the object itself (Rizzolatti et al., 1988). Those neurones may mediate the internal representation of actions evoked by the observation of the actions of others, playing a role in both imitation and recognition of action (Rizzolatti et al., 1996). During a seated balance task on a fitness ball, we have exposed 20 adults (20.8±1.60, 10 women) to 4 conditions: (i) doing the task without demonstration or self-observation, (ii) looking at oneself in a mirror, (iii) first looking to the instructor doing the task and then doing it, (iv) looking to the instructor and then to oneself in the mirror. Time of standing on the ball without falling was recorded. Order of conditions, were random-ized across subjects (4 groups). Mirror neurones activation is supported if condition (iv) promotes better performance than the other three conditions. Additionally, conditions (ii) and (iii) should promote better performance than condition (i). Data was treated on SPSS v. 15.0.

Only condition (iv) revealed normal distribution of data (Shapiro-Wilk, p>0.05). Friedman test revealed significant differences among experimental conditions (Greenhouse-Geisser adjustment) (Wilcoxon signed ranks test revealed that on condition (iv) subjects performed significantly more time (14.90±9.08s) than on conditions (i) (10.64±9.95s, Z=2.837, p<0.011) and (ii) (12.12±8.97s, Z=2.539, p<0.03), but not compared with condition (iii) (12.67±8.78s, Z=1.867, p>0.05). Friedman test revealed significant differences among conditions (i) and (ii) (Z=2.359, p<0.05) and (iii) and (iv) (Z=2.651, p<0.01). There were no significant differences among conditions (ii) and (iii) (Z=0.784, p>0.05). Results completely support mirror neurones' role: observation of the actions of another person may have played a role on a better performance (condition (iii), which combined with self-observation (condition (iv)) seemed to upgrade the effect of imitation 4.

Observing others and self execution favours motor learning and may have a neuroethical support on mirror neurones. Because no instructions were involved, perception-action perspective (Reed, 1982) is strongly supported, namely because condition (iii) and (iv) had similar effect on performance.

References.

MULTISENSORY INFORMATION: DOES AUDIOVISUAL INFORMATION ENHANCE MOTOR LEARNING?
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A growing number of studies has been realized about efficiency of multisensory information in motor learning in basic research (1), but only a few studies related to applied research. Here we focus on motor learning of rowing and compared learning based on two different conditions: For the visual group (VG) instruction as well as feedback was given as video and for the audiovisual group (AVG) there was audiovisual instruction/feedback in terms of video + motion attendant sounds (MAS), the sound of the rowing-ergometer blower-wheel and sliding seat. To quantify differences of subjects’ technique compared to the models’ technique a dynamic-time-warping algorithm was adapted.

Method: 32 male subjects (all novices) tried to learn the rowing technique on the ergometer. Instructive technique was demonstrated as a video of a junior world champion, performing on an identical ergometer with low power. The performance of VG (video instruction) and AVG (audio and video) were compared. Subjects had been parallelized for initial performance index and age. Technical performance was measured with four sensors (grip force, footrest force, grip pull-out, sliding seat position) on a pre-test, for three weeks of training (2 trainings a week á 5 blocks) and two blocks on three week retention. For all sessions differences of subjects’ technique to the models’ technique were computed using a dynamic-time-warping algorithm. MAS were captured with a directional microphone (Behringer ECM 8000) and monitored via headphones (sennheiser dynamic DT 100).

Results: Learning effects became evident over the whole training as well as over a single training session (ANOVA, rep. measurements, main effects on ‘training’ was 18.2; p<0.01; ‘block’ was 10.7; p<0.01). Also learning effects remained stable, no differences between last training
and retention became evident (t-test, VG: T = 23, p = .82, AVG: T = 80, p = .43). Between both groups no differences became evident (treatment between groups: F = .06, p = .82, ANOVA, rep. measurement).

Discussion: Though we got evidence that the experimental setting was well suitable to initiate motor learning of a closed skill, no benefits of additional acoustic information became measurable. Results are surprising, because the ergometer generates a broad spectrum of MAS for a long period of each rowing cycle. The instruction model video contains corresponding MAS, though a comparative orientation between subjects’ own and models’ sound pattern should have been feasible. Maybe the duration of MAS IID each 50 cycle-training block was too short or visual information is sufficient for initially acquiring the technique of ergometer rowing.

References.

**EFFECTS OF FREQUENCY OF KNOWLEDGE OF RESULTS ON MOTOR LEARNING IN PERSONS WITH DEVELOPMENTAL DELAY**

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Knowledge of results (KR) is one of the most important learning factors. The purpose of this study was to investigate the effect of relative frequency of KR on motor learning. High (100%) and low (50%) frequency knowledge of results were applied in a group of 24 individuals with developmental delay (age from 22 to 57 years) and in gender and age-matched average individuals learning a motor skill; over-hand throw a tennis ball to the target circle on the carpet. Participants were randomly assigned to either a 100% KR or a 50% KR group. KR was provided during the 40 trials of acquisition phase according to group assignment as participants learned the motor skill, whereas no KR was provided during the retention phase (10 trials) performed 15 minutes later. The results indicated both populations who received 50% KR in the acquisition phase showed better performance in the retention phase than those who received 100% KR. These results were consistent with Rice and Hernandez (2006) results with a motor learning a laptop computer task. As has been found in the average population, reducing the KR frequency provides for individuals with developmental disabilities the opportunity to develop intrinsic error detection and correction capabilities on the no-KR trials.

**MOTOR TASK DOES NOT ALTER SYNCHRONOUS CHANGES IN EXCITABILITY OF HAND MUSCLE REPRESENTATIONS IN HUMAN MOTOR CORTEX DURING MOTOR PREPARATION**

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Muscle evoked potentials (MEP) following transcranial magnetic stimulation (TMS) vary in size from trial-to-trial. These fluctuations are positively correlated for muscles of the same upper limb [1], partly due to synchronous fluctuations in corticospinal neuron excitability. The mechanism and function of this coupling is unclear, but widespread corticomotor (CM) synchrony may assist in dynamic linking of neurons for particular tasks (binding). To assess functional organization of CM synchrony we compared the correlation of MEP size fluctuations for 2 hand muscles during preparation prior to a movement requiring their synergistic or independent activation. We hypothesized that CM synchrony would be stronger when the movement plan calls for synchronous activation of hand muscles compared with the independent activation of one muscle of the pair.

Surface electrodes recorded electromyographic (EMG) activity from left first dorsal interosseous (FDI) and abductor digit minimi (ADM) in ten healthy right-handed subjects (6M, 4F; 24±2 yrs), with focal TMS to right motor cortex. A choice reaction protocol was employed. Subjects were given a visual cue (0200 ms) indicating one of four movement tasks (randomised order), followed by an auditory cue to execute the movement starting at 550, 600, 650, 700 or 750 ms. TMS (1.3 x resting motor threshold) was delivered at 380 or 440 ms. Tasks were 1) relax both FDI and ADM, 2) activate ADM (relax FDI), 3) activate both FDI and ADM, and 4) activate FDI (relax ADM). Trials were repeated every 5s in 5 blocks of 40 (50 trials/task). Subjects relaxed the muscles prior to the audio cue, whereupon they abducted the instructed digit or digits as quickly as possible. They were tested after training required for satisfactory task performance. MEP peak-to-peak amplitude was quantified for FDI and ADM in each trial. Linear regression coefficient (r) revealed a significant positive relationship between FDI and ADM MEP size for the 50 trials/task in 37/40 (93%) comparisons. Mean (±SE) regression coefficients (r=1) were: task 1, 0.49±0.06; task 2, 0.49±0.04; task 3, 0.50±0.06; and task 4, 0.43±0.04, with no significant difference between tasks (F3,9 = 0.56, P>0.05). Mean MEP amplitude did not differ between tasks (F3,9 = 2.31, P>0.05).

These results suggest that CM synchrony does not change in the early period of motor preparation when synchronous, rather than independent, activation of muscles is required for the movement. During this period overall CM excitability remained unchanged. Differences in CM synchrony may emerge if TMS were applied closer to movement onset, when CM excitability is enhanced for muscles engaged in the movement [2]. The present findings, however, do not support the hypothesis that CM synchrony reflects functionally relevant binding of sub-populations of corticospinal neurons controlling hand muscles.

References.

**COMPARISON OF POSTURAL SWAY BETWEEN GYMNASTS AND NON-GYMNASTS**

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Maintaining upright stance normally requires minimal conscious control and relies on the continuous regulation and integration of somatosensory inputs from the central nervous system. Two mechanisms have been proposed for the control of quiet stance, firstly that the body acts as a spring damped inverted pendulum pivoting at the ankle and secondly that postural adjustments are achieved using feed-forward and feedback neural control. The objective of this study was to investigate postural sway parameters in gymnasts and non-gymnasts using three postural conditions.

14 female gymnasts and 10 female non-gymnasts were recruited. Three conditions were studied: Normal stance, feet placed a pelvic width apart (NoS); narrow stance, with feet in tandem (NaS); and beam stance (BS) which was the same as the NaS but on a gymnastic beam set 80 cm above the floor. Retroreflective markers (19 mm) were placed bilaterally on the ankle, knee, pelvis, shoulder and head. Participants performed 5 trials in each position, the order of which was randomised. For each trial 30 seconds of kinematic data were collected (100 Hz) using 8 MPU 240 cameras (Qualisys SE). The stochastic nature of sway led to non-normally distributed data, therefore,
statistical significance between groups was analysed using non-parametric tests. Significance for all statistical analyses was accepted at P < 0.05. All subsequent data are presented as mean ± sd. No significant differences were found in segmental sway areas between the non-gymnasts and gymnasts in the normal stance condition. All subjects exhibited an inverse conical sway volume when segmental absolute sway areas were viewed from the ankle to the head, irrespective of stance condition. The absolute sway areas (mm²) for each segment were as follows: knee (52 ± 1.1), pelvis (20.3 ± 3.4), shoulder (30.3 ± 4.3) and head (45.1 ± 6.4) each being significantly different to the one above. In both the narrow and beam stance conditions both groups significantly increased their sway areas at all segmental levels compared to normal stance. When comparing the transition from narrow to beam stance, non-gymnasts significantly further increased their sway areas at all segments except the pelvis. In contrast, gymnasts showed no further increase in any of the segmental sway areas. This appears to be the first study showing segmental postural differences between non-gymnasts and gymnasts. Compared to normal stance, the reduced base of support in narrow stance provides a greater postural challenge as evidence by both groups increasing their postural sway at all segmental levels. However, when this same position is performed on the beam non-gymnasts show a further increase in sway instability. These findings do not appear to be explained by the inverted pendulum mechanism but suggest that feed-forward mechanisms may dominate in such conditions.

Oral presentations (OP)

OP-PE04 Physical Education 4 - Physical Activities

PHYSICAL ACTIVITY GUIDELINES: COMPLIANCE IN A SAMPLE OF CHILDREN AND YOUTH WITH 60 MINUTES OF MODERATE TO VIGOROUS PHYSICAL ACTIVITIES (MVPA)

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Physical inactivity is a well documented risk factor for coronary heart disease and is associated with increased risk for other chronic diseases, including obesity, Type II diabetes mellitus, hypertension, colon cancer, depression, and osteoporosis. Despite evidence on the social, health, and personal benefits of physical activity, many people still choose not to exercise. Accordingly, promoting physical activity has become a public health priority worldwide. Because of the growing awareness of the health benefits of regular physical activity, public health guidelines for physical activity have been established. Several of these guidelines focus on youth. PURPOSE: The aim of this study was to compare the compliance between boys and girls of 60 minutes of MVPA during almost every day of the week (60MVPA).

METHODS: A random sample of 210 (12-18 years) boys In, 80, age, 15.11 ± 1.63, weight, 62.4 ± 14.3, height, 168.6 ±11.1, BMI, 21.7 ± 3.6) and girls In, 130; age, 14.8 ± 1.8, weight, 53.7 ± 9.5; height, 159.1 ±6.6; BMI, 21.2 ± 3.3) was evaluated from Porto region. Body Mass Index (BMI) was calculated from the children’s height and weight [weight (Kg)/height² (m)]. The following measurements were carried out: percentage of fat mass, and PA levels (GT1M, MTI Acligraphs). The activity monitor was used as instrument to objectively measure daily PA. The study was conducted during 7 consecutive days. RESULTS: Our results reveal that there’s a difference in the compliance of 60MVPA between boys and girls, during all days of the week and weekend (p<0.05). When comparing results in the different days of the week, we can observe that in girls the percentage, meeting the guidelines for a day, fluctuate between 19.4% (Saturday) and 70.6% (Sunday). When comparing boys we can examine values between 47.7% (Sunday) and 84.6% (Friday). Unfortunately when we analyze all children that accomplish the recommendations of 60MVPA during all days of the week (7 days) only 15% of boys and 7% of girls meet the criteria. CONCLUSIONS: The prevalence of children and youth meeting the guidelines of 60MVPA for every day of a week is very small, although when comparing individually the days of the week we can find percentages between 19.4% (girls) and 84.6% (boys) in specific days of the week. There is uncertainty concerning the true prevalence of compliance with physical activity guidelines in Portuguese children and youth, a national representative sample is needed in order to establish several public health strategies aiming at increasing the compliance with physical activities guidelines.

EXPERIMENTAL RESEARCH IN MOTOR AND SPORT ACTIVITIES FIELD IN PRIMARY SCHOOL IN ITALY: AN INTEGRATED MODEL OF ACTION RESEARCH AND DESCRIPTIVE RESEARCH

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Experimental Research in Motor and Sport Activities Field in Primary School in Italy: an Integrated Model of Action Research and Descriptive Research

Every activity that becomes part in Italian school, including research, must model itself on the complex educational system that is regulated by didactical, organizational and managerial constraints. It is necessary for all areas of research to be carried out in school during childhood, to use a methodology fit for an integration with the program, mostly impacting on didactic and on the quality of teaching. Therefore research in motor-sports activities in the educational contexts requires the use of methods and techniques compatible with the culture and the rules of school, with its logistics, its organizational models, its educational needs and its professional characteristics. Action research and observational research meet these requirements. Kurt Lewin (Lewin, Weiss Lewin, 1948) coined the terms “action research” to describe a particular qualitative research whose characteristics permit to intervene in the observed phenomenon. Many researchers have developed this model of research directed primarily to solve educational problems (McKinnon & Whitehead, 2006). The observational research in this educational practice involves techniques for observation of behaviors, recording quantitative and qualitative aspects.

Educational research in the motor-sports field is subject to constraints that are not present in other fields and that require researchers’ specific skills. As a matter of fact every activity of movement involves apparatus and body systems, produce neurophysiological reactions and is regulated by biomechanical principles. In particular the effect of motor both at cognitive and at functional level binds to a number of factors related to the sex, the age, the characteristics of the subject.

The organization and supervision of the research is linked also to the need to guarantee security conditions of the child during execution - individual and group - phases in advance.
Then the activity must combine different models of research in an integrated frame whose specific characteristics allow to implement a “practice aimed to the improving of teaching and learning” (Kemmis S. & R. McTaggart, 1988), within a more complex research protocol which integrates the positive aspects of action research, the ties of experimental research and the methodologies of observational research in sport-motor field (Thomas Nelson & Silverman, 2005).

References:

PICTURES OF ACTIVE AND INACTIVE GIRLS IN SWEDEN; PHYSICAL ACTIVITY, LEARNING PROCESSES IN SCHOOL PE AND SIGNIFICANT OTHERS

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Several studies show that girls have lower physical activity levels in relation to boys and that the dropping out rate from organized sport occurs earlier for girls than boys. In Sweden there is also a higher percentage of non-participation in school PE among female students. Although data shows that inactive teenage girls would like to become more physically active, but they don’t know how.

Objective: The aim of this study has been to describe and analyse female students and their self-reported physical activity level in relation to attitudes to school physical education, learning processes, significant others.

Method: Data from a follow up study 2002 within a multi disciplinary project called School-Sport and Health (SIH) has been used. The SIH-base study contained 48 randomly chosen schools, in total 1975 students. The follow up study was undertaken 1 1/2 years after the base study, where a strategic sample of the five most physical active schools together with six of the less active was undertaken. The categorization was made by a self-reported physical activity index. Results from questionnaires to students aged 14 103 girls and 117 boys and their parents 186 will be presented. The results have been analysed by SPSS. Included in the analysis is also a neighbourhood environmental index for physical activities, which was measured for each participating school.

Results: The girls and their parents have a corresponding opinion of the girls’ view of their self as an active or non-active person. Inactive girls had, surprisingly, more negative attitudes towards the subject PE and the learning process in terms of experienced learning competence, attitudes towards learning and expressed feelings about the subject. They also had lower grades and fewer friends that were physically active. The mother’s influence (as a significant other) is only significant for the active girls. Socio-economical background in terms of the mother’s educational level, the parent’s own physical activity or view of the school PE had no relation with the activity level of the girls. A majority of the parents valued the school PE as equally important as other subjects in school. When it came to the neighbourhood environmental index, schools rating low on the environmental index scale showed a significant higher incidence for inactive female students.

Discussion: The presented data will be discussed from a critical pedagogical perspective in the context of existing research with focus on girls, gender order and the school subject PE and physical activity.

References:
Garret, R Negotiating a physical identity: girls, bodies and physical education. Sport, Education & Society 2004:9, 2, pp. 223-237.

CHANGES IN THE ABILITY TO CONCENTRATE BY THE INTRODUCTION OF DAILY PHYSICAL ACTIVITY DURING LESSONS IN SECONDARY SCHOOL AGES

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Problem
Current empirical results inferring that physical activity influences on the ability to concentrate are inconsistent (Memmert & Weickgenannt, 2006). Some studies have proven statistical connections between physical activity and learning (Etnier et al., 1997). Unfortunately, few studies have been made in secondary schools. Furthermore, almost no substantiated data indicating the influence of physical activity on the learning ability are available. Therefore, we examined the effects of daily physical activity on the development of the concentration in a secondary school with pupils aged 13 to 17.

Method
Over a period of ten weeks 103 pupils from grades 8-11 received daily activity breaks of five minutes duration in the fourth and sixth blocks of the school day (TG). The 101 pupils of the parallel classes served as control group (CG). The development of the ability to concentrate was measured using the d2 Test of Attention (Brickenkamp, Zillmer, 1998). This test shows good reliability and validity and is suited as an compatible procedure for the analysis of the ability group being researched. The test was conducted prior to the intervention, after 4 weeks and at the end of the complete 10 weeks of intervention. To determine the differences in the development of performance, variance analyses of the KL-parameter were carried out.

Results
Over the period of 10 weeks both TG (n=82) and CG (n=84) improved their ability to concentrate [F=322.54; df=157; p=.000; part. eta²=.80]. The additional influence of the intervention couldn’t be statistical verified [F=2.80; df=157; p=.06; part. eta²=.03]. However, the analyses show an interaction over time between TG/CG and the grade level [F=2.55; df=316; p=.02; part. eta²=.05]. Particularly the pupils in the 9th grade belonging to the TG, performed significantly better after the intervention. Moreover, the analysis shows that the TG achieved higher rates of increased performance than the CG [F=6.66; df=157; p=.002; part. eta²=.08].

Discussion
The results show, that the pupils, who take place in a regular daily physical activity program during school lessons, can reach a higher level in their ability to concentrate after a period of ten weeks, than the other pupils do. The next question is, if this improvement of the ability to concentrate as one part of the learning conditions can improve the learning results.

References:
RELATIONS OF MOTOR FITNESS OF PRESCHOOLERS AND SOME ANTHROPOMETRIC MEASURES

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This paper identifies and analyzes meaningful research carried in Portugal about preactive decisions of PE teachers, in the last 15 years, published by authors in books, reviews, and master and doctoral thesis. Previous syntheses are upgrading (Carreiro da Costa, 2006; Sanches & Jacinto, 2004).

Methods.

Initial sample was consisted from 68 children (38 boys) in a mean age of 6.17 yrs ± .67. EUROFIT test battery (Adam et al. 1988) was performed in order to assess motor fitness of preschool children. Flexed arm hang was not performed, instead children were measured with additional test of coordination so called Indian skip. Five anthropometric measures were also taken (height, weight, subscapular, triceps and abdominal skinfold), and body mass index was calculated. Multiple linear regression analysis was used to determine the association between motor variables set as dependent variables while anthropometric measures (BMI and skinfold measures) were used as independent variables. Since ANOVA revealed difference between boys and girls only in grip strength and in standing long jump, at first regression analysis was done for whole sample. Additionally three separate regression analysis were performed on three subsamples classified on the basis of summarized T-scores (Baumgartner and Jackson, 1999) for motor variables.

Results.

After adjustment for outliers regression analysis on whole sample showed that tapping (R² = .61 F(4,40)=5.78 p<.009) and shuttle run (R² = .58 F(4,40)=5.07 p<.002) were significantly predicted by independent variables although only triceps skinfold BETA was significant. Grip strength was significantly related to body mass index and abdominal skinfold (R² = .55 F(4,40)=4.24 p<.006). On the basis of sum of T-scores of motor variables participants was divided in high level fitness group, middle level and low level group. Regression analysis performed on those limited samples groups showed that in low and middle level groups group significant relations were obtained between Indian skin and independent variables (R² = .77 F(4,15)=5.63 p<.006). BETA coefficient of BMI, triceps and subscapular skinfolds were significant.

References.


THEORETICAL AND METHODOLOGICAL ISSUES OF TEACHER’S PLANNING CONCERNING PREACTIVE DECISIONS IN PE

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This paper identifies and analyzes meaningful research carried in Portugal about preactive decisions of PE teachers, in the last 15 years, published by authors in books, reviews, and master and doctoral thesis. Previous syntheses are upgrading (Carreiro da Costa, 2006; Sanches & Jacinto, 2004).

We search to answer the following five questions: What research questions are stated? What kind of process, techniques and samples has been used to data gathering? What are the major methodological problems we can identify? What are the main results and findings? Finally, how can we overview future goals and ways to know better teacher planning practices and constraints?

References.


Oral presentations (OP)

OP-PM11 Physiology 11 - Sports

PHYSICAL DEMANDS IN MODERN FEMALE ELITE TEAM HANDBALL

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The purpose of this study was to determine the physical demands in a handball match for Danish female elite players as well as to clarify any possible differences arising from different playing positions. Twenty four Danish female elite handball field-players ([25.7±3.3 years, 174.9±5.7 cm and 70.3±7.4 kg]) were examined over a four-year period from 2002 to 2006. Video analyses of tournament matches were carried out. For each player, both a locomotive and a technical analysis of the game were undertaken. The players were divided into three categories for both attack and defence, namely wing players (WP), circle runners (CR) and backs (B). In addition, the heart rate was continuously monitored. A treadmill test was carried out in order to find the individual correlation between heart rate frequency and oxygen uptake. Furthermore, a Yo-Yo intermittent recovery test was performed on a separate day. The average maximal aerobic power for female elite handball players was 47.5 ml O2/min/kg. The average physical load during match play was found to be 79 % of VO2-max. A mean total distance of 4.0 km was covered per match and up to 700 changes of action were...
observed on the basis of eight categories of the locomotive analysis. The high, intense work of quick runs (0.7 %) and sprints (0.1 %) constituted a total of approximately 1 % of effective playing time. Each player had an average of 27 high intense play actions per match. There were a number of marked differences in both the locomotive and the technical analysis and in the practical, physical test between the various playing positions. Both WP (4063 m) and CR (4050 m) covered a greater total distance per match than B (3866 m, P< 0.05). WP also did more high intense work (3.56 % of total distance covered) than CR (2.32 %, p<0.05) and B (1.35 %, p<0.01). In attack, WP received less tackles (1.8 per match) than both CR (2.54, p<0.01) and B (15.9, p<0.01), but did more quick runs (4.4 per match) than both CR (2.47, p<0.05) and B (1.35, p<0.01). In defence, WP gave less tackles (1.8 per match) than CR (2.7, p<0.01) and B (24.6, p<0.01). WP covered a greater distance in the Yo-Yo intermittent recovery test (1516 m) than both CR (1360 m, p<0.05) and B (1352 m, p<0.05). WP was slower in both height (169.3 cm) and weight (63.5 kg) than CR (177.7 cm, 72.5 kg, p<0.01) and B (177.0 cm, 70.6 kg, p<0.01).

In conclusion, this study shows that modern female elite team handball places high demands both on the player’s aerobic and on the anaerobic energy production. A mean total distance of 4.0 km was covered per match with an average physical load during match play corresponding to 79 % of VO2-max. A game consists of up to 700 activity changes with an average of 27 high intense play actions per match. There are distinct differences in the physical demands in the various playing positions, where wing players do more high intense work, cover a greater running distance, and do less tackles compared to backs.

**PHYSIOLOGICAL AND METABOLICAL IMPACTS OF RUGBY TOURNAMENT FOR YOUNG PREPUBERTAL BOYS**

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**Hypothesis:** We presume that the physiological and biological impacts of the Rugby competitions currently organized in France for the children aged respectively less 9 (-9years) and less 13 years (-13years) are unsuited to their capacities.

**Method:** Twelve players -9years (36.9±/−5.3kg, 136.9±/−4.7cm, 147.5±/−3.9cm) and 12 players -13years (46.5±/−6.7kg, 147.5±/−3.9cm) had taken part in an official tournament (3 matches) organized by the French federation of Rugby. The total duration of matches was 24min for the -9years and 30min for -13years. Each one of them was equipped with a cardiofrequencemeters to record heart rate (HR), with an accelerometer (Armiband) to evaluate the distances covered and was filmed during matches. Before and after the tournament a blood microcapillary sample was carried out in order to analyze by infra-red spectrometry the evolution of 19 plasmatic parameters.

**Result: discussion:** We did not record any significant difference (physiology and biology) between the groups. During matches on average, children were stopped 59% ± 2 or walked 24% ± 1. More than 84 % of their HR ranged between 40 and 85 % of their HRmax. Their metabolic profile showed a sensitive rise in their glycemia accompanied by a modest lactetemia (6±1,45mMol/L) nevertheless a lipid mobilization suggested by a significant increase of the glycerol and a moderate increase of free fatty acids (FFA) which can be the witness of probable hydrolysis of triglycerides with orientation of FFA towards the muscles. All these results testify to a moderate intensity aerobic physiological request (approximately 60 ±70% of VO2max).

**Conclusion:** Favoring in a modest way the aerobic pathway, the children Rugby tournament proves to be insufficient either to develop their physiological and motion capacities or to prepare them to a more intense future practice.

**SOCCER TRAINING AND COMPETITION EFFECT ON Crossover CONCEPT IN YOUNG ELITE PLAYERS DURING A SEASON**

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**Purpose:** To evaluate the effect of a training and competition season to the response of the adaptation to the Crossover concept in elite young soccer players.

**Methods:** 19 young elite soccer players (age: 17.9 ± 0.7 yrs) from the sports academy of a professional Spanish soccer team where evaluated during a treadmill test 3 times throughout the season (T1: 8 weeks after the beginning of the season, T2: 12 weeks after T1, and T3: 16 weeks after T2). During this test (inclination: 1%, initial speed: 8 km/h-1, step duration: 3 min, passive pause: 30 sec, and increments: 1 km h-1 until exhaustion) Fat (FAOx) and carbohydrate (CHOox) oxidation rates were estimated and averaged for the last 2 minutes of each step throughout stichometric equations. Maximum Fat (FATmax) and CHO (CHOmax) oxidation rates were calculated as well as Crossover Point (COP), and Minimum Fat oxidation rate (FATmin) in relation to % O2max. CHOoxr and FAToxr were calculated for the following three intensity zones: Z1: FATmax-COP, Z2: COP-FATmin, and Z3: FATmin-CHOmax for each of the laboratory tests. Team average training load was quantified in seconds during the season (T1, T2, and T3) and for each of the 3 intensity zones (Z1, Z2, and Z3). A repeated measures ANOVA was used to compare the level of the studied variables. The statistical level of significancy was P<0.05.

**Results.** The relative intensities for each oxidative variable studied throughout the season were FATmax: (72.1 ± 6.9, 73.0 ± 7.5, and 72.6 ± 6.5 %HRmax), COP: (85.6 ± 4.7, 85.7 ± 5.9, and 82.8 ± 5.5 %HRmax), CHOmax: (100 ± 0 %HRmax), and CHOmin: (79.7 ± 3.1, 87.6 ± 4.7, and 93.0 ± 5.6 %HRmax), and COP: (85.6 ± 4.7 vs. 82.8 ± 5.5 %HRmax), p< 0.05, and T3 (85.7 ± 5.9 vs. 82.8 ± 5.5 %HRmax), p< 0.01). The average FAOx decreased significantly in Z2 between T1 and T3 (0.11 ± 0.03 vs. 0.09 ± 0.02 g·min-1, p<0.05). CHOOxr decreased in Z3 between T1 and T3 (5.03 ± 0.87 vs. 5.17 ± 1.06 g·min-1, p<0.05). Finally, the average training load decreased significantly throughout the season in Z1 (1523 ± 244, T2: 1279 ± 224, and T3: 1178 ± 241 sec, P<0.001), and in Z2 (1009 ± 215, P2: 759 ± 240, and P3: 764 ± 232 sec, P<0.001). No significant differences were found in Z3 (T1: 92 ± 130, T2: 67 ± 99, and T3: 65 ± 98 sec).

**Conclusion:** The players from the evaluated soccer team showed a disadaptation to aerobic metabolism during the last third of the season, specifically in the relative intensities in the COP, FAToxr and CHOoxr in Z2 and Z3 respectively. This could be due to a decrease in the training load observed at sub-maximal intensities starting from T1. Therefore, it is suggested to increase the training load at sub-maximal intensities during the second third of the season to maintain the level of aerobic adaptation.
INFLUENCE OF ACTIVE OR PASSIVE RECOVERY AFTER EXERCISE ON SPRINT PERFORMANCE

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It is known that during active recovery lactate concentration decreases faster than during passive recovery. This is often interpreted as an indirect sign for a faster recovery, but this was seldom proven directly. In this study we therefore tested the hypothesis that active recovery performance in sprint tests is better than after passive recovery. Ten male subjects (age: 25.2 ± 5.5 years) took part in the study. In a pre-test the maximum power (Wmax) subjects was determined in an incremental cycling test. From this test the power for warming up (50% of Wmax) and the active recovery (40% of Wmax) was deduced. To test the hypothesis we administered three randomly ordered trials of 3 min all-out sprint tests. The trials were separated by 60 min of passive recovery. The main test consisted of two Wingate-tests (WT) separated by 60 min of active recovery (ACT) and followed by 18 min of passive recovery (PAS). The study was performed in a crossover design. Five subjects started with PAS and five with ACT. The test started with a resting period (3min) sitting on a cycle ergometer (Lode Excelsior Sport) followed by the warming up consisting of 2min with 10 Watt and 10 min at 50% of Wmax at a cadence of 80 to 90 rpm. After a break of 1 min the first WT (30sec) was started. After this test the subjects remained sitting on the bike and 1 min after termination of WT started cycling with 40% Wmax for 18 min. Afterwards power was increased again to 50% for 10 min. After a break of 1 min the second WT was started. The following recovery period lasted 10 min (ACT and PAS, resting in a deck-chair). In the PAS trial exercise was replaced by 15 min rest on the deck chair. During the whole test heart rate and spirometric data (Metalyzer IIIb, Cortex) were continuously measured. Blood for lactate determination was taken from a hyperaemized earlobe.

Wmax in the incremental test was: 4.06 ± 0.7 Watt/kg. Lactate concentration reached 12.3 mmol/l 3 min after WT. Thereafter lactate further increased to 12.8 mmol/l during PAS, but decreased to significantly lower values during ACT and remained lower during the second warming up, during the second Wingate tests and the recovery period (P<0.001). Maximum WACT: 1231.4 ± 179.2 Watt and WPASS: 1250.2 ± 1707 Watt and mean power (739.9 ± 64.3 and 742.5 ± 62.4 Watt, respectively) during WT1 were not significantly different between both conditions. Maximum power in WT2 was not different from WT1 and not different between ACT and PAS. However, mean power in WT2 was significantly lower after ACT than after PAS (ACT: 727.7 ± 801.5 PAS: 741.4 ± 75.5 Watt; P<0.05).

In spite of the lower lactate concentration maximum power was not influenced by active recovery. That shows that the decrease in lactate is not necessarily a measure for recovery. Mean power was higher after PAS than after ACT in spite of higher lactate values showing that lactate seems not to be limiting under these strenuous exercise conditions. The reason for the lower performance might be a larger glycogen breakdown or an enhanced electrolyte shift during the active recovery.

EFFECTS OF INTENSIVE ENDURANCE TRAINING ON MAXIMAL OXYGEN UPTAKE AND ENDURANCE PERFORMANCE IN HIGHLY TRAINED JUNIOR CROSS-COUNTRY SKIERS

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The aims of this study were (1) to predict performance in 1.5 km and 12 km free technique roller skiing, and (2) to investigate the effects of three different endurance-training regimens upon maximal oxygen uptake and performance in 1.5 km and 12 km free technique roller skiing. Twenty-four highly trained male and female junior cross-country skiers (17 ± 0.5 yr) were tested for maximal aerobic capacity and performance before and after an eight week training period. The men and the women had a baseline maximal oxygen uptake of 71 ± 4 ml/min/kg and 61 ± 6 ml/min/kg, respectively. The major finding in this study was that highly trained junior cross-country skiers responded more positively to a training program with increased training at lactate threshold compared to increased training at intensities well above or well below the lactate threshold. The group of skiers who emphasized training at lactate threshold significantly improved their 1.5 km free technique roller ski performance compared to the other groups (P<0.05) and, moreover, it was also the only group to significantly improve the 1.5 km free technique roller ski performance (P<0.05) and the 6.7 km hill run (P<0.05) from pre- to post-test. Another main finding in this study was that the variance in the 12 km free technique roller ski performance was significantly (P<0.05) predicted by maximal aerobic capacity, 2 km double poling on roller skis, and 12 km free technique on roller skis. As well, 82% of the variance in the 12 km free technique roller ski performance was significantly (P<0.05) predicted by a 2 km double poling on roller skis and a 6.7 km hill run. It is concluded that increased training at the lactate threshold can improve performance in highly trained XC-skiers.

INFLUENCE OF PRIOR SPRINT EXERCISE ON THE PARAMETERS OF THE ‘ALL-OUT CRITICAL POWER TEST’

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The power-duration relationship for severe intensity exercise is defined by two parameters: the critical power (CP) and the W’ which represents a fixed work capacity above CP. These parameters can be established in a 3-min all-out cycling test against fixed resistance, where the end-test power (EP) represents the CP and the work done above EP (WEP) indicates the W’. Prior intense exercise could enhance the aerobic energy provision during a subsequent exercise bout, but insufficient recovery following prior exercise might compromise the repletion of high-energy phosphate stores and thus result in reduced performance. The aim of this study was therefore to establish how prior sprint exercise and subsequent recovery duration may influence the all-out test EP (predominantly aerobic) and WEP (predominantly anaerobic) parameters during the 3-min all-out cycling test.

Following ethical approval, seven male subjects completed a ramp incremental test, a 3-min all-out familiarization trial, a 3-min all-out test (control), a 3-min test preceded by a 30-s sprint and a 2-min recovery, and a 3-min test preceded by a 30-s sprint and a 15-min recovery (Lode Excalsior Sport cycle ergometer, Groningen, The Netherlands). The last three trials were administered in a random order. The EP was calculated as the mean power output over the final 30 s of the 3-min test and the WEP as the power-time integral above EP. Parameter estimates from different trials were compared using one-way repeated measures ANOVA.

The EP measured in the 2-min recovery’ test (16.5 ± 3.3 kJ) was significantly lower than in the 5′-min trial (21.2 ± 4.5 kJ) and the control trial (20.8 ± 3.9 kJ), F2,6 = 17.9, P < 0.001. The total work done in the 3-min test was also lower in the 2-min trial (56.4 ± 7.2 kJ) than in the 15-min trial (63.0 ± 6.0 kJ) and control trial (63.5 ± 6.6 kJ). The EP was similar in all trials (Control 235 ± 44 W; 2-min trial 223 ± 46 W; 15-min trial 232 ± 50 W; F2,6 = 2.45, P = 0.13). The highest VO2 attained during the all-out tests were not different from the ramp test determined VO2peak (Ramp test 4.07 ± 0.49 L·min⁻¹, control VO2 4.05 ± 0.32 L·min⁻¹, 2-min VO2 4.07 ± 0.34 L·min⁻¹, 15-min VO2 4.07 ± 0.23 L·min⁻¹, F3,6 =
The reduced WEP when the recovery time following the initial sprint was limited to 2 min supports the notion that the work capacity above CP is dependent upon the availability of the immediate intramuscular energy stores. The overall performance in the 3-min test, as indicated by total work done, was not improved by prior sprint exercise and 15 min recovery (i.e. priming exercise did not enhance exercise tolerance), and performance was markedly reduced when only 2 min recovery was permitted.

**ORAL PRESENTATIONS (OP)**

**OP-PM12 Physiology 12 - Thermoregulation**

**THERMOREGULATORY DEMANDS OF ELITE PROFESSIONAL AMERICA’S CUP YACHT RACING**

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America’s Cup yacht racing is predominantly performed in hot and humid conditions, with athletes exposed to the environment for prolonged periods, yet there is little data in the published literature on thermoregulatory demands and fluid balance during sailing. Core and skin temperature, fluid balance and sweat composition were measured in thirty-two elite, professional, male America’s Cup yacht racing athletes during a 1.5 h 40 min moderate intensity race simulation between two similar America’s Cup racing yachts. Environmental conditions were regarded as moderate for sailing, due to the light wind strength (33C, 56% relative humidity, 5 m/s wind speed (8.5 m/s upwind, 1.0 m/s downwind). Core (Tc) and 4-site skin temperatures (Ts) were measured using ingestible temperature sensors and wireless dural thermostats, respectively. Sweat loss was calculated as the change in body mass corrected for fluid intake and urine excretion. Sweat electrolyte content was assessed from absorbent patches applied to four skin sites. The racing intensity of both boats was similar with an overall subjective rating of 3 out of 5. When comparing the different crew positions, the bowmen recorded the greatest elevation in Tc (peak 39.1°C, range 39.0 to 39.4°C; n=4) followed by the grinders (peak 38.3°C, range 37.9 to 38.6°C; n=6). No significant difference was found in Tc between the upwind and downwind legs. There was no significant difference in mean Ts between positions, however, within positions, bowmen had significantly lower regional skin temperatures at the lower leg compared with the chest (P<0.05), while grinders had significantly greater forearm skin temperatures compared with the chest (P<0.05). A modest correlation was found between Tc and percentage dehydration (r=0.45, P<0.05). For the whole group sweat loss during racing was 2.24 ± 0.89 L (range 0.74 to 3.95 L) with bowmen experiencing the greatest loss of sweat (3.7 ± 0.9% of body weight). Mean fluid intake was highly correlated to sweat loss (P<0.001) with 72 ± 41% of sweat losses replaced. Sweat sodium and chloride concentrations were strongly related to sweat rate (P<0.001), although no relationship was found for magnesium or potassium. The mean sodium concentration of sweat was 27.2 ± 9.2 mmol/L (range: 12.0 to 43.5 mmol/L) and the rate of sodium loss was 0.6 ± 0.4 g/h (range: 0.1 to 1.7 g/h). The total NaCl loss during racing was 3.8 ± 2.4 g (range 0.7 to 10.0 g).

This is the first study to quantify the thermoregulatory demands of racing in elite professional sailors. The apparent lack of a significant difference in Tc between upwind and downwind legs may be attributed to the relatively short duration of each leg. Even though the race intensity was moderate, bowmen appeared to be at risk of hyperthermia and dehydration during racing. These findings have important implications in the management of hydration and prevention of heat injury in America’s Cup athletes.

**EFFECTS OF THE MENSTRUAL CYCLE ON TEMPERATURE RESPONSES TO EXERCISE AND PROLONGED EXERCISE PERFORMANCE, BOTH IN TEMPERATE AND IN HOT, HUMID CONDITIONS**

Janse de Jonge, X., Thompson, M.

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Eumenorrheic women have a biphasic rhythm in basal body temperature throughout the menstrual cycle. After ovulation, temperature is elevated during the luteal phase, compared with the follicular phase. The most widely accepted explanation is that the thermoregulatory set point is increased during the luteal phase, which would imply that body temperature remains elevated during exercise and/or heat stress. This increased temperature during the luteal phase may exert a negative effect on prolonged exercise performance, particularly in hot, humid conditions. The present study investigated effects of the menstrual cycle on temperature responses to exercise and prolonged exercise performance, both in temperate and in hot, humid conditions. Twelve recreationally active young women volunteered to take part in this study. Testing was conducted during the follicular (low progesterone) and the luteal (high progesterone) phase, in both temperate (20 degrees C, 45% relative humidity) and hot, humid (32 degrees C, 60% relative humidity) conditions. Prolonged exercise performance was measured as time to exhaustion in an incremental performance test immediately following 60 minutes of sub-maximal exercise at 60% of maximal oxygen consumption. Rectal temperature (Tre) and skin temperature (Tsk) were measured. Mean Tsk was calculated according to Ramathan (1964).

Resting serum progesterone measures revealed that seven out of twelve subjects had ovulated during both environmental conditions (progesterone concentration > 16 nmol/L). The mean (range) for age, height and weight was 24.4 (19-29) years, 166 (160-176) cm and 68.2 (51.8-82.9) kg respectively. Repeated measures ANOVA showed that Tre was significantly higher during the luteal than the follicular phase, both at rest and during sub-maximal exercise. The rate of increase in Tre during submaximal exercise and Tre at exhaustion did not show a significant difference over the menstrual cycle. Tsk at rest, during sub-maximal exercise and at exhaustion demonstrated no significant difference over the menstrual cycle. Time to exhaustion was shorter during the luteal than the follicular phase, and also during hot, humid conditions as compared to temperate conditions. No interaction was found between menstrual cycle phase and environmental conditions.

The fact that the increased resting Tre during the luteal phase remained significantly elevated throughout sub-maximal exercise supports the thermoregulatory set point theory. The results further suggest a negative effect of increased luteal phase body temperature on prolonged exercise performance, independent of environmental conditions. Practical recommendations may therefore include advising regularly menstruating athletes to attempt to compete in endurance events during the follicular phase.

References.
ARE SOME PEOPLE PREDISPOSED TO EXERTIONAL HEAT STROKE?

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Exertional heat stroke (EHS) is a potentially life-threatening condition that occurs in some individuals when they perform prolonged intense physical activity in warm environments. Ethically, controlled studies are not able to induce EHS, which leaves case reports as the primary source for identifying the causes of EHS.

A fit VO2max 72.0mL/kg/min 29 year old male collapsed 700m from the finish of an ironman distance triathlon. During the 9.5 hour event the ambient temperature ranged from 15.2°C to 31.3°C and the relative humidity ranged from 19% to 60%.

The patient was found to be unresponsive to pain and his heart rate was 120bpm. On route to the hospital he projectile vomited several times and he became cyanotic at the entrance to the hospital. His blood pressure was 100/60mmHg and he was hypothermic (T 40.4°C).

The patient was suffering significant rhabdomyolysis; his initial CPK was elevated at 2,865U/L and increased over the first 24 hours post collapse to reach a peak of 30,798U/L. His AST and ALT levels were both raised considerably reaching peak values of 1490U/L and 909U/L respectively. He was given 4 litres of normal saline and his rectal temperature decreased to 37.9°C before he was transferred from emergency to the intensive care unit. The patient was hospitalised for 3 days and was given intravenous bicarbonate fluids. His liver function and CPK were monitored 12 hourly. He had regular coagulation profiles to rule out disseminated intravascular coagulation.

Four weeks later the patient undertook a thermal tolerance test. The ambient temperature was set to 35°C, 40%rh. The patient cycled at 300 Watts (70%VO2max) on a cycle ergometer. He was stopped after his rectal temperature had reached 39.8°C. He had a resting mean arterial pressure (MAP) of 95mmHg and maintained his MAP throughout the test. His heart rate increased gradually throughout the test to offset a decline in stroke volume. Cardiac output remained steady at 26.2L/min after the first 20 minutes of exercise. VO2 remained constant at 3.9-4.0L/min. Rectal temperature increased at a rate of 0.06°C/min, while skin temperature fluctuated between 37.05°C and 37.41°C.

There are a number of studies showing that heat shock proteins play an important protective role for cell survival. Moran et al showed that a drop in HSP72 during the first hour of recovery after an exercise heat exposure was indicative of heat intolerance due to impairments in heat shock protein gene transcription (Moran et al, 2006). The patient’s HSP72 returned to resting levels in the first hour after the thermal tolerance test indicating an intolerance to heat that may have predisposed him to EHS. More research is needed to determine why some people are susceptible to EHS and to determine the relationships between EHS and abnormal HSP72 response.

CHANGING WORK INTENSITY IN COLD IS BENEFICIAL FOR MUSCLE FUNCTION

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Repetitive work in cold induces higher level of strain and fatigue for the working muscles as compared to similar work in thermally neutral condition (Oksa et al. 2002). There are implications that intermittently increasing the intensity of repetitive work from 10 %MVC to 30 %MVC induces lower level of strain and fatigue than work at 10 %MVC level only (Oksa et al. 2006). Therefore, the purpose of this study was to evaluate whether intermittently increasing the workload from 10 %MVC to 50 %MVC level is also able to induce beneficial effects on muscle function during repetitive work in cold.

Eight healthy female subjects participated in the study and were exposed once to 21°C (TN) and twice to 4°C for 120 minutes. During the exposure to 21°C and first exposure to 4°C (C10) subjects performed wrist flexion - extension work bouts at 10 %MVC level. On the second exposure to 4°C the workload was increased every fourth minute to 50 %MVC (C50). Maximal wrist flexion force (MVC) was measured before and after the experiment. During work EMG activity was measured from two wrist flexor and extensor muscles. From EMG data work loading parameter which defines the percentage amount of activity coming from each muscle (4 muscles = 100 %) was analyzed. The activity from flexors and extenders is presented as mean of two muscles.

The cumulative work at C50 was 5508±467 kg and differed significantly from C50 and TN (4950±420 kg, p<0.05). After exposure MVC was 9 % (NS) lower at C10 (155±12 N) in relation to TN (170±12 N) and C50 (169±11 N). The percentage EMG activity in forearm flexors and extensors was similar during TN (78.5±0.5 and 21.5±0.4) and C50 (78.2±0.7 and 21.6±0.5). However, significantly lower percentage activity from flexors (71.5±1.1) and higher from extensors (28.5±1.1) was observed during C10 exposure indicating increased co contraction.

In all exposures maximal wrist flexion force decreased indicating muscle fatigue. However, the most pronounced change was observed after C10. Likewise, the relation between the activity of agonist - antagonist muscles in the forearm was similar between C50 and TN whereas, the level of co contraction during C10 was the highest. Therefore, it can be concluded that intermittently increasing the workload in cold condition induces similar changes during repetitive work as in thermoneutral condition, less pronounced fatigue and level of co contraction. Thus, altering work load during low intensity repetitive work in cold can be regarded as beneficial in terms of muscle function in relation to the use of low intensity work only.

References

ACUTE RECOVERY OF VOLUNTARY AND EVOKED MUSCLE PERFORMANCE FOLLOWING INTERMITTENT-SPRINT EXERCISE IN THE HEAT

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Despite the volume of research outlining the reduction of exercise performance in the heat, there is a paucity of research describing the effects of warm conditions on acute post-exercise recovery. Therefore, the aim of this study was to determine the effects of warm condi-
tions on the acute recovery of voluntary and evoked muscle performance following intermittent-sprint exercise. Nine male and six female team-sport athletes performed two testing sessions separated by 7 days. Sessions consisted of both a 30-min exercise protocol and a 60-min passive recovery in either 21°C or 33°C. The exercise protocol involved a 20 s maximal sprint every 5-min, separated by constant-intensity exercise at 100 W on a cycle ergometer (LODE Excalibur Sport). Pre- and immediately, 15-, 30- and 60-min post-exercise, maximal voluntary contraction (MVC) and a resting and superimposed twitch (IP) of the right knee extensors were assessed, while a capillary blood sample was obtained to measure lactate, pH and HCO3. During and following exercise, core temperature from a telemetry ingestible capsule (MiniMitter), heart rate (Polar) and Rating of Perceived Exertion (RPE) were also measured. A repeated measures ANOVA and Cohen's d effect size analysis were used to determine differences between conditions. Results indicated no difference (P<0.05) in peak power during repeated 20 s sprints between hot and mild conditions. Post-exercise MVC was reduced (P<0.05) in both conditions and a moderate effect size (d=0.50) indicated a small suppression in recovery of MVC in the hot environment (60-min post: 82 ± 76% recovered). There were no differences (P>0.05) in IP at any time point pre- or post-exercise. Both heart rate and core temperature were significantly higher (P<0.05) post-exercise and during the recovery in the hot condition. Blood lactate, pH and HCO3 did not differ between conditions at any time point during exercise or recovery. Finally, RPE was higher immediately and 60-min post-exercise in the heat. The current data suggests that passive recovery in warm temperatures not only delays cardiovascular and thermal recovery, but may also slow the recovery of MVC. This slower recovery of MVC seems likely to be from a central or motivational origin, as evoked twitch force was not different between conditions and no contractile properties were evident. Additionally, RPE was significantly higher in the heat and may indicate the increased perceptual strain or a reduction in motivation to perform. It must be noted that peak core temperatures were not exceptionally high (<38.5°C) and a greater induced thermal strain may result in a more pronounced suppression of performance or slower recovery. In summary, these data indicate the possible delayed recovery of not only the cardiovascular and thermal systems, but also muscle performance during passive recovery in the heat and hence highlights the possible usefulness of post-exercise recovery strategies.

COMPARISON OF PHYSIOLOGICAL RESPONSES DURING SNOW REMOVAL IN SEDENTARY MEN AND WOMEN

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Manual snow removal is a necessary winter task that is performed by men and women. It is positively correlated with an increased risk of injury and cardiac events such as myocardial infarction or sudden cardiac death (1). While safety guidelines have been developed for performing this task in healthy men (2), guidelines are currently lacking for women. The purpose of this study was to compare the physiological responses during self paced snow removal in sedentary men and women. It was hypothesized that there would be no significant gender differences in these physiological responses, and therefore, gender based safety guidelines would not be necessary. Consent was obtained from six sedentary healthy males and six females who completed: (a) an incremental arm cranking test to determine peak oxygen uptake (peak VO2; mean = 17.6 ± 4.5 ml/kg/min and 18.6 ± 2.0 ml/kg/min in men and women respectively) and (b) two self paced snow removal trials on an outdoor grass covered surface with a snow depth of 50 cms. Subjects scooped the snow with a 2 kg shovel (72 cm handle) and threw it sideways to clear a vertical path. Each trial lasted 10 mins interspersed with a 10 min indoor rest period. Mean outdoor temperature, wind and relative humidity during the 10-day snow removal period were: -7.5 ± 4.9°C, 13.6 ± 3.8 km/h and 85.1 ± 7.9% respectively. Physiological responses were recorded with a wireless metabolic system and heart rate monitor. Data were averaged over 20 sec intervals and the peak values of oxygen uptake (VO2) and heart rate (HR) were used for analysis. Blood pressure (BP) was measured during the first minute of recovery and blood lactate (La) was measured from a fingertip two minutes post exercise. Two-way analysis of variance with repeated measures on trials indicated no significant differences (p > .05) between genders and trials for VO2, HR, systolic and diastolic BP, and La. The respective means for the men and women were: VO2 = 19.1 ± 6.3 and 18.8 ± 2.7 ml/kg/min; HR = 159.6 ± 19.8 and 152.1 ± 12.1 bpm; systolic BP = 141.4 ± 19.1 and 141.0 ± 15.8 mmHg, diastolic BP = 88.9 ± 8.6 and 82.5 ± 6.4 mmHg; La = 3.95 ± 1.1 and 3.50 ± 0.7 mmol/L. The VO2 during snow removal corresponded to 109.7±29.3% and 101.0 ± 10.3% of peak VO2 measured during arm cranking in men and women respectively. The corresponding values for HR were 91.0 ± 13.0% and 98.7 ± 6.0% respectively. These relative intensities were also not significantly different (p > .05) between genders. Self paced snow removal by sedentary men and women induces an energy expenditure that equals or exceeds that observed during maximal arm cranking in healthy men (2), guidelines are currently lacking for women. The purpose of this study was to compare the physio-

FIGHTING SPORT PROJECT 2000: CREATING A SOFTWARE FOR TRAINING PROGRAMMING IN COMBAT SPORTS

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Introduction

In modern combat sports and martial arts competitions, the training and the high level of specialization of the athletes, play a key role. Therefore is very important to program and plan training in a functional and scientific way. Filling in a questionnaire, the 95.65% of Italian Karate technicians said to know the advantages of training programming, but only the 86.96% of them actually plan their work. Moreover, only the 22.61% of them stated to know software for training programming, but only the 64.35% of them would be interested in over, only the 22.61% of them stated to know software for training programming, but only the 64.35% of them would be interested in
method and questionnaires (those functions are included in the software). Such trainings might be organized following the classical model of periodization (Matwejew, Tschiene) or the blocks one (Verchosanskij), or also mixed models. With FSP 2000 you can decide what to do during your training session: Karate’s agonistic training or technical teaching (low level belt and young activity). The performance of each exercise is shown by a descriptive and a multimedia section (through video and images). You can also choose the parameters of the exercise: execution time, recovery time, repetitions, series, volume, density, intensity, loading percentage. The software is able to display the trend of the training’s loading, both for a single session and a longer one, through the intensity/volume chart and the time sharing for each objective.

Conclusions
FSP 2000 is ever growing in order to meet every problem and variable the modern theory and methodology of training and the several needs of sport technicians present. Now we are modifying some program’s functions to optimize the programming process and we are trying to adapt it to the needs of others combat disciplines (judo, wrestling, boxing, TKD, kick boxing...).

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FACTORS TO PREDICT FREESTYLE PERFORMANCE TIMES IN MASTER SWIMMERS
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University College Dublin, Ireland and IUSM Roma, Italy

Many studies have been conducted to identify models based on anthropometric and strength measures capable of describing the performance time in swimmers. Some studies have focused on investigating the implication of hand [2, 4] and forearm strength swimming performance using different methodologies and devices being generally in agreement with the important role of upper extremity in the total thrust in the crawl stroke [2, 4, 1]. Few studies are dedicated in Master swimmers athletes despite they are an invaluable model to trying to adapt it to the needs of others combat disciplines (judo, wrestling, boxing, TKD, kick boxing...).

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The assessment of fatigue thresholds in order to evaluate swimming performance potential and to promote an efficient training control and advice seems to be possible only in mixed or dominantly aerobic efforts. In this field the anaerobic threshold it’s very well none. The study of fatigue thresholds in efforts of the anaerobic domain is apparently unusual. This is probably due to some lack of knowledge associated to anaerobic performance, once tests who most directly evaluate it (e.g. muscular biopsy or Nuclear Magnetic Resonance) are expensive, invasive and not applicable in sports practice. The most widely accepted anaerobic test is the cycloergometer Wingate test. Although, Wingate is very unspecific for swimmers, and other tests must be found to evaluate this capacity. The aim of the present study was to find and compare fatigue thresholds 30s time-curves obtained with swimmers. 90 swimmers, 30 pre-pubertal, 30 pubertal and 30 post-pubertal, being 15 males and 15 females in each group, participate in the study. Pubertal stages were defined using stages described by Tanner (1962). Experimental procedures included five 30s tests: (i) free swimming with the swimmers connected to a cable velocimetric system, (ii) fully tethered swimming (Globus strain-gage), (iii) simulated swimming on a biokinetic swim bench, (iv) crank ergometer Wingate test and (v) cycloergometer Wingate test. Two especially developed Matlab programs allowed to assess fatigue thresholds on the continuous 30s efforts of the three first tests (Soares et al., 2006) and on the two Wingate tests. It was possible to observe the existence of velocity, force and power time-curves with one and two fatigue thresholds. In curves with one threshold, fatigue appears around 13s from the beginning of the effort. In curves with two fatigue thresholds first appears around 8s of exercise, and the second around 18s from the beginning of the effort. We could conclude that fatigue thresholds appearance seems to be independent of the kind of effort performed by swimmers.

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EVOLUTION OF PERFORMANCE DURING CYCLING–RUNNING SUCCESSION ALONG ONE SEASON IN YOUNG TRIATHLETES

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INTRODUCTION

The cycling-running succession has an important physiological component: it is difficult to adapt to running after cycling. Hence, triathletes who show the best overall performance are therefore those in whom the cycling component least affects their running (1). The aim of this study was to compare the changes along two seasons of the cardiorespiratory response and performance during a cycling-running succession in elite young triathletes.

MATERIAL AND METHODS

Nine elite young triathletes selected by the Spanish Triathlon Federation as the best in their category (under 16) participated in the study. Experimental protocol was repeated in the same moment of two different seasons (2006 and 2007) and consisted of two trials performed in random order. In trial 1 (C-R) subjects completed 30 min cycling at 3.5 W/kg on a cyclergometer. Immediately after, subjects run 3000 m as fast as possible on a 400 m track (7.5 laps). Trial 2 (R) consisted of running 3000 m as fast as possible. All cardiorespiratory variables were measured with a portable metabolic system (Jaeger Oxycon Mobile) and oxygen cost of running (O2C) was calculated each 400 m using the formula of Di Prampero (2).

RESULTS

The C-R trial was associated with: 1) an acute cardiorespiratory response compared with R and, 2) an impairment of 3.5% in performance during running (647.0 ± 22.9 vs. 624.9 ± 15.0 seconds for C-R and R respectively).

When seasons were compared, cardiorespiratory response and O2C were similar, but performance improves significantly in both conditions. Thus, time to complete the running sector decreased a 6.4% during C-R (667.3 ± 24.7 s) from 2006 to 2007 season.

DISCUSSION

Our study confirms the specific cardiorespiratory response and the loss of performance showed by others during cycling-running trial (1, 3, 4), but in our knowledge, this is the first work that evaluate the changes along a season. Millet and coworkers indicated that performance in the running sector might be more important than the VO2max in the detection of talented competitors, and suggested this performance be monitored over time (5). Thus, we conclude that monitoring and comparing this performance with professional could be be helpful in the detection of talented triathletes.

REFERENCES


EFFECTS OF RUNNING VERSUS SPECIFIC AEROBIC TRAINING IN YOUNG HANDBALL PLAYERS

Buchheit, M., Laursen, P., Kuhnle, J., Renaud, C., Ruch, D., Ahmaidi, S.
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The aim of the present study was to compare the effect of high-intensity running exercises versus specific handball aerobic training on athletic performance in young handball players. Thirty two highly-trained adolescents (15.5 ± 0.9 y, 16 girls, 16 boys) were randomly assigned to either running (HIT; n = 17; girls = 8) or specific (HB; n = 15; girls = 8) training groups. During 10 weeks, HIT consisted in 15-s runs at 95% of the speed reached at the end of the 30-15 Intermittent Fitness Test (VIFT) interspersed with 15 s of passive recovery (15/15); HB training consisted in small-sided handball games (4-a-side) of similar duration than HIT series. Groups performed either HIT or HB twice per week and maintained similar external training programs. Before and after training, performance was assessed by the VIFT, using the formula of di Prampero (2).

To assess the differences between C-R and R, and between seasons, paired t-tests were performed and the significant level was fixed at p<0.05.

RESULTS

The C-R trial was associated with: 1) an acute cardiorespiratory response compared with R and, 2) an impairment of 3.5% in performance during running (647.0 ± 22.9 vs. 624.9 ± 15.0 seconds for C-R and R respectively).

When seasons were compared, cardiorespiratory response and O2C were similar, but performance improves significantly in both conditions. Thus, time to complete the running sector decreased a 6.4% during C-R (667.3 ± 24.7 s) from 2006 to 2007 season.

DISCUSSION

Our study confirms the specific cardiorespiratory response and the loss of performance showed by others during cycling-running trial (1, 3, 4), but in our knowledge, this is the first work that evaluate the changes along a season. Millet and coworkers indicated that performance in the running sector might be more important than the VO2max in the detection of talented competitors, and suggested this performance be monitored over time (5). Thus, we conclude that monitoring and comparing this performance with professional could be be helpful in the detection of talented triathletes.

REFERENCES

COORDINATIVE AND TACTICAL PARAMETERS IN THE HANDBALL THROW AND THEIR INFLUENCE TO THE LEVEL OF PERFORMANCE

Wagner, H., Kainrath, S., Müller, E.
University of Salzburg, Austria

For testing the performance level of handball players physical fitness tests to measure physical characteristics, strength, jump height, throwing velocity, power-load, sprint running time or running endurance (cf. Gorostiaga et al., 2005) or 3D-kinematics of throwing movements to measure throwing velocity and precision, angles, angular velocities and joint velocities (cf. Wagner et al., 2006) were used generally. But the performance level of handball players and their teams are also strongly influenced by technical and tactical parameters. Therefore the aim of this study was to analyse these parameters and their influence to quality parameters and performance level.

Fifteen games of the last World championships (performance level 10 and 9), the qualification for the European championship (level 8 and 7) and the qualification tournament for the second Austrian handball league (level 3 and 2) were analysed for this study. Every throw of both teams during the game were assigned and separated in different categories like quality parameters (goal, blocked throw, saved or missed), throwing technique (jump, cross over step, standing or dive throw), last passing direction (goal keeper, rebound, from left or right side, cross, pivot pass or intercepted), fast break, throwing position (wing, backcourt, pivot, left, right side or middle), throwing execution (with high ball velocity, lifting or turning throw), throwing arm (over or under shoulder) and trunk position (bend left, right or no bend). To calculate the correlation between performance level, quality parameters and all assigned technical and tactical parameters pearson’s product-moment correlation were used. To identify performance determining parameters linear regression analysis were calculated as well.

Significant correlation were found between performance level and backcourt right, middle position (+ corr), rebound, left wing position, fast break (- corr), between goal and pivot pass, backcourt left position (+), cross over step throw with throwing arm under shoulder (+), between blocked throw and cross over step throw, backcourt middle position (+), fast break, left wing, pivot middle position (-), between throws saved from goalkeeper and pivot pass, backcourt left position (-) and between goal missed and backcourt left, pivot right position (+), cross over step throw with throwing arm over shoulder and backcourt middle position (-). The linear regression analysis with the criterion variable performance level calculated a model with the predictors fast break and backcourt right position.

Interpreting the results of this study it could be summarized that the jump throw is the most applied throwing technique (>70%) in handball and that throwing more often from the right backcourt position and preventing the fast break of the rival team should increase the performance level.

References

17:15 - 18:45

Invited symposia (IS)

IS-PM11 State of the art of molecular techniques and use in sports: sequencing, gene expression and proteomics

TRAINING AND GENE EXPRESSION IN CELL CULTURE AND HUMAN MODELS

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Skeletal muscles have a great capacity for adaptation to training requirements and stress. Exercises with high metabolic, catabolic effects in high-intensity training lead to predominance of a slow muscle type, since slow muscle fibers are more resistant to stress than rapid fibers. Muscular adaptation proceeds via various mechanisms. Changes in protein isoforms, new fiber formations or splitting, hypertrophy of fibers and fiber degeneration. At the protein level, the isoforms of the myosin heavy chain (MHC) largely determine the contractile properties of a fiber and characterize the muscle. The new formation of muscle fibers proceeds from the pool of satellite cells, which differentiate under the influence of myogenic differentiation factors Pax7, MyoD and Myf5. The isoform MHC I alpha which has newly been discovered in skeletal muscle normally finds cardiac expression and could indicate satellite cell activation. Muscle hypertrophy and fiber regeneration are controlled essentially by the hormones insulin, thyroxin and insulin-like growth factor.

Mechanisms are induced via the external cytoskeleton and via special channel proteins as signal pathways for genetic transcription. The muscle produces secretes its own mechanically-induced growth factor, the mechano growth factor and dependant on intensity also cytokines like interleukin-6 or stress proteins. Elimination of unneeded proteins and fibers is necessary for fiber adaptation, and controlled cell death (apoptosis) probably plays an important role here.

There is a limit of current training models in athletes in respect of the detection of underlying biochemical and molecular mechanisms because of limitations in samples and in respect of the possible interventions by training (intensity, duration). Athletes are primarily interested in sports success and in new training ideas, however, control groups are often difficult to organize. Pharmacological or transgenic interventions are clearly limited by biological and ethical limits. Therefore cell culture models are a interesting option.

Electrical stimulation (ES) is frequently used to investigate muscle response to cellular stress, and ES can bring about a series of functional and structural responses in the skeletal muscle, which varies with characteristics of ES. We use ES in C2/C12 mouse myoblasts as a model to study mechanisms underlying skeletal muscle adaptation to cellular stress.

Electric stimulation to C2/C12 cells led to distinct Hsp70 response at both mRNA and protein level, which associated with characteristics of ES. Not only the duration of ES, but also the frequency of ES could significantly affect the Hsp70 response. There was a discrepancy in Hsp70 response in the ES-stimulated cells between mRNA and protein level, suggesting possible different regulation at transcriptional and translational level in the Hsp70 response. The control of apoptosis and cell cycle is balanced.
Muscle plasticity was presented and discussed. By comparing a number of proteomic studies, performed by our group, in animal models and in humans, a list containing proteins, both analysis of the changes observed in various conditions such as training, detraining, bed rest, hypoxia, microgravity, and in pathological alteration or decrement, the muscle plasticity was evaluated by a proteomic approach. This approach implies the qualitative and quantitative analysis of a large number of proteins at the same time. Skeletal muscle wasting also occurs in human muscles as a result of denervation, aging, starvation, and a number of disease states. The atrophy observed under these different conditions imply the activation of different types of molecular triggers and signalling pathways producing muscle wasting. As a result, these activated signals can influence the protein turnover by differentially modulating the protein synthesis and degradation. To define this phenomenon at the molecular level and particularly the proteins involved in muscle mass increment or decrement, the muscle plasticity was evaluated by a proteomic approach. This approach implies the qualitative and quantitative analysis of a large number of proteins at the same time. By comparing a number of proteomic studies, performed by our group, in animal models and in humans, a list containing proteins, both contractile and metabolic, involved in muscle plasticity related to physiological, parapathophysiological, pathological conditions was built. The analysis of the changes observed in various conditions such as training, detraining, bed rest, hypoxia, microgravity and in pathological conditions in specific contractile (myosins, heavy chains, myosin light chains, troponysins, troponins, actins), regulatory, transport and metabolic proteins will be presented and discussed.

APPLICATION OF PCR AND LC-MS METHODS AND GENOMIC DATABASES IN SPORTS SCIENCES

Dékány, M., Györe, I., Gógl, Á., Berkes, I., Pucsok, J.

The series of the human gene map for performance and health-related fitness phenotypes began in 2000 with the goal of making available all the advances on the genetic basis of a large family of exercise-related traits in an easily accessible format. The genes with evidence of association or linkage with a performance or fitness phenotype in sedentary or active people, in adaptation to acute exercise, or for training-induced changes are positioned on the genetic map of all autosomes and the X chromosome. By 2004 the human gene map for physical performance and health-related phenotypes includes 140 autosomal gene entries and quantitative trait loci, plus four on the X chromosome. Moreover, there are 16 mitochondrial genes in which sequence variants have been shown to influence relevant fitness and performance phenotypes. In 2000 this map contained only 29 autosomal markers. Thus, the map is growing in complexity and progress is being made.

The genetic basis for variation in human athletic performance is a new direction in exercise physiology. Due to its consequences the importance of genetic databases has increased. The first part of this presentation has been shown the foundation of hungarian sport-genomic database and its importance.

The second part of this paper has been presented the mass spectrometry based proteomics, which has established itself as an indispensable technology to interpret the information encoded in genomes. Protein analysis by mass spectrometry has been most successful when applied to small sets of proteins isolated in specific functional contexts. The systematic analysis of the much larger number of proteins expressed in a cell, an explicit goal of proteomics, is now also rapidly advancing, due mainly to the development of new experimental approaches.

The coupling of electrospray ionization with Fourier Transform Mass Spectrometry has created a new capability for analysis of proteins and other large biomolecules. Mass spectrometry nowadays has a central role for studying the primary structure of proteins, protein expression levels, and protein-protein interactions.

Invited symposia (IS)

IS-PM12 Muscle lipids and insulin resistance

MUSCLE TRIACYLGLYCEROL AND INSULIN RESISTANCE

Hesselinke, M.

A sedentary life style and consuming energy dense diets contributes to the development of insulin resistance (IR), a hallmark in the pathogenesis of type 2 diabetes. IR and storage of excess of calories as triacylglycerol (TG) in non-adipose tissue (ectopic TG storage) relates positively to peripheral insulin resistance in untrained, but not in fat oxidation prone trained subjects. This suggests that not TG per se impede insulin signaling, but rather intermediates in synthesis and degradation of TGs. Although this notion is already around for years, information on the origin and type of insulin desensitizing lipid moieties is still fragmentary. Neither is it known how lipid moieties are modulated upon insulin (de)sensitizing interventions.

Storage of TG as lipid droplets in humans is most abundant in type 1 muscle fibers. Upon increased fatty acid availability, lipid droplets increase in size and number. Thus, acute infusion of an emulsion with long chain fatty acids massively increases TG storage, this in contrast to lipid emulsions containing also 50% of the more readily oxidizable medium chain fatty acids. In both conditions, however,
similar effects on IR were observed. In addition, we observed that acute infusion of lipid in humans induced IR along with downregulation of genes encoding for mitochondrial biogenesis (PGC1α and PPAR). We also showed these genes to be downregulated in muscle biopsies from type 2 diabetic patients. Jointly, these findings suggest that an increase in muscular TG content in diabetogenic models requires mitochondrial defects to impede insulin signaling. Interestingly, administration of Rosiglitazone for 8 weeks to type 2 diabetic patients improved skeletal muscle glucose uptake along with restoration of PGC1α and PPAR, to control values. Improved insulin sensitivity occurred in the absence of changes in whole muscle TG content but with declined muscular protein content of ADP and OXPAT, lipid droplet coating proteins with a putative role in lipid droplet dynamics. Thus, under conditions of a low fat oxidative capacity, decreased mitochondrial biogenesis and increased lipid load, the muscle is prone to insulin resistance. Improvements in insulin sensitivity, however, can occur without changes in muscular TG content. This has led us to pursue studies towards the dynamics in lipogenesis and lipolysis of ectopically stored TG.

Enhancing TG storage capacity by overexpressing of the TG synthesizing enzyme DGAT1 may provide a 'sink' for fatty acids, either dietary or derived from non-muscle lipolysis, leaving the level of insulin signaling desensitizing lipid moieties low. In contrast, inhibiting muscle lipolysis by knocking down its major TG lipase ATGL impedes insulin signaling. This indicates an indirect and complex interaction between TG storage and IR, with multiple proteins involved in the dynamics of ectopic lipid storage, some of which will be discussed during the conference.

CERAMIDES AND INSULIN RESISTANCE

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The appearance of insulin resistance is considered one of the early signs of metabolic dysfunction, which left untreated, will lead to major metabolic derangement and overt diabetes and/or the metabolic syndrome. It is generally thought that excess intramyocellular lipid storage mediates an attenuating effect on insulin sensitivity through an increased fatty acid precursor supply which leads to accumulation in skeletal muscle of one or more of the lipid intermediates diacylglycerol, long chain fatty acyl-CoA and ceramide. In muscle ceramides are generated primarily through de novo synthesis from palmitate and serine or through breakdown of sphingomyelin in the membranes. In rat muscle and in cell lines there is evidence that increased content of ceramide attenuates insulin signalling through serine/threonine phosphorylation of Akt/protein kinase B, which subsequently leads to impaired translocation of GLUT4 to the plasma membrane and attenuated activation of glycogen synthase.

In human muscle a higher ceramide content have been found in obese insulin resistant compared to lean insulin sensitive subjects and 8 weeks of endurance training was found to reduce muscle ceramide content and improve glucose tolerance in obese young insulin resistant subjects. However, other studies have demonstrated similar muscle ceramide concentration in lean and overweight male subjects and similar muscle ceramide content in trained compared to untrained normal young and middle aged men. Furthermore, in middle aged men muscle ceramide content was similar across a very wide range of insulin sensitivities. Obviously it is at present not possible to point to a very clear cut role of muscle ceramide for insulin resistance in man.

To further unravel the influence of muscle ceramide in man interventions that modify plasma fatty acid availability such as lipid infusion, acute prolonged exercise induced a 25% increase in muscle ceramide content concurrent with a decreased insulin sensitivity after the lipid infusion. In rats lipid infusion of saturated fatty acids induced insulin resistance through muscle ceramide accumulation, whereas infusion of unsaturated fatty acids induced insulin resistance through increased muscle diacylglycerol content. More consistent evidence is available for insulin infusion as there was no influence on ceramide content in human skeletal muscle. In contrast acute prolonged exercise induced a 25% increase in muscle ceramide content in both trained and untrained male subjects.

Although not unequivocal the data in rats implies that the type of fatty acid availability may play a role for accumulation of muscle ceramide and a subsequent increased insulin resistance.

MITOCHONDRIAL RESPIRATION AND INSULIN RESISTANCE

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It is well known that a part of the pathophysiology behind insulin resistance in skeletal muscles, revolves an imbalance between lipid availability and lipid removal. The mitochondrion is the site of lipid oxidation and therefore an essential part of the lipid removal. During the last decade numerous studies have investigated the mitochondrion and its relation to insulin resistance, and for a good reason, studies have shown a correlation between insulin resistance lipid oxidation, diseases such as Friedreich's ataxia and mitochondrial diabetes, which are characterized by mutations in the mitochondrial genome or mutations in genes coding for mitochondrial proteins in the nucleus, have symptoms which are very similar to type 2 diabetes patients, and finally, studies investigating patients with insulin resistance have revealed a decreased gene expression of several mitochondrial proteins involved in the electron transport chain and an increased phosphorylation (inactivation) of the ATP-synthase-subunit. These results have led to the hypothesis that insulin resistance is caused by a mitochondrial dysfunction. The proposed mechanism is that a low mitochondrial capacity leads to a decreased lipid oxidation, which increases the concentration of intramuscular lipid metabolites such as ceramides, diacylglycerides and long chain acyl-CoA's, that are known to inhibit the insulin signalling.

A decreased mitochondrial function may be caused by numerous factors such as increased oxidative stress, physical inactivity, lipid oversupply, insulin resistance and inheritance. These factors are highly related. However, it has been suggested that increased intramuscular lipid concentration, have the potential to induce mitochondrial dysfunction.

Few studies have investigated the mitochondrion and its relation to insulin resistance and even fewer studies have distinguished between mitochondrial quality and mitochondrial quantity. At present time the results from these studies are ambiguous, but indicating that there may be a decreased mitochondrial function in subjects with insulin resistance.
Psychosomatic principles have suggested for a long time that what we think and feel will have an impact on our physical functioning. When the body’s activity affects how we think and feel this should be classed as ‘somatopsychic’ (Harris, 1973). In exercise psychology we explore somatopsychic processes, to seek answers to why physical activity might help people feel better. Here we examine the role of exercise as a somatopsychic process during treatment and recovery from breast cancer. Using a randomised controlled trial design we aimed to determine the functional and psychological benefits of a 12 week supervised group exercise programme during treatment for early stage breast cancer with a 6 month follow-up. The participants were 203 women and 177 completed the 6 month follow up. We excluded those with concurrent unstable cardiac, hypertensive or respiratory disease; cognitive dysfunction; and those who were regular exercisers. The control group received usual care. The intervention was a supervised group exercise programme twice weekly for 12 weeks in addition to usual care. The main outcome measures were: Functional Assessment of Cancer Therapy questionnaire, Beck Depression Inventory, Positive and Negative Affect Scale, body mass index, 7 day recall of physical activity, 12 minute walk test and assessment of shoulder mobility. The results showed both functional and psychological benefits: a 60% increase in minutes of moderate intensity activity reported in a week (+67 [52 to 84]), minutes of moderate intensity activity reported in a week (+182 [75 to 289]), shoulder mobility (+2.6 [1.6 to 3.7]), breast cancer-specific quality of life (+2.5 [1.0 to 3.9]), positive mood (+4.0 [1.8 to 6.3]). In general, these effects were maintained at the 6 month follow-up (Mutrie et al., 2007). Qualitative data provided evidence that the participants viewed the exercise as something that helped them feel better at a time of health challenge (Emslie et al., 2007) and for some even provided post-traumatic growth. The findings suggest that there is indeed a somatopsychic effect from exercise and that clinicians should promote exercise to help patients feel better. These somatopsychic effects may be available to many clinical populations and to the general population.

References


**THE PHYSICAL SELF AND ITS IMPACT ON MENTAL HEALTH**

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Physical activity participation is clearly associated with reduced risk of some mental illness and disorders, most notably depression, cognitive impairment and dementia, and has also shown effectiveness as a treatment for depression. Furthermore, physical activity improves a range of aspects of the physical self, such as improved perceptions of competence and autonomy, and reductions in negative states and disorders such as depression and anxiety. Contemporary theories of motivation, however, place emphasis on the reasons for engaging an activity as important predictors of the quality of that engagement and whether or not participation results in mental health benefits. In particular, Basic Needs Theory, a mini-theory within the larger Self Determination framework (Deci & Ryan, 2000) suggests that positive changes of feelings of self determination (and the underpinning satisfaction of basic needs for competence, autonomy, and connection with others) may be mechanisms explaining the physical activity and mental health relationship. Studies will be highlighted which support the application of this theoretical perspective to the exercise domain (see Edmunds, Nitoumanis, Duda, J.

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The benefits of regular physical activity for mental health and emotional well-being are well documented in the literature. Pulling from this body of work, it is often assumed that participation in physical activity will translate into positive psychological and emotional outcomes and reductions in negative states and disorders such as depression and anxiety. Contemporary theories of motivation, however, place emphasis on the reasons for engaging an activity as important predictors of the quality of that engagement and whether or not participation results in mental health benefits. In particular, Basic Needs Theory, a mini-theory within the larger Self Determination framework (Deci & Ryan, 2000) suggests that positive changes of feelings of self determination (and the underpinning satisfaction of basic needs for competence, autonomy, and connection with others) may be mechanisms explaining the physical activity and mental health relationship. Studies will be highlighted which support the application of this theoretical perspective to the exercise domain (See Edmunds, Nitoumanis, Duda, J.)
Determination of Muscle Characteristics in Isometric Plantar Flexions

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Introduction: Maximal muscle force and muscle power can be determined using maximal voluntary contraction tests, both in time discrete and time dependent conditions. One of the key factors of these abilities is the distribution of muscle fibre types within the relevant muscles. Up to now the fibre compositions of a muscle have only been determined using complex, invasive and ethically questionable procedures, such as muscle biopsies. The deduction of fibre type composition from non-invasive methods has not been discussed sufficiently in the literature. Therefore, the purpose of this study was to develop a non-invasive method for the identification of the mechanical muscle properties of the plantar flexors.

Methods: 50 male subjects (25.4±2.3 yrs, 181±5 cm, 77.8±7.0 kg) performed maximal voluntary contractions of the plantar flexors on a specifically designed measuring device. The ground reaction forces acting on the foot were measured using a self-made 1D force plate. The seat position and the angle of the ankle were adjusted individually based on the anthropometric conditions of the subjects. The forces during isometric contractions over time were measured at 13 different ankle angle values (75°-135°, 5° increment). Results and discussion: Fmax and Fex decrease systematically and significantly with an increase of the ankle angle (and consequently the reduction of the muscle-tendon complex length) in isometric plantar flexions (Fmax 1453±265 N at 75° to 465±253 N at 135°, Fex 6830±1780 N/s at 75° to 1740±1450 N/s at 135°). This is due to the decreased overlapping of the actin-myosin-filaments in shortening the muscle-tendon complex. The results are highly specific according to individual muscle-mechanical properties of the subjects.

Conclusion: The measuring device and in combination with the protocol provides an adequate method to determine the muscle mechanical characteristics of the plantar flexors. Based on the individual anthropometric data and specification of the initial conditions (ankle angles), the test routine provides information regarding the following aspects: (1) subject specific plantar flexor characteristics (Fmax, Fex) as a function of muscle-tendon length and (2) inter-subjective comparison of plantar flexor characteristics. This is important information that can be used to control and optimize training regimes.

References:

Influence of Body Weight on Joint Loading in Stair Climbing

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In Germany 15% of the children between 3-17 years are overweight and 6.3% are recorded as obese (Kurth & Schaffenrath Rosario, 2007). Excessive weight leads to numerous health problems not only for the metabolic system but also for the locomotor system (Wabitsch et al., 2005). Obesity is a known risk factor for osteoarthritis but the specific mechanisms are still not well understood. Research on joint loading of overweight children has been performed in level walking and standing, but little research has been done in other daily living activities (e.g. Morrison et al. 2007, Nantel et al, 2006). Therefore, the purpose of this study was to examine whether or not obese children exhibit altered patterns of joint loading in the lower extremities during stair climbing, compared with children of normal weight. 5 normal weight children (11.4 ± 0.9 yrs, 41.6 ± 7.2 kg) and 4 obese children (12.1 ±0.8 yrs, 71.6 ± 14.7 kg) participated at this study. A staircase with 6 steps (117 cm x 28 cm per step) was built. To record the dynamic data of 2 consecutive steps, 2 force plates (AMTI, 1200 Hz) were embedded in the 3rd and 4th step. The kinematic data was collected by 10 infrared cameras (Vicon, 300 Hz). The children performed 3 valid trials walking upstairs and downstairs at 3 different speed levels: 90, 110,130 steps/min. The most representative out of 3 valid trials was taken for further analysis. Dynamic data was normalized to bodyweight and both kinematic and dynamic data was time-normalized to the stance phase. Inverse dynamics was calculated and peak values of the ankle, knee and hip joint moments were identified. Independent t-tests were used to examine differences between the two groups within each speed-condition. In all speed conditions obese children show more pronounced hip flexor moments, especially in the downstairs condition. Analogous to level walking (Nantel et al., 2006) the change between extensor and flexor moment occurs earlier in the gait cycle in obese children than in their normal-weight counterparts. Obese children reveal a significantly higher maximal varus-moment in the knee when walking downstairs. The obese children pronounce a tendency to higher plantarflexor moments and higher pronation moments in walking upstairs. In obese children a clear trend to higher lower extremity joint loading in stair climbing can be observed. In combination with misalignments of the joints this might cause local overloading within the joints. Furthermore, this might be related to a greater occurrence of lower extremity joint problems and osteoarthritis. Latter has to be proven in long-term studies.

References:
Introduction
Electromyostimulation (EMS) training is based on electrical induced rhythmic muscle contraction. In human, it has been shown that a fibre type transition phenomenon from type I to type II fibres results from this kind of training in the vastus lateralis muscle (1). In animal, a fiber type transition has been associated with changes in muscle stiffness (2). Thus, the aim of the present study was to analyze whether EMS training leads to changes in musculotendinous (MT) stiffness of the human triceps surae (TS) as observed after changes in functional demand (3).

Methods
Experiments were done on 11 college students. The subjects had to perform a training protocol (4 weeks, 4-5 sessions of 1 hour per week) based on a 75Hz frequency electromyostimulation program. Laboratory tests were performed using an ankle ergometer (4). Subjects had to develop a maximal effort in plantar flexion (MVC). Three trials were carried out and the best was considered as true MVC of the day. Then, MT stiffness was established by means of a quick-release technique, when the subject maintained a voluntary isometric torque (40%, 60% and 80% MVC). The ratio between variation in dynamic torque and displacement was related to the isometric torque initially exerted by the subject. The slope of the linear relationship so obtained was defined as stiffness index (SIMT). Then, sinusoidal perturbations (3° peak-to-peak, 4-16 Hz) were imposed at different voluntary isometric torque levels (0%, 20%, 40% and 60% MVC). For each level of torque, a second order model was adjusted to a Bode diagram to calculate inertia, viscosity and elasticity of the musculoarticular (MA) system. These parameters allowed the calculation of $V'_{max}$ defined as the maximal shortening velocity at a torque value corresponding to zero by using an adaptation of Hill's equation to sinusoidal perturbations (5).

Results
Mean MVC changed significantly from $113.6\pm10.5$ to $135.2\pm12.6$ Nm, which correspond to a significant increase of 19.8%. SIMT decreased significantly from $2.1\pm0.16$ to $1.7\pm0.17$ rad$^{-1}$ (-17.8%). Finally, mean $V'_{max}$ was significantly increased by 21.3% (from $7.7\pm0.71$ to $9.1\pm0.71$ rad s$^{-1}$).

Discussion/Conclusion
The present results are the first ones showing the SIMT evolution due to EMS training. It is well known that SIMT is composed of an active fraction (muscle fibres) and a passive fraction (tendon). There is no reason to believe that tendon decreases its stiffness as a result of training. Then, the decrease in SIMT can be interpreted in terms of fibre type transition phenomenon as it is known that an increase in type II fibers lead to a decrease in muscle stiffness (2). This is also comforted by the increase in $V'_{max}$, since this parameter depends mainly on the fiber type distribution.

References

IN VITRO ASYMMETRIC STRAIN DISTRIBUTION IN THE HUMAN ACHILLES TENDON AT DIFFERENT LOADING LEVELS - INTERACTION BETWEEN M. TRICEPS SURAE FORCES AND CALCANEAL ALIGNMENT

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Nonhomogenous strain between different fibers of a tendon represents a possible underlying mechanism for tendon injury. The following factors may cause asymmetrical loading of the Achilles tendon (AT): a) the joining of three different muscles with different force potentials and activation patterns into the musculotendinous junction, Mm. gastrocnemius medialis (GMI) and lateralis (GIL) and m. soleus (SOL) b) Distal AT fiber insertions at the calcaneus (CAL) have been described as separate for different portions of the M. triceps surae (TS) (1,2). However, the interaction between TS forces and CAL alignment regarding a possible asymmetric strain distribution in different parts of the tendon is only studied with forces up to 400N (2). Therefore the purpose of the this study was to determine the strain distribution within the human AT while changing TS force application at different levels and changing the positioning of the CAL.

Three human cadavric ATs were mounted in a specially designed loading simulator. Length changes on the ventral and dorsal side of the tendon were controlled with high-resolution video cameras. Different loads (400-1200N in total) were applied to the three parts of the TS while calcaneus position was changed systematically (neutral position, eversion (EV), inversion (INV) each 7.5°/15°). Moments around the CAL were calculated from reaction forces gained by force dynamometers implemented in the testing device.

Different TS loading simulations induced different tendon strain distribution patterns, whereas GL and GM seemed to be more sensitive to induce asymmetric strain than the SOL. Strain in the proximal part (up to 2%) was lower than it was in the distal part (up to 4%) of the tendon. All different muscle loading conditions induced different CAL INV moments with the neutral positioning of the CAL. These findings could be explained by the morphology (twist) of the CAL. EV of the CAL provoked higher strain on the medial side (ventral and dorsal) in the proximal as well as in the distal part of the tendon. Strain increased from 4-6% with increment of the EV angle from 7.5° to 15°. The laterally reversed pattern could be found for the CAL INV angles with strain values up to 5.5%. A CAL INV moment could be found for the neutral CAL position as well as for the EV conditions. A comparably lower EV moment was only found for the INV conditions. Again these findings could be explained by the morphological configuration of AT fiber distribution/twist. This study showed that asymmetric strain within the AT can be caused by TS muscle force variations as well as by different CAL angles in the frontal plane. The latter can induce a greater effect on strain magnitude. Except for the INV conditions greater strain in the medial part of the tendon could be found. The findings of these study could lead to a better understanding of AT pathologies.

References
Changes in architecture of aponeurosis of tibialis anterior upon contraction measured by 3D-ultrasonography

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Introduction.
Architectural feature of the aponeurosis is important for the modeling of the muscle-tendon unit, especially for pennate muscles. The width of the central aponeurosis of the tibialis anterior increases as the contraction level is increased (Maganaris et al 2001, Muramatsu et al 2001). Not much is known, however, about the changes in shape and position of the aponeurosis during contraction. The aim of the present study is to clarify the position and surface area changes of the aponeurosis of human tibialis anterior muscle upon contraction by using 3D-ultrasonography.

Methods.
A healthy male participated as a subject in the experiment. The ankle joint was fixed at 30 deg plantar flexion with the knee joint positioned at 0 deg (full extension). In the present study, we employed 3D-ultrasonogram (USE-1200, Nihon-Kohden, Japan) with an electromagnetic position sensor attached to the ultrasonic transducer. During the scanning, the probe was moved by the tester along the longitudinal axis of the muscle belly from the distal end of the tibia toward the proximal end. Transverse serial images of the tibialis anterior muscle were retrieved as composite video signals from the ultrasonic machine and three-dimensional ultrasound images were reconstructed using a software (Tomtec3D, Tomtec, Germany). During the ultrasonic data acquisition, the subjects were asked to relax then maintain isometric dorsiflexion at three force levels (20, 40, and 60% of the maximal voluntary force level [MVC]).

Using the software, the serial cross-sectional images (10mm interval) of the tibialis anterior muscle were detected. The x,y coordinates of the surface of the central aponeurosis in each image were measured. The distances between the central aponeurosis and superficial and deep muscle fascia were measured.

Results and Discussion.
The surface area of the aponeurosis increased from 287 mm² at rest to 390 mm² at 60% MVC. The distance between the aponeurosis and deep muscle fascia did not change. The results indicate that the central aponeurosis has transverse elasticity, and that we need to reconsider the model of contraction of pennate muscles with a constant muscle thickness.

Conclusions.

References.

Muscle and Tendon Properties during Isometric Ramp Contractions of the Ankle Plantar Flexors in Children

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AIMS: Architectural arrangement of muscle fibers is a very important factor for muscle force production (1). Most studies examined isometric force and muscle architecture properties (2) in adults. In contrast, there is a lack of data in children. Recent studies have shown that children present different values at muscle pennation angle as well as fascicle length (3) compared with adults. The aim of this study was to examine the relationship between fascicle length and tendon aponeurosis displacement and isometric force production in children.

METHODS: Twenty boys (age= 11.2 ± 0.26 years, mass= 48.78 ± 9.15 kg, height= 156.7 ± 7.28 cm) participated in this study. All tests were performed on a Kin Com (Kin-Com, Chattanooga Group Inc, USA) dynamometer. In vivo muscle architecture was assessed using B-mode ultrasonography (SSD-3500, 7.5MHz, Aloka, Japan). Isometric torque of the plantar flexors was assessed at angles of -15° (dorsal flexion), 0° (neutral position), 15° and 30° (plantar flexion). The subjects performed three efforts at 100%, 40%, 60% and 80% of MVC. The total duration of each effort was 5 seconds. Subsequently muscle thickness, fascicle length and aponeurosis strain were evaluated.

RESULTS: The changes of muscle thickness were very small with increasing level of muscle effort. Particularly the muscle thickness of MG ranged from 2.5cm to 2.4 cm at 30°, from 2.18 cm to 2.14cm at 15°, from 2.26cm to 2.13cm at 0° and from 2.3cm to 2.15cm at -15° ankle angle. Higher fascicle length values were found at an angle of -15° while the smaller one was observed at 30°. Fascicle length ranged from 4.5cm to 3.5 cm, from 4.1 cm to 3.2cm, from 3.7cm to 3 cm and from 4.6 cm to 3.7cm for 30°, 15°, 0° and -15° ankle angles, respectively. Aponeurosis elongation increased as the angle decreased. The maximum value (9.22%) was obtained at -15° and the minimum (1.98%) at 30°.

CONCLUSIONS: To our knowledge, this is the first study which examined the relationship between isometric force production and muscle tendon interaction in children. The results of this study are consistent with previous studies on the plantar flexor architectural properties. Even though children demonstrated lower fascicle length, thickness and tendon elongation values than adults, the relationship between level of force and each architectural parameter was similar as previous published results in adults.

References.
Within the present study, should provide more scientific evidence of psychosocial processes in obese adolescents seeking weight loss.

Methods
Subjects were 49 obese adolescents (BMI M=30.7 SD=4.5 kg/m², age M=13.6 SD=1.5 y, 25 girls) being followed in a tertiary health unit, who are participating in a long-term program that comprises medical, nutritional, physical activity and psychological interventions. The program comprises up to 3 sessions of exercise per week in addition to lifestyle physical activity recommendations. Self-esteem (Rosenberg, 1969), Emotions (PANAS, Watson et al., 1988), Weight Efficacy Lifestyle Questionnaire (WELO, Clark et al., 1991), Exercise motivation (IBREG-2, Markland & Tobin, 2004), Body Size Dissatisfaction (BIA, Williamson et al., 1989), weight and height were measured at baseline and 2 months later during the program. Paired t-tests were used for the analysis of differences between baseline and 2 months’ values. Pearson correlations measured the association between psychosocial changes with weight and BMI changes, while independent t-test evaluated change differences between gender.

Results
Although no differences were found in weight or BMI, improvements were observed in positive emotions (p<.035), intrinsic motivation (p<.026), and in the WELO’s sub-scales: negative emotions (p<.043), availability (p<.026) and social pressure (p<.013). There were also marginally significant improvements in identified motivation (p<.094) and total self-efficacy (p<.070). These improvements were similar between gender and were not associated with weight and BMI changes.

Conclusion
Despite the short-term time frame of the analysis, the positive changes observed in psychosocial variables suggested the same conclusions registered in studies with longer periods (Blaine et al., 2007). The improvements in the more self-determinate type of motivation, which should influence exercise and program adherence (Teixeira et al, 2006), represent a particularly strong sign that the program might be successful among the adolescents that increased their exercise’s intrinsic motivation. Further data with longer time periods, within the present study, should provide more scientific evidence of psychosocial processes in obese adolescents seeking weight loss.

METABOLIC SYNDROME AND PHYSICAL ACTIVITY IN ADOLESCENTS

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Purpose: Metabolic syndrome (MS) is defined by the clustering of central obesity, impaired glucose metabolism, dyslipidemia and hypertension and indicates increased risk of cardiovascular disease and diabetes. In adults, higher levels of moderate to vigorous intensity physical activity have been associated with a reduced risk of having MS, but there is little information regarding adolescents. This study aimed to evaluate the association between the level of physical activity and prevalence of MS in adolescents.

Methods: The study population consisted of 2565 males and 2638 females aged 16 years, members of population based Northern Finland Birth Cohort 1986 (NBBC 1986), who responded to a mailed questionnaire and were clinically examined in 2001-2002. Metabolic syndrome was defined using the International Diabetes Federation paediatric definition (Zimmet et al. 2007). Physical activity was assessed by self-report taking into account both intensity level and time duration, and was summarised as metabolic equivalent hours (MET hours). Prevalence of MS and 95% confidence intervals (CI) were estimated in the quintiles of physical activity described by MET hours.

Results: The overall prevalence of MS was 2.4%, and was higher in males (3.5%) than in females (1.1%). In males, the prevalence of MS was inversely associated with the level of physical activity, and was 2.0% (CI 1.0 to 3.7) in the physically most active quintile and 4.7% (CI 3.1 to 7.4) in the least active quintile. In females, the prevalence of MS showed no significant variation by physical activity.

Conclusion: In males aged 16 years, the level of physical activity was inversely associated with the prevalence of MS while no such association was seen in females.

Reference.

THE ASSOCIATION BETWEEN SKELETAL MATURITY, SOCIO-ECONOMIC STATUS AND BODY MASS INDEX IN MADEIRAN CHILDREN AND ADOLESCENTS

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The association between skeletal maturity, socio-economic status and body mass index was investigated in a mixed longitudinal sample of Portuguese children and adolescents (251 girls and 256 boys), 7 through 18 years of age. Skeletal age was estimated from a radiograph of the left hand and wrist using the Tanner-Whitehouse method II. Socio-economic status was based on Census 91 developed by the Portuguese Institute of Statistics. Stature and body weight were measured and body mass index was used as an adiposity indicator. Early maturing boys and girls showed higher body mass index values than their average and late maturing peers. The significant differences among maturity groups were not present in boys 14 to 15 years of age. Youngsters from families with a high socio-economic status...
showed a higher body mass index than those from families with an average or low socio-economic status. However, no significant differences were found between socio-economic categories for boys 10-11 years and for girls 12-14 and 15-18 years. Body mass index is associated with skeletal maturity and socio-economic status in children and adolescents from Autonomous Region of Madeira, Portugal.

ENVIRONMENTAL CORRELATES, PHYSICAL ACTIVITY AND BODY MASS INDEX OF CHILDREN

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Introduction.
Research findings suggest that sedentary behaviour of children is influenced by a number of social and built environment factors. Also, strong evidence indicates that physical inactivity and obesity are major risk factors for Coronary Heart Disease (CHD). Therefore, exploring environmental factors and assessing young people’s physical activity (PAI) and body fatness has become a key component of understanding disease prevention and intervention strategies. The aims of this study were: (1) to examine physical activity patterns of British children and to determine the variation across weekdays and weekends according to body mass index (BMI) and gender; (2) to explore the environmental causes of sedentary behaviours amongst this age group.

Methods.
Three hundred and thirty five children (157 boys and 178 girls) aged 8-14 years from Central England volunteered to participate following informed consent from children and parents along with institutional ethical approval. BMI was determined as kg/m2 and weight status was classified according to International Obesity Task Force (IOTF) cut-off points. The children wore a sealed pedometer for 4 consecutive days (2 weekend days and 2 weekdays) to determine their daily step counts. They were asked to complete a brief survey to verify the length of time they wore the pedometers. Questionnaires and semi-structured interviews were used to explore the impact of social and built environment on PA.

Results.
A 2 X 2 X 2 repeated measures analysis of variance (ANOVA) with 2 levels of steps per day, 2 levels of gender and 2 levels of weight status was used to assess children’s pedometer determined PA and to examine any variation due to BMI, gender or day. Results indicated that 28.8% of participants were classified as overweight/obese and 71.2% were classified as normal weight according to IOTF criteria. 34.4% of boys and 43.1% of girls met or exceeded the BMI referenced cut-offs for health respectively. A significantly higher number of steps/day was recorded during weekdays than weekends (F(1,333) = 47.8, p = 0.001) with normal weight children achieving significantly greater steps/day than their overweight/obese peers (F(1,333) = 13.36, p = 0.01). Additionally, neighbourhoods’ social and built environment appeared to have a major impact on opportunities for PA.

Discussion.
The results suggest that the majority of children are not achieving sufficient PA to gain health benefits. A significant number of them were overweight or obese and did less PA than their normal weight peers. Intervention strategies are needed to increase opportunities for PA. Active commuting to school and interventions through modifying the social and built environment of children are important to overcome the PA deficit and change children’s sedentary behaviour. The findings highlighted the need for multi-level interventions that encompass psycho-social and environmental factors.

INCREASE IN LEISURE-TIME PHYSICAL ACTIVITY OVER 9 YEARS DECREASES THE RISK OF METABOLIC SYNDROME IN YOUNG ADULTS

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Background and Aim: Regular physical activity may prevent or delay the onset of the metabolic syndrome in adulthood. It is unclear, however, what are the longitudinal effects of physical activity on metabolic syndrome risk in young adults. This study aims to examine the association between physical activity and the metabolic syndrome over a period of 9 years in a population-based cohort of young adults.

Methods: Data were obtained from the Cardiovascular Risk in Young Finns Study in which 2214 young subjects participated in the study in 1992 and 2001. The participants were 15-, 18-, 21-, 24-, 27- and 30-year-olds in 1992, and 24-, 27-, 30-, 33-, 36- and 39-year-olds in 2001. Leisure-time physical activity (LTPA) was assessed using a self-report questionnaire at two consecutive measurements and summed as physical activity indices (PAI). Change in LTPA was first calculated as a continuous variable by subtracting follow-up PAI from baseline PAI and then, as a categorical variable (LTPA tertiles) in order to study the effects of change in LTPA on the metabolic syndrome risk. Metabolic risk variables consisted of fasting insulin, waist circumference, serum triglycerides, inverted HDL cholesterol, systolic blood pressure, diastolic blood pressure, and plasma glucose. The original values of metabolic variables were transformed to z-scores for each individual, and then summed to create a continuously distributed the metabolic risk variable.

Results: Multivariate analysis of variance revealed that both men and women who increased their physical activity from the lowest tertile to the highest tertile at follow-up had a lower risk of metabolic syndrome. Similar results were found among both sexes in those who moved from the moderate tertile at baseline to the highest tertile at follow-up. Both men and women who maintained their high level of physical activity had lower metabolic risk than those who in low-low tertiles over time. Linear regression analysis showed that the increasing LTPA was significantly and inversely associated with the metabolic risk score for both sexes (p < 0.001), independently of baseline PAI values, age, smoking and education. A graded decrease was found in the metabolic risk across tertiles of change in LTPA for both sexes after adjusting for the confounders.

Conclusions: We conclude that both increased and persistent physical activities are significantly associated with a lower risk of metabolic syndrome in young men and women. This benefit is also influenced by the increasing physical activity during 9 years. The continuity of physical activity in adulthood is important in preventing clustering of metabolic syndrome risk factors.
FROM CHILDHOOD TO PUBERTY: LONGITUDINAL RELATIONSHIP BETWEEN BMI, PERCENTAGE BODY FAT, AND PHYSICAL FITNESS

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The main goal of this study was to search for the relationships between somatic characteristics and physical fitness along childhood and puberty. Two hundred seventy four children were longitudinally followed from 6 to 15 years of age (at 6, 7, 8, 9 and 15 years), and their somatic (BMI, %BF) and physical fitness (60 sec sit-ups, flexed arm hang, standing long jump, 50 meters dash, 10 meters shuffle run, and 20 meters pacer run) characteristics assessed within the Estoril Multifunctional Institute of Viana do Castelo (Viana do Castelo Growth Study). All results were standardized (z-scores) within each gender group and a composite score was used to assess physical fitness as an all.

Children with higher BMI and/or %BF had lower physical fitness levels at any given age (r= -27 to -52, p<0.01), but, interestingly, somatic status showed even stronger relationship with the next wave of physical fitness evaluation (r= -44, -43, -46, -39, and -51, -46, -50, -35, respectively for BMI and %BF for 6-7, 7-8, 8-9, and 9-15 years old). Furthermore, correlations were stronger between physical fitness at 15 years of age and somatic status (BMI/%BF) at 6, 7, 8, and 9 years old (r= -18 / -24, -31 / -31, -32 / -33, and -36 / -35), than for the autocorrelation of physical fitness at those same ages (r= -16, -19, 23, and 28).

These results lead us to conclude that children somatic characteristics (BMI and %BF) are strong predictors of physical fitness at latter puberty years.

Oral presentations (OP)

OP-NU03 Nutrition 3

THE GREEN-TEA CATECHIN EPICALLOCATechin GALLATE (EGCG/TEAVIGOTM) INCREASES RUNNING ACTIVITY AND RESULTS IN A SKELETAL MUSCLE FIBER TYPE SHIFT IN MICE

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Epigallocatechin gallate (EGCG/ TEAVIGOTM) is the most active component of the green tea. It is associated with reduced risk of cancer, diabetes and pronounced cardiovascular and metabolic health benefits. In a swim model, it was shown that green tea extract improves endurance capacity (Murase et al., 2004).

The purpose of the present study was to determine the effect of EGCG on running activity and skeletal muscle in mice. Sixty C57Bl/6J mice (5 wks old) initially received a high-fat diet (HF) for 3 months. Thereafter, mice were randomly assigned into 5 groups (n=10): Low fat diet (LF), HF, HF + 0.5% w/v EGCG (HF+EGCG), HF + exercise (HF+EX) and HF + 0.5% w/v EGCG+exercise (HF+EGCG+EX). The exercise groups had unlimited access to running wheels and the distance was recorded daily. At the end (2 months of treatment) maximal running performance on a treadmill was determined, body composition was measured and plasma was taken. Gastrocnemius muscle was excised, frozen in liquid nitrogen and stored for later histological analysis.

Mice receiving HF+EGCG ran significantly greater distances per day in the running wheels compared to mice fed only with HF. The maximal endurance test showed that the EX groups or groups treated with EGCG had significantly longer, whereas the HF+EGCG+EX group ran the longest distance. EGCG reduced the body fat mass in exercising and non-exercising animals. Plasma concentrations of leptin and cholesterol were decreased in the LF group. The histological analysis in the medial part of the gastrocnemius indicated an increased percentage of type I and type IIA fibers and less type IIB and IID/X fibers in mice supplemented with EGCG. The observed fiber type shift in both EGCG groups was more pronounced than the fiber type shift in the exercised high-fat group. Exercise alone resulted in an increased proportion of type IIA fibers.

Our results demonstrate that EGCG increases the desire to exercise, the willingness to run and the motivation to move in animals. It was also shown that EGCG increases the number of oxidative (slow-twitch) muscle fibers, the number of aerobic skeletal muscle fibers which can help to perform endurance exercise.

In conclusion, EGCG/TEAVIGOTM improves the voluntary and maximal running activity of the mice. In skeletal muscle, a fiber-type shift from fast to slow twitch fibers was observed. We hypothesised that EGCG/TEAVIGOTM leads to accelerated training success.

References.
Murase et al.: “Green tea extract improves endurance capacity and increases muscle lipid oxidation in mice.” Am J Physiol Regul Integr Comp Physiol. 2005 Mar;288(3)

EFFECT OF ORAL GLUCOSE INGESTION ON ENDURANCE TRAINING ADAPTATION PERFORMANCE AND METABOLISM

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Introduction. Major exercise and sport-organizations recommend athletes to ingest beverages containing carbohydrates during exercise. The argument being that the athlete could then train harder and longer and thus achieve a superior training effect. There is, however, no empirical evidence to support this claim. On the contrary, there is data to suggest that glucose ingestion can modulate the training response. We wanted to investigate whether 1) glucose ingestion during training would allow subjects to train harder if they ingested a glucose drink during the training session and 2) whether glucose ingestion during training would have an impact on performance and metabolism. Methods. Male subjects (n=21) were recruited in a double-blinded intervention study. The intervention group (Glucose-group) (n=11) received an 8% (w/v) glucose drink during training whereas the placebo group (Plc-group) (n=10) drank a placebo. Both groups performed the same supervised 12 week training program on a cycle ergometer. Subjects performed an incremental maximal workload (Pmax) test at the start of each week of training. The subjects trained 4 times per week and the training consisted of continuous and interval cycling at intensities from 55-91% of Pmax and a duration of 1-2.5 hours. The training was designed so that the subjects could not manage all training sessions at the planned workload. If the subject could not manage the workload the resistance was reduced by 5% until the subject could finish the training session. Before and after the training period the subjects performed a Pmax test to determine VO2max, Pmax and the ventilatory threshold (VT) as well as a time-to-fatigue-test at 70 % (TT70%) of Pmax. Furthermore, changes in

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It has been firmly established that co-ingestion of protein with carbohydrate stimulates post-exercise muscle protein synthesis and leads to a positive net muscle protein balance during recovery. In contrast to the impact of nutritional interventions on post-exercise muscle protein synthesis, little is known about the potential to modulate protein synthesis during exercise. PURPOSE: This study investigates the impact of the co-ingestion of protein hydrolysate with carbohydrate on muscle protein synthesis rate during resistance type exercise activities. METHODS: Ten healthy males were studied in the evening after consuming a standardized diet throughout the day. Subjects participated in 2 experiments, in which they ingested either carbohydrate or carbohydrate with a protein hydrolysate during a 2 h resistance type exercise session. Subjects received a test beverage prior to and every 15 min during exercise, providing 0.15 g/kg/h carbohydrate with (CHO+PRO) or without (CHO) 0.15 g/kg/h protein hydrolysate. Continuous intravenous infusions with L-[ring-2H2]phenylalanine and L-[ring-2H2]tyrosine were applied, and blood and muscle biopsies were collected to assess whole-body and skeletal muscle protein synthesis rates during exercise. RESULTS: Protein co-ingestion lowered whole-body protein breakdown rates by 26±4%, compared to the ingestion of carbohydrate only, and elevated protein oxidation and synthesis rates by 77±17 and 33±3%, respectively. As a consequence, whole-body net protein balance was negative in CHO, whereas a positive net balance was achieved in the CHO+PRO experiment (25.4±0.4 µmol phe/kg/h in CHO+PRO vs CHO; P<0.01). In accordance, mixed muscle protein fractional synthetic rate (FSR) was 49.2±2% higher following protein co-ingestion (0.088±0.012 and 0.060±0.004 %/h in CHO+PRO vs CHO, respectively, P<0.05). CONCLUSION: We conclude that even in a fed state, co-ingestion of protein hydrolysate with carbohydrate stimulates whole-body and muscle protein synthesis rates during resistance type exercise.

POST-EXERCISE ALCOHOL INGESTION DELAYS THE RECOVERY OF DYNAMIC STRENGTH FOLLOWING FOLLOWING STRENUOUS ECCENTRIC EXERCISE

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Introduction
Competitive sport participation often involves significant eccentric muscular action which may result in muscle micro-structural damage, reduced muscle performance, and soreness. Coincidently, alcohol is regularly consumed by sports-people during the post-event period. Rapid restoration of muscle function is necessary to enable optimal subsequent training or performance, yet it is not known how alcohol consumption affects the recovery process.

Objective
To compare the effects of acute alcohol intake with that of a non-alcoholic beverage on muscle performance following strenuous eccentric exercise.

Design
Eleven men, 23.9 ± 4.7 years (mean ± SD) performed 300 maximal eccentric contractions of the quadriceps muscles of one leg on an isokinetic dynamometer. They then consumed a beverage containing 1g/kg bodyweight ethanol (as vodka and orange juice). On another occasion they performed another bout on the contralateral leg after which they consumed an isocaloric quantity of orange juice. Maximal isokinetic (concentric and eccentric) and isometric torque produced across the knee, and plasma creatine kinase concentrations were measured before and at 36 and 60 hours following each exercise bout.

Results
Alcohol ingestion following eccentric exercise significantly reduced maximal isometric, eccentric and concentric torque, and average eccentric and concentric torque, at 36 and 60 hours compared to orange juice (all p < 0.05). Post-exercise plasma creatine kinase concentrations were not different between conditions.

Conclusions
Moderate consumption of alcohol post-exercise increases decrements in dynamic and static strength following strenuous eccentric exercise. To ensure optimal recovery, participants in sports involving eccentric muscle work should avoid alcohol in the post-event period.

WEIGHT LOSS RESISTANCE IN SOME OBESE WOMEN IS ATTRIBUTABLE TO MUSCLE ENERGETIC EFFICIENCY, WITHOUT DIRECT RELATION WITH LEPTIN

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This work aimed to test the following hypothesis related to adaptive thermogenesis: some obese women don’t lose weight after a physical activity program, and it could be due to a leptin stimulated reduction in energy expenditure. 26 sedentary obese women, aged from 25 to 50 years old, were studied. They were kept on physical activity program for 4 months, three times a week (30 minutes of aerobic and 30 minutes of resistance exercise). They were evaluated at the beginning and at the end of the program: food consumption, physical activity level, body composition (by DXA), body mass index (BMI), waist circumference (WC), resting (REE) and daily (DEE) energy expenditure, V02, VCO2 and RER from aerobic power test, with the calculation of muscular efficiency (GME), fasting leptin, TSH and glu-

body composition was assessed by DXA-scanning and substrate utilization was investigated during a 1-hour exercise-test at 65% of Pmax (1h-test) by infusing a labelled glucose tracer (6,6-2H2-Glc). Before, immediately following, and 3 hours after the 1h-test muscle biopsies were taken, which were analyzed for activity of metabolic enzymes and glycogen content. Results: The total amount of work performed during the training period was not different between the 2 groups. In line with this, VO2max increased significantly from 4.2 and 4.1 to 5.1 and 4.9 l/min in the Glc-group and Plc-group, respectively, but was not different between groups. In addition, Pmax and the power at which VT occurred also increased significantly in both groups with no differences between groups. Time to fatigue and total work during the TTF70% test and the fraction of VO2max where VT occurred did not change after training and was not different between groups. Both groups increased lean body mass and decreased fat mass with no difference between groups. Conclusion/Discussion. The effect of glucose ingestion on training adaptation appears to be limited. No difference between the Glc- and Plc-group in the ability to maintain a high workload during training or any of the p
case. To perform the final evaluation, the women were distributed in two groups: G1= final BMI < initial BMI, and G2= final BMI >/= initial BMI (BMI= body mass index). Leptin levels were reduced after the program (G1: from 47.92±7.44 ng dl-1 to 40.34±8.76 ng dl-1, p<0.05 and G2: from 50.22±6.60 ng dl-1 to 42.45±7.81 ng dl-1, p<0.05), but only 50% of the evaluated women reduced their BMI (G1(n=13): from 37.1±4 to 36.5±5 kg/m2, p<0.05, and G2(n=13): from 35.5±3 to 35.3±3 kg/m2 p>0.05). REE was not different from initial to final values, for both groups. During the aerobic power test, G2 showed reduction in VO2 at 30W (G1: from 7.8±1.0 to 7.5±1.1 mL Kg-1.min-1; p>0.05 and G2 from 8.2±1.6 to 7.3±1.2 mL Kg-1.min-1; p<0.05) G2 improved muscle efficiency to perform the aerobic power test (+11.4% at 30W, +10.42 at 50W and +2.08 at 70W higher than G1). Leptin not completely explained the VO2 values (from 17.1 to 40% of the statistical explanation). As conclusion, some obese women present higher muscular efficiency and therefore higher resistance to lose weight, but there are weak evidences regarding the role of leptin in these results.

**INTERRELATIONSHIP BETWEEN LACTATE AND CARBOHYDRATE UTILISATION**

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**INTRODUCTION:** Indirect calorimetry is a valid and reliable indicator for estimating fat and carbohydrate oxidation rates. Lactate indicates the glycolytic activity, and its concentration in blood (BLC) is a standard measure of exercise intensity. The breakdown of carbohydrate via glycolysis results in pyruvate, which is either aerobically combusted or converted into lactate. The relative rate of pyruvate combustion (RPY) is determined by pyruvate dehydrogenase complex activity (PDH) in which pyruvate availability is a key regulator. Nevertheless, the ratio between lactate and pyruvate is regulated by the near equilibrium enzyme lactate dehydrogenase (LDH). Consequently, lactate may be used as an indicator of RPY. Sigmoid approximations have previously been used to describe the behaviour of many metabolic systems including the relationship between lactate and pyruvate combustion (Beneke 2003). The purpose of this study is to test whether RPY can be described as a function of BLC in incremental exercise testing.

**METHODS:** 21 healthy males (Age 26.3±6.0 years, Height 179.4±8.1 cm, Body mass 74.9±12.5 kg) completed an incremental load cycling test at 50 rpm. Starting with 1 W kg-1 body mass, power output was increased by 0.5 W kg-1 body mass every 2 min stage. Capillary blood samples were drawn from the hyperaerobic earlobe at rest and at the end of each stage. Oxygen uptake (VO2) and carbon dioxide production (VCO2) were measured, and analysed for estimating carbohydrate and fat oxidation using indirect calorimetry. The relative rate of pyruvate combustion (RPY) was calculated as a percentage of the full pyruvate combustion which is considered as when VO2 equals VCO2. RPY was further approximated as a sigmoid function of lactate (RPY = 100 / (1+kel / BLC2) where kel is the constant of half maximal pyruvate combustion.

**RESULTS:** Describing RPY as a function of BLC explained 86±0.09% of the variance in RPY. Estimates of kel were 1.82±0.095 [mmol l-1], and ranged from 0.54 to 4.4 [mmol l-1]. RPY appears more or less saturated at 96.5±8.1% corresponding with BLC levels of 4.9±2.0 mmol l-1.

**CONCLUSION:** RPY may be described as a function of BLC. This may be useful in using BLC to explain the inter-individual variations in the relative utilisation of carbohydrate and fat during incremental exercise.

References.

**Oral presentations (OP)**

**OP-PM13 Physiology 13 - Muscle-Tendon**

**EFFECTS OF HEAVY STRENGTH TRAINING WITH DEEP OR SHALLOW SQUATS ON MUSCLE CROSS SECTIONAL AREA AND MUSCLE FUNCTION**

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Heavy strength training and explosive strength training results in muscular adaptations as increase in muscle cross sectional area and in muscle length (1). Theoretically, heavy strength training at long muscle lengths may lead to a greater increase in muscle length and cross sectional area than training at short muscle lengths. Furthermore, different changes in muscle cross sectional area and muscle length should in turn result in marked differences in muscle function. The purpose of this study was to investigate the effects of heavy strength training in the squat exercise with short or long range of motion on thigh muscle hypertrophy and muscle function.

Eighteen males (20-38 years) were randomized into two groups performing either deep-squats (femur parallel with the floor) or shallow-squats (110° in the knee joint) with the same relative intensity (3-10 RM sets) and training volume. However, the external load was approximatively twofold higher in the shallow-squat group than in the deep-squat group. All subjects performed 3 workouts per week and 4-7 sets per exercise. Contractile properties of the knee extensors were measured in maximal isokinetic contractions at angular velocities of 60°/s and 300°/s and in maximal isometric actions at knee angles of 40°, 75° and 105° (full extension). Cross sectional areas of thigh muscles were measured at five sites with MRI. Values are given as means±SE.

Cross sectional area of m. quadriceps increased significantly at all measured sites in the group training deep-squats [4-7%], while significant changes in the group training shallow-squats only was observed at the two most proximal sites [2-4%]. In the hamstrings no significant changes in cross sectional area was observed. Isometric knee extension strength increased significantly in the deep-squat group at a knee angle of 105° (7.2%), but no significant changes were observed at 75° and 40°. No significant changes in isometric strength were observed in the shallow-squat group, but a tendency towards increased strength was noted at a knee angle of 40° (6.4%). Isokinetic strength at 60 and 300°/s increased by 7±3% and 8±2% respectively in the deep-squat group, while no significant changes was observed in the shallow-squat group. In the test at 300°/s, the knee angle of peak torque was increased by 4±2% in the deep-squat group while no change was observed in the shallow-squat group.

In conclusion, the group training deep-squats experienced more pronounced hypertrophy of m. quadriceps than the group training shallow-squats and this difference was translated to larger increases in muscle strength measured both in isometric and isokinetic tests. In addition, some indications of muscle length changes was observed in the deep-squat group with more pronounced strength increases at longer muscle lengths and increased knee angle of peak torque in the isokinetic tests.
DIFFERENCES IN TIME TO TASK FAILURE ARE NOT EXPLAINED BY THE WORK PERFORMED BY THE ELBOW FLEXOR MUSCLES

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Time to failure for sustained submaximal contractions of the elbow flexors is briefer when supporting an inertial load (position task) of 20% of maximum compared with exerting an equivalent torque against a rigid restraint (force task). Because the fluctuations in limb acceleration increase more rapidly during the position task than do the fluctuations in force during the force task, it has been suggested that the muscles perform more work during the position task and thereby fatigue more rapidly. The purpose of this study was to compare the fluctuations in force and the times to failure when the elbow flexors performed the force and position tasks at low and high target forces. In a counterbalanced order with each task performed on a separate day, the subjects sustained the force and position tasks at 20% and 60% MVC force as long as possible. The subjects were seated with the forearm horizontal and in a neutral position, and the net muscle torque exerted by each subject was identical for the force and position tasks at each target force. Electromyographic (EMG) activity was recorded in both heads of biceps brachii, brachioradialis, and triceps brachii using surface electrodes. The force fluctuations were quantified as the coefficient of variation (CV) for force based on measurements obtained with a force transducer in both tasks. Time to failure for the position task at 20% MVC was briefer than that for the force task (126 ± 44 s and 846 ± 228 s, P = 0.03), whereas it was similar when the contraction intensity was at 60% MVC (95 ± 17 s and 89 ± 19 s, P = 0.8). The amplitude of the average EMG (% MVC) for the elbow flexors during both tasks was greater for the 60% MVC target force (58 ± 12% MVC) than for the 20% MVC target force (30 ± 6% MVC, P < 0.001). The rate of increase in EMG activity was similar for both tasks at 60% MVC target force, but was greater for the position task compared with the force task at the 20% MVC target force. The force fluctuations during the two tasks were similar at both target forces: the coefficient of variation for force was 2.6 ± 1.2% and 1.8 ± 0.2% during force and position tasks at the 60% MVC target force (P = 0.3) and 2.3 ± 0.8 and 2.3 ± 0.2% at the 20% MVC target force (P = 0.9). The similarity in the force fluctuations during the two tasks suggests that the work performed by the elbow flexor muscles did not explain the difference in the time to failure for the force and position tasks at the lower target force.

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THE EFFECTS OF A 12 WEEK PEDOMETER-BASED WALKING INTERVENTION ON INFLAMMATORY MARKERS IN ADULTS NOT MEETING THE PHYSICAL ACTIVITY RECOMMENDATIONS

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Purpose
Across Europe, in 2005, 4.35 million deaths can be attributed to cardiovascular disease (CVD) accounting for approximately half of all deaths, with this figure rising each year (European Cardiovascular Disease Statistics 2005). Physical activity has long been prescribed to combat the high levels of CVD with the current recommendations being that adults should participate in a minimum of 30 minutes of moderate intensity physical activity [PA] on at least 5 days of the week [1]. Systematic low grade inflammation is associated with the aetiology of CVD, however the effects of increasing physical activity on markers of inflammation remains to be established. The aim of the current study, therefore, is to investigate if a 12 week pedometer-based walking intervention results in a reduction in inflammatory markers in adults not currently meeting the physical activity recommendations.

Methods
Recruited from the West of Scotland community 48 participants (37 females and 11 males) were randomised to either a control (n=24) or intervention group (n=24). The control group were instructed to maintain their normal walking for the 12 week study period. The intervention group received a PA consultation followed by a 12-week graduated walking programme aimed at increasing pedometer step-counts by an additional 3,000 steps/day, 5 days/week from week 7 onwards. Blood samples were collected at baseline and at 12 weeks and analysed for high sensitivity C-reactive protein (hsCRP) via an automated analyser and for interleukin-6 (IL-6), soluble IL-6 receptor (sIL-6R) and tumor necrosis factor-alpha (TNF-alpha) by enzyme linked immunosorbent assay (ELISA). Analysis was performed, using 2(group) by 2(time) mixed factorial repeated measures ANOVAs. Data are presented as mean (S.D.)

Results
The control group had an average daily step count of 6610 (3090) at baseline and this value did not change (P>0.05) at 12 weeks. In the intervention group average daily step count was 6684 (3443) at baseline, increasing (P<0.05) to 10837 (3463) at 12 weeks. In spite of this increase in walking there were no significant reductions in any of the inflammatory markers measured (P>0.05).

Conclusion
A progressive increase in walking, in the current population, for 12 weeks had no effect in reducing the inflammatory markers measured in the present study. It is likely, therefore, that a higher duration or intensity of exercise may be required to reduce the CVD risk associated with systemic low grade inflammation.

References.

HAMSTRINGS MUSCLE ATROPHY FOLLOWING 35-89 DAYS OF UNLOADING

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While it is generally held that the postural knee extensor muscles show greater atrophy than the knee flexors in response to disuse or unloading, data reported in the literature are not consistent. Thus, this study compared changes in hamstrings and quadriceps muscle volume in men and women after long-term unloading.

Methods: A total of seventeen otherwise healthy middle aged men and women were subjected to either 35 of unilateral (left leg) lower limb suspension (ULLS; 1) or 90 d of bed rest (BR; 2). Before and after ULLS and BR, and on day 29 of BR, volume of the hamstrings and quadriceps muscles was assessed by means of magnetic resonance imaging.
Results. There was a decrease in hamstrings muscle volume (5.5%; p<0.025) following ULLS. Volume of the weight bearing limb showed no change (p>0.05). Similar decrease was noted after 29 d of BR (6.3%; p<0.025). Half of the muscle loss shown on d 89 of BR (12.6%; p<0.025) occurred within 29 d of BR. The atrophy was greater (p<0.025) for quadriceps (18.6%) compared to hamstrings on d 89 of BR. There was a trend (p<0.10) towards greater quadriceps than hamstrings muscle atrophy after 29 d of BR (9.5%) and 35 d of ULLS (8.8%).

Conclusion: These results are in agreement with the belief that the quadriceps muscles are more prone to undergo atrophy than the hamstrings muscles in response to lack of weight-bearing. Yet, the loss of hamstrings muscle volume was substantial (ca. 70% of the quadriceps atrophy on d 89) and deserves attention. Hence, rehabilitation and countermeasures resistance exercise programs, targeting the lower limbs following or during longer episodes of disuse or unloading should incorporate the hamstrings muscles.

References.

THE EFFECT OF SINGLE AND MULTIPLE SET STRENGTH TRAINING ON HEAT SHOCK PROTEINS IN M. VASTUS LATERALIS AND M. TAPEZIUS IN UNTRAINED MEN

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Introduction.
Heat Shock Proteins (HSPs) play an essential role in both cell protection and cell remodeling in response to different stressors, like exercise (1). Various kinds of strenuous exercise acutely increases HSP expression in muscles (3, 4, 5), but the HSP response to long-term regular exercise is less studied. However, increased levels of HSPs are reported in human muscles after 5-8 weeks strength training (2). The purpose of this study was to examine the effect of 1 and 3 sets strength training on the levels of HSP70 and B-Crystallin in a leg muscle and an upper body muscle. We hypothesised that 3 sets strength training would lead to a greater increase in the HSPs than the 1 set protocol.

Methods.
Twenty-five untrained men were randomly assigned into two groups. One group performed 3 sets in legs exercises and 1 set in upper body exercises (3L-1UB), while the other group performed 1 set in legs exercises and 3 sets in upper body exercises (1L-3UB). The subjects performed 3 workouts per week during 11 weeks. Biopsies were obtained from m.vastus lateralis and the upper part of m. trapezius before, after 2 weeks and after the training intervention. After homogenization, the cytosolic fractions were analysed by Western blotting for HSP 70 and B-Crystallin. Values presented are means ± SEM, p<0.05.

Results.
The levels of HSP70 and B-Crystallin were significantly increased in m.vastus lateralis after 2 weeks (66 ± 23% and 76 ± 22%, respectively) and post intervention (68 ± 22% and 88 ± 21%, respectively). In m. trapezius a significant increase was observed in HSP70 and B-Crystallin after 2 weeks (39 ± 16% and 49 ± 22%, respectively), but the levels after 11-weeks training was not significantly different from baseline levels. There were no significant differences in the heat shock protein response between the training groups in neither m.vastus lateralis nor m. trapezius.

Discussion/Conclusion.
The main findings were a rapid increase in both HSP70 and B-Crystallin, but thereafter HSP levels seemed to stabilize with only minor changes observed between 2 and 11 weeks of training. Training with 3 sets per exercise did not result in a larger HSP response than training with only one set per exercise. The HSP response seemed to be larger in m. vastus lateralis than in m. trapezius and this could be due to the fact that there were only one exercise involving upper part of trapezius (shoulder press) and two exercises involving m. vastus lateralis (leg press and knee extensions).

References.

DIFFERENT MORPHOLOGICAL ADAPTATIONS TO ECCENTRIC VERSUS CONCENTRIC TRAINING IN OLDER INDIVIDUALS

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According to Hill's force-velocity relationship (1938), for any given shortening or lengthening contraction velocity, each value of force should belong to the same level of neural activation. It follows that if muscle loading during concentric (CON) and eccentric (ECC) contractions is applied with the same absolute load, motor units must be necessarily de-recruited during the ECC phase. Thus when comparing the effects of CON training to those of ECC training, loading of the muscle in these two conditions should be matched for the same relative intensity to avoid MU de-recruitment in the ECC phase. The present study tested the hypothesis that a training protocol based on pure eccentric loading performed at the same relative intensity would produce greater strength gains and hypertrophy than concentric training only. Nineteen older volunteers took part to this study; 9 were assigned to a CON training group (aged 74±3 yr, mean±SD, 4 males, 5 females), and 10 to a ECC training group (aged 67±2 yr, 5 males, 5 females). Both groups underwent progressive resistance training three times/week for 14 weeks using knee extension and leg press exercises (Technogym, Italy). For each contraction mode, the training load was set to 80% of the 5RM, i.e. at 80% of the CON 5RM and 80% of the ECC 5RM. Before and after training the following parameters were measured: quadriceps cross-sectional area (CSA) by MRI, vastus lateralis muscle fascicle length (LF) and pennation angle (PA) by ultrasound, muscle strength expressed as CON and ECC 5RM. Training resulted in a significantly greater increase in 5RM in the ECC group (46%-55%, P<0.001) than in CON group (14%-22%, P<0.001). The increase in quadriceps CSA was slightly greater in the ECC group (4.0%, P<0.001) compared to the CON group (2.5%, P<0.001). Despite a modest, but significant, difference in hypertrophy between the two groups, the changes in muscle architecture markedly differed between the CON and ECC groups. Lf increased by 21% (P<0.001) in the ECC group, but only by 8% in the CON group (P<0.001). Instead, PA increased by 11.3% (P<0.001) in the ECC group and by 35% (P<0.001) in the CON group. These results show that, in addition to greater gains in muscle size and strength, ECC training involves different morpho-
logical adaptations than CON training. These observations may indicate that the addition of sarcomeres in series and in parallel differs between CON and ECC training.

References.

Oral presentations (OP)

OP-PM14 Physiology 14 - Circulation

DYNAMICS OF FOREHEAD SKIN MICROCIRCULATION DURING EXERCISE
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We demonstrated in forehead skin microcirculation the presence of a rhythm at an intermediate frequency range (0.12-0.18 Hz) between the respiratory and the 0.1 Hz rhythm, which emerged in response to psychomotor drive reduction. First evidence for a possible central origin came from observations that respiration was tightly coupled to this intermediary rhythm at a preferred synchronization ratio 2:1. In a comparative nonlinear analysis of data from canine, we were further able to detail central dynamics of discharge rates in small unspacific reticular brainstem neurons. The rhythm of these discharge rates exhibited a statistically significant range in response to pharmacological drive reduction.

In the present study, we tested the autonomy of this intermediary rhythm by selectively elevating pressure-flow levels in the systemic circulation with a special physical exercise protocol that allowed maintaining a relaxed mental state (harmonic exercise, HE). In ten subjects, time series of respiration, arterial blood pressure, heart rate, forehead skin microcirculation (photoplethysmography, PPG), and locomotion pace were recorded continuously. We used Morlet-wavelet based time-frequency-distributions to identify frequency components and post-event-scans to detect coordination patterns (software package Procalysis). During HE, we observed a high amplitude rhythm at 0.16±0.019 Hz (range 0.12-0.22 Hz) in the forehead skin microcirculation of all subjects studied. This rhythm prevailed for 60.2±23.7 % of total HE time (range 30.8-94.6%), and was neither affected by simultaneous fluctuations present in arterial blood pressure of 0.1 Hz nor by respiratory related oscillations. Synchronization of the rhythm with respiration was observed at 1:2, 1:3 and 1:4 integer number ratios for 31.6±24.9 % of total HE time (range 11.9-94.6%). As this rhythm submerged low amplitude 0.1 Hz and respiratory induced fluctuations emerged. This transition was accompanied by a twofold increase of heart beat amplitudes in the PPG.

Conclusions: These findings during exercise conditions provide further support for our hypothesis of a central origin, presumably in the reticular formation of the lower brainstem. We are convinced that there is reason to assume that rhythmic neuronal activity at an intermediate frequency range between the two major autonomous rhythms, the 0.1 Hz rhythm and the respiratory rhythm, produces this oscillatory activity in forehead skin microcirculation.

References.

TOTAL HAEOMOGLOBIN MASS OF ELITE KENYAN RUNNERS
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Introduction: East African runners are among the most successful endurance athletes worldwide. To discover underlying physiological reasons research focused on muscular and metabolic factors. Data concerning the limiting factors of oxygen transport to the muscle, i.e. heart size and haemoglobin mass are missing. Since most of the East African runners proceed from moderate altitude a special advantage due to improved oxygen transport by the blood is frequently hypothesised.

Purpose: The aim of the present study, therefore, was to investigate total haemoglobin mass (Hb-mass), blood volume (BV) and heart size of elite Kenyan runners. A second goal was to monitor possible cardiac and haematological de-adaptation processes during a sojourn at lowlands.

Methods: Ten Kenyan runners (group K, competing between 1.500m and marathon) living and training at moderate altitude (~2150m) performed a 6-weeks lasting training camp at 350m in Germany. The training volume (~210km/week) was managed by their own trainers and was similar to that normally performed in Kenya. Hb-mass and BV were determined using the optimized CO-rebreathing method on the first day after arrival to Germany and weekly during their whole stay. In addition BV and haemoglobin concentration [Hb] were also examined before departure at altitude. VO2max was determined in three field tests (running speed increased by 2km/h every min) and one laboratory test on a treadmill (speed increased by 2km/h every 3 min). 13 German elite runners served as a control group (group G).

Results: The Kenyan runners were characterized by significantly lower body mass (K 57.2 ±7.0kg; G 66.5 ±6.9kg) and BMI (K 18.5 ±0.9; G 20.9 ±0.9), but similar percentage body fat (K 9.9 ±2.1%, G 10.7 ±2.2%). During the training camp body mass increased by 3.0 ±1.8 kg and fat mass by 1.0 ±1.3kg. Relative VO2max did not differ between the groups (K 71.5 ±5.0 ml/kg/min; G 68.8 ±2.9 ml/kg/min) and absolute VO2max did not change during the 6 weeks at low altitude. Relative Hb-mass from 803 ±83g to 767 ±90g, p<0.001, VO2max from 5828 ±703ml to 5466 ±661ml, p<0.01. Hb tended to decrease 1.04 ±1.0g/dl when commuting altitude but did not differ at sea level between the groups (K 15.4 ±1.0g/dl, G 15.1 ±0.8g/dl). The heart size was slightly lower in the Kenyan group (heart volume: K 14.0 ±1.5ml/kg, G 14.9 ±1.7ml/kg, left ventricular volume: K 4.8 ±0.5ml/kg, G 5.2 ±0.7ml/kg) and did not change at low altitude.

Conclusions: The hypothesis that blood transport is improved in Kenyan runners can be rejected. Longer stays at lowlands even decrease their Hb-mass. Since also heart size tends to be relatively small we conclude that the oxygen transport system is obviously not the reason for the excellent endurance performance of Kenyan runners.
EXERCISE-INDUCED PLASMA VOLUME EXPANSION AND POST-EXERCISE PARASYMPATHETIC REACTIVATION

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The aim of the present study was to investigate the effect of exercise-induced plasma volume expansion on post-exercise parasympathetic reactivation. Eleven moderately-trained men performed, before (D0) and two days after (D+2) a single supramaximal exercise session, 6-min of submaximal running where heart rate (HR) recovery (HRR) and HR variability (HRV) indices were calculated during the first 10 min of recovery. Relative plasma volume changes (RPV) were calculated using changes in hematoctit and hemoglobin measured over consecutive mornings from D0 to D+2. Parasympathetic reactivation was evaluated through 1) the rate of post-exercise HRR, 2) the absolute number of heartbeats recovered in one minute (HRR60s), 3) the HRV vagal-related indexes calculated during the last 5-min stationary period of recovery and 4) the time course of the root-mean-square for successive R-R interval differences between successive 30-s segments (mSSD30s). Compared to D0, RPV (+4.8%, P<0.01), HRR60s and all vagal-related HRV indices were significantly higher at D+2 (all P<0.05). In contrast, the rate of HRR was not different between trials. Changes in vagal-related HRV indices were positively related to PV (all P<0.01). Nevertheless, there was no association between changes in HRR indices and RPV. Present results show that the short-term improvement in post-exercise parasympathetic reactivation two days after a single session of supramaximal exercise might essentially be related to exercise-induced plasma volume expansion. Results also confirm that post-exercise HRR and HRV indices characterize distinct independent aspects of cardiac parasympathetic function, with HRR linked more to vagal tone and HRV indices related more to parasympathetic modulation.

ACUTE HYPOBARIQ HYPONAXIA INDUCED MYOCARDIAL OXIDATIVE DAMAGE IN OLD AND YOUNG RATS

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Although high altitude exposure results in increased oxidative damage in the tissues of rats, whether the levels of myocardial injury augmented with the severity of the altitude is not known. Since aging has been shown to associated with increased levels of oxidative damage and aged animals may have impaired adaptive response to stresses, the effects of high altitude on myocardial oxidative damage in aged animals is a matter of subject. Therefore, this study investigated the effects of high altitude on myocardial oxidative damage in aged animals. In addition, we examined if acute exposure to mild levels of altitude modify the levels of the myocardial damage induced by severe hypobaric hypoxia. Both 4 (young) and 20 month-old (old) Wister Albino rats were randomly assigned to following groups: 1) control in=5 in young and 6 in old, 2) 6000m (mild levels of hypobaric hypoxia, n=6 for each group) 3) 8000m (severe levels of hypobaric hypoxia, n=1) and 4) 6000+8000m (32h after mild levels of hypobaric hypoxia, animals exposed to severe levels of hypobaric hypoxia, n=1). Duration of hypobaric hypoxia was 6h. About 1h after the last exposure to hypobaric hypoxia, hearts were removed and advanced oxidation protein products (AOPP), lipid hydroperoxides (LHP), protein carbonyl (PCO), total and protein thiols (T-SH, P-SH) along with Hsp72 levels were determined. Although aging associated with increased levels of AOPP, PCO, LHP on each altitude, these values were not different than that of young animals when corrected with the basal levels. Compare to 6000m, 8000m altitude results in higher levels of myocardial AOPP, PCO and LHP formation in both young and old hearts. On the other hand, T-SH and P-SH levels decreased with the increasing levels of altitude. Compare to 8000m, exposure to 6000m before severe hypobaric hypoxia did not modify the levels of any parameter studied. There were no changes in Hsp72 levels across all groups. Our findings support the notion that aging associated with increased levels of oxidative damage. However, acute hypobaric hypoxia could not cause any additional oxidative damage to old myocardium.

USING DIGITAL BALLISTOCARDIOGRAPHY TO DETECT AUTONOMIC NERVOUS SYSTEM CHANGES IN THE CONCUSSED ATHLETE

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Recent research from our laboratory showed that heart rate variability (HRV) is altered in the concussed athlete during mild exercise, suggesting anomalies in autonomic function (1, 2). Although HRV is a valuable tool for assessing and monitoring autonomic activity, advanced recording techniques may provided a more accurate measurement of this dysregulation. Recent technological advances are available where micro-accelerometers can be used to monitor cardiac function. Digital ballistocardiography (dBG) measures the seismic activity of the heart during a cardiac cycle, and accelerations during systole and diastole produce very-low-frequency compression waves which can be recorded and matched with the EKG waveform. The resulting dBG provides an illustration of the mechanical functioning of the heart. We hypothesized that dBG could be used to detect changes in neural innervations to the heart during rest and after mild exercise in the normal (N) and concussed (C) athlete. To evaluate the utility of using dBG to assess autonomic function, 2 asymptomatic C athletes were monitored at rest and after mild knee extension exercise (1 min) at Day 4-11 post-concussion. HR was calculated beat to beat. These data were compared with 2 N control athletes. On average 30 dBG waveforms showed that atrial contraction force was 56.5±14.3 (rest) and 60.5±5.5 milli-gravity (mg) (post-exercise) in the C, while it was 70.1±15.5 (rest) and 102.5±54 mg (post-exercise) in the N. Ventricular contraction force was 62.0±19.0 (rest) and 122.5±74.5 mg (post-exercise) in the C, while it was 101.0±15.0 (rest) and 205.5±79.5 mg (post-exercise) in the N. Resiling HR at baseline was not different between the C (55 bpm) vs N (52 bpm), but post-exercise there was a greater variability in the concussed (SD=13.7 bpm) vs the normal (SD=7.0 bpm) athlete. Day-to-day reliability for the dBG variables was n=0.94. Based on our results, the dBG has the ability to determine all timing of the cardiac cycle, and the slope, velocity, and amplitude of each of these cycles (eg. atrial contraction, mitral valve open and close, aortic valve open and close, rapid ejection period, early diastole amplitude). From rest to exercise the normal population increases the slope and amplitude of each of these signals and adjusts the various time periods to meet the cardiac demand. While the timing and duration of the events were considered normal in our C subjects (n=2), the amplitudes of the atrial and ventricular waves were highly variable indicating altered autonomic function. This is the first study to our knowledge that has examined the mechanical changes in cardiac function using dBG to reflect ANS function in the concussed athlete. References.

CARDIOVASCULAR RESPONSES TO DAYTIME SIESTA: IS IT SLEEP PER SE OR PRE-SLEEP ACTIVITY THAT MEDIATES LOWER BLOOD PRESSURE?

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Our recent finding that the daytime sleep-onset period is associated with a marked drop in blood pressure (Zaregarizi et al., 2007) leads us to question whether the siesta habit reduces the blood pressure (BP) of hypertensive patients normally at home, and the amount of pre-siesta physical activity is important in contributing to a lowered BP. We answered these questions via a large-scale epidemiological study and a controlled experiment.

In study (i), 439 hypertensive patients were allocated to non-siesta (n=393), siesta-without-sleep (n=35) and siesta-with-sleep (n=11) groups, matched for medication, age, gender and body mass. Wrist-activity, heart rate (HR) and BP were recorded every 20 min for 24-h using ambulatory monitors worn during everyday living. In study (ii), 6 normotensive adults, mean (SD) = 39 (6), y, exercised at 09:30 h following a night of restricted (4 h) sleep. Participants exercised at either 70%VO2max for 30 min, or at 40%VO2max for a duration which equated total work-done. At 14:00 h, participants napped. Polysomnographic data allowed us to describe a 10-min period of relaxed wakefulness before lights-out, the time between lights-out and stage 1 sleep onset and the time between stage 1 and 2 sleep onset.

Changes in BP and HR over these 3 phases were compared between trials. Data are described as mean (SD).

In study (i), the lowest systolic/diastolic BP of 125(6)/79(4) mmHg was found between 16:00 and 17:00 in the siesta-with-sleep group compared to 139(6)/79(4) and 140(4)/82(2) in the non-siesta and siesta-without-sleep groups (P<0.05). There was no difference in 24-h BP profiles between the non-siesta and siesta-without-sleep groups (P>0.05). The 24-h profile in physical activity was different in the siesta-with-sleep group compared to the other two groups in line with the afternoon behaviors that were adopted (P=0.03). There was also evidence that the siesta-with-sleep participants were more active during the morning. In study (ii), systolic BP was 4±3 mmHg lower during phases (i), (ii) and (iii) of the nap onset period, respectively following the more intense exercise compared to exercise at 40% VO2max (P<0.05). Diastolic and mean arterial BP and HR during the nap were not significantly different between the exercise trials (P>0.05).

Our epidemiological data confirm that afternoon siesta can reduce the BP of hypertensive patients, but only if sleep is taken. Those who slept during siesta also scheduled more physical activity in the morning period, which could also reduce BP during subsequent siesta via post-exercise hypotension. Data from study (ii) suggest that 30 min of exercise at 70% VO2max can indeed mediate a lower blood pressure during subsequent afternoon sleep compared to light exercise. Therefore, the reduction in BP during siesta with sleep might be, in part, mediated by a hypotensive effect of prior exercise.

References.

Oral presentations (OP)

OP-PS06 Psychology 6 - General 2

ELITE RUGBY COACHES’ COMMUNICATIONS IN MATCH

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This research is organised with the National Technical Direction of the French Union in Rugby. The problematic consists in informing the private and public facets of the coaches’ communications with players during the match. We try to characterize communications by different aspects : intention, frequency, object, modalities, and their impact on the game production. The theoretical frame aims to encircle the implicit and tacit competences constituents. Coaching process is complex, dynamic and depending from the context (Lyle, 2002).

The methodology has for ambition to supply a detailed and ecologically valid portrait about coaches and about the coaching process (Gilbert & Trudel, 2004). We study all the technical staff members involved in the coaching process, using case studies with methods triangulation (Mouchet, 2005). We articulate :
- interviews before the match about coaches conceptions,
- behaviors and communications recording during contest,
- explicitation interviews (Vermersch, 2002) after the match about coaches subjective lived,
- analysis of game evolution. We use for this last aspect the video of the game and an observation tool.

Results are in the course of treatment. The first elements about coaches’ conceptions put in evidence :
- The main addressees of orders: numbers 9 and 10 for the strategic aspects; the captain if he’s a different player, for aspects relative to the group management.
- The variety of used distribution channels, according to the opportunities of meeting with the players during the game, or the use of persons authorized to enter on the ground (for example medical staff).

On the other hand it is surprising to notice the absence of elements strongly shared in coaches’ conceptions about the nature of communications. The only element quoted explicitly by 50 % of the coaches concerns ‘ strategy ’. But the optimal use of these strategic regulations seems to require from coaches a fine analysis of events and the necessity of developing two aspects:
- Functional modalities of communications distribution in the course of contest,
- Players’ responsibility and self-sufficiency in the management of the game.

Data treatment of the communications in game is in course at this moment. The first elements seem to indicate preferential modes used by coaches depending on their own experiences and characteristics as coach or player. But also depending from the local context of the match.

References.

THE EFFECT OF TWO DIFFERENT BREATHING FEEDBACK TECHNIQUES ON PSYCHOPHYSIOLOGICAL PARAMETERS IN A SPORT SPECIFIC STRESS TEST

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Many sport psychologists utilize relaxation techniques to reduce stress and enhance performance (Schwartz & Andrasik, 2003). Besides common techniques (Progressive Muscle Relaxation, Autogenic Training) device-guided relaxation techniques are becoming more widespread. The aim of our study was to investigate the effects of two different breathing feedback trainings on peripheral and central physiological parameters and to evaluate the transfer of the techniques to a stress-related situation.

Forty-five sport students were randomly assigned to three different groups. The respiratory sinus arrhythmia (RSA) biofeedback training group practiced to synchronize their alteration in heart beat with breathing. The respi rate group learned to adjust their breathing to a sound which paces the breathing to a rate less than 10 breaths per minute. The third group received no intervention (control group).

A training session lasted 15 minutes and was performed three times a week for a period of five weeks. At the beginning and at the end of the five week period the subjects underwent a sport specific stress test which consisted of several cognitive and coordinative tasks (e.g. memory game, balance test) that were embedded into different relaxation phases (baseline relaxation at the beginning and intertrial relaxation phases between the tasks). Peripheral (SC, Temp., ECG, Breathing, EMG of m. frontalis) and central parameters (EEG) were recorded during training and test conditions.

Regarding the alterations in parameters of the 2nd, 8th and 15th session, the RSA group revealed significant increases in coherence between heart rate and breathing [F(2,26)=5.47, p=0.03, eta2=0.30], in heart rate variability [F(1,26)=6.25, p=0.01, eta2=0.33] and SDNN [F(2,26)=4.26, p=0.02, eta2=0.32]. Concerning the stress test, a time (pre-post)*group (RSA-respirate-control) effect occurred for coherence [F(2,27)=3.67, p=0.04, eta2=0.21] and SDNN [F(2,29)=5.08, p=0.01, eta2=0.26] during baseline relaxation. Both intervention groups increased coherence and SDNN from time 1 to time 2, whereas these parameters decreased in the control group. Additionally, a comparison of baseline relaxation and intertrial relaxation data revealed a time*group effect for coherence [F(2,27)=3.45, p=0.046, eta2=0.24]. While the differences between baseline and intertrial relaxation remained stable for both intervention groups over time, the control group showed less discrepancy between baseline and intertrial relaxation at time 2 than they did at time 1.

In sum, both breathing techniques had an instantaneous effect on improving psycho-physiological relaxation of athletes. Furthermore, results indicate that improving psycho-physiological relaxation via breathing techniques might also be helpful in stress-related situations and contribute to a better performance of athletes.

References.

THE EFFECTS OF FEEDBACK INTERVENTIONS (FI) ON COGNITIVE PERFORMANCE OF ATHLETES ON A SPORT-SPECIFIC SELECTIVE ATTENTION TASK

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Athletes are often confronted with feedback information on their performance that direct attention to the self, e.g. I am better than others (normative Feedback) or My performance was much worse than I anticipated (self-related feedback). According to the Feedback Intervention Theory (Kluger & DeNisi, 1996), feedback relating on the self may debilitate performance even when FI is positive.

In order to test whether FI that direct attention to meta-task processes deteriorates performance of athletes, a computerized test measuring selective attention in sport-specific situations was designed with DirectRT 2006 software (© empirisoft). The test consisted of two parts. Within each part, 15 video clips containing sport scenes [1941 ms length] were presented. Subjects were asked to indicate how many athletes they were able to recognize in each clip (selective attention task). Reaction time was limited.

Before completing the first 15 trial sequence, athletes had to prognose their performance on the test (percent of correct answers). After finishing the first part subjects were given a fictitious feedback on their performance with normative (positive - p or negative - n) and self-related (p or n) information (e.g. you were much worse than you anticipated. Additionally, you were much worse than others who completed the test n:n combination). Hence, four different FI groups were established (pp, nn, pn, and np), completed by a control group which received no feedback. After a three minute relaxation phase, subjects completed the second 15 trial sequence. Correct answers were recorded for each trial.

Participants were n=96 sport students (39 female, 57 male) who were all active in different kinds of sport. Subjects were randomized to FI groups.

MANOVA results show that the different feedback intervention strategies did not effect athletes’ performance (i.e. the percentage of correct answers) in the second part of the test [F(4,91=1.37, p=2.5]. However, when focusing on the two groups who received consistent feedback (negative-negative or positive-positive, respectively), results reveal that athletes who received positive feedback tended to increase their performance [F(1,38)=3.88, p=0.06], whereas athletes who received negative feedback did not.

It was hypothesized that feedback relating on the self deteriorates athletes’ performance on a sport-specific cognitive task, even when Fi is positive. Our results, however, did not support this hypothesis. Athletes either perform at the same level, or even increase their performance.

Further analyses have to show whether these results are affected by personality traits or task characteristics.

References.
EFFECT OF ACHIEVEMENT GOAL PROFILES ON PEER INTERACTION AND PERSISTENCE IN YOUTH SPORT

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The purpose of this study was to determine whether the dispositional goal orientation profiles that have been reported in the literature would be observed in a sample of youth sport participants, and to investigate the differences between the goal profiles on perceptions of the motivational climate, peer relationships and drop out data. The sample consisted of a cross-sectional study of 1294 youths aged between 12-16 years of age (Male n = 787, Female n = 507) experienced youth sport participants. Participants responded to a questionnaire addressing achievement goals, perceived motivational climate, perceived peer acceptance, quality of friendship, perceptions of being bullied, and we performed a follow up procedure on whether the participants continued or dropped out of their respective sport the following season. Four profiles emerged from the cluster analysis that were similar to previous research (Hodge & Petlichkoff, 2000, Smith, Balagué & Duda, 2006). The profile groups were found to be different on all of the peer interaction variables, but not the drop out rates. The overall trend was for participants who were higher in task orientation to have more positive peer relationships. They were lower in conflict, higher in companionship, peer acceptance and lower in the perception of being bullied. In general, the findings support the predictions coming from achievement goal theory (e.g., Nicholls, 1989), and suggest that better peer relationships are fostered with task achievement goals.

ANALYSIS OF THE EFFECTS OF A PSYCHOLOGICAL INTERVENTION PROGRAMME IN THE RATE OF DEPRESSION IN PHYSICALLY ACTIVE ELDERLY PEOPLE

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The World Health Organization defines the term Quality of Life (QL) as a search for harmony on the physical, psychological and social aspects of life. It is the absence of certain symptoms and/or behaviors that can interfere on the adaptation of a person to a new situation. This adaptation process more abruptly with the elderly when compared to younger people. It is perceived in Brazil a lack of attention to the QL of elderly, at the same time that this population is in a progressive increase. The ageing process promotes physical changes that may result, mainly, in stress, anxiety and depression. The depression in old age is associated with a loss of self-esteem and physical and cognitive declines, resulting in the inability of the elderly to satisfy their needs and impulses or to defend themselves against threats to their safety. The depressive patterns in this age group are altered in its symptomatic appearance through bio-psycho-socio-cultural inferences. An exercise program should be directed to the improvement of the physical capacity of the individual, leading, eventually, to a reduction of the deleterious effects resulting from the aging process, maximizing the social contact of the subjects, trying to reduce the psychological problems such as anxiety and depression. Thus, participation in physical activity programs allows the elderly to discover capacities that were considered lost group activities promotes sharing of experiences, results and advances, as well as social activities. The aim of this study was to analyze the effects of a psychological intervention program on the QL of elderly physically active individuals, through the levels of depression. The study also compared the results with groups of sedentary people (elderly also). The Beck Inventory was used to investigate depression. The psychological program was elaborated according to the test results and consisted of 20 sessions. The tests were then reapplied and a follow up test was applied 1 month after. The sample consisted of 60 voluntary people (60-72 years old) distributed in experimental, control and placebo group. Significant improvement was found on the active group that received psychological support. On the placebo and control group (both active) that had no psychological support the alterations were low. On the sedentary group and on the group without intervention there were no significant alterations on the results (depression level). We conclude that regular physical activity combined with psychological support promotes important benefits for the QL of elderly people more than when the two are done separately. This confirms the need of a permanent program (physical activity and psychological intervention) utilizing a bio-psycho-social approach.

THE DEVELOPMENT OF A QUALITY DECISIONAL INDEX FOR THE MATCH ANALYSIS OF OFFENSIVE ONE-ON-ONE SITUATIONS IN BASKETBALL

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INTRODUCTION: In order to reach a better understanding of the game dynamics, sport performance analysis, is nowadays branded by a multidisciplinary nature of contributes (Reilly & Gilbourne, 2003). However, much of the match analysis does not explain the continuous interaction between the player and the competition environment. Decision-making behaviour is usually not included in these match analyses. In this work we consider the 1 vs 1 situations that finished with an attempt to shot. In order to analyze the dyad we considered the interaction between players as a symmetric relation defined for the distance between the basket and both players and their interpersonal distance (Araújo et al., 2006). The aim of this paper is to provide a match analysis tool for decision-making behaviour in basketball. To achieve this goal, we present a quality decisional index (QDI) (Esteves, Araújo & Barreto, in press) which allows the measuring of the temporal course of this behaviour in a one-on-one situation in basketball.

METHOD: In order to show that it is an accurate and reliable tool for analyzing information regarding players' behaviour in the game, we used notational analysis data from one-on-one situations that occurred in a basketball game (Portuguese main league). This notational procedure allowed us to gather the needed variables for the quality decisional index \( QDI = 0.7 \times S/A \times 0.1 \times LB/n1v1 + 0.2 \times FS/n1v1 \), where SA is the number of shots attempts, SS is the number of shots scored, LB is the number of lost balls, n1v1 is the number of occurrences of 1v1, and FS is the number of fouls situations suffered by attacking player of the dyad. The QDI calculated values were correlated with the ones obtained through the Most Valuable Players equation (MVP), which is used by the official Portuguese basketball statistics.

RESULTS: There were significant positive correlations between QDI and MVP values obtained. When correlating the variables QDI and MVP, calculated per intervals of 5 min, significant positive relationships \( r > .6 \) were verified. Nevertheless, there were no significant correlations between the same variables when cumulative values were considered.

DISCUSSION: The results showed that the QDI describe the efficacy of decision-making behaviour in this type of situations (1v1 attack and with the possibility of trying) in short time intervals (5 min). Its external validity was obtained with the positive significant correlations with the MVP-values.

References.


Oral presentations (OP)

OP-TT09 Training and Testing 9 - Elite

THE RELATIVE CONTRIBUTION OF SWIMMING, CYCLING AND RUNNING TO OVERALL PERFORMANCE IN ELITE OLYMPIC DISTANCE TRIATHLON

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Olympic Distance (OD) triathlon consists of a 1.5km swim, 40km cycle and 10km run performed in sequential order. The aim of the current study was to: i) quantify the relative contribution of each discipline to overall performance in draft-legal OD triathlon, and ii) investigate if the quality of field (QOF) or the presence of wetsuits changed the relative contribution of each discipline.

Swim, cycle, run and overall performance were analysed for athletes finishing within 10% of the winner in 110 ITU World Cups, ITU World Championships and Olympics from 1996-2005. All performances were related to the median of the top 10 performances. Percentages behind the winners overall time were used to account for differences between courses, while differences between each discipline were calculated in seconds to provide an absolute representation of the contribution to overall performance. There were 4366 male and 3121 female data points analysed.

The greatest variation in performance (SD from median of top 10 times) was found to be in the run for both men (100.7s) and women (114.9s) compared to swimming (27.7, 45.7s) and cycling (71.3, 81.6s), even though the duration of the run is typically half that of the cycle leg.

For male triathletes, correlations to overall performance were found to be higher for running (r=0.95) and cycling (r=0.90) than for swimming (r=0.59); once combined, these variables accounted for 95% of the variation in overall performance. When comparing high and low QOF, significant differences in correlations were noted for running (r=0.96 vs r=0.95; p<0.05), cycling (r=0.94 vs r=0.89; p<0.01) and swimming (r=0.63 vs r=0.54; p<0.05).

Female triathletes showed a similar trend, albeit with lower correlations, for the relationship of running (r=0.85), cycling (r=0.76) and swimming (r=0.53) to overall performance, collectively, these variables explained 85.6% of the variation in performance. QOF analyses revealed significant differences between swimming (r=0.66 vs r=0.58; p<0.05) and cycling (r=0.84 vs r=0.71; p<0.01), but not running (r=0.89 vs r=0.89; p>0.50) when comparing high to low QOF.

Classification tree analyses revealed the presence of a wetsuit did not feature in any terminal nodes and therefore was not considered to contribute to predicting overall performance.

This study has confirmed that running is critically important to performance in elite OD triathlon but swimming is not as important. This may have been expected given that running is the final discipline of a triathlon, however it is somewhat surprising given its shorter duration compared to the cycling component of the event. Cycling was also shown to be a major predictor of overall performance, even though drafting promotes the formation of large groups. The QOF changed correlations for cycling and swimming, but did not appear to influence the importance of running to overall performance.

COMPARING THE PORTUGUESE AND THE SOUTH AFRICAN RUGBY TEAMS DURING THE RUGBY WORLD CUP (RWC 2007)

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Introduction

Research in team sports has focused in the factors that identify player and team performance. Rugby game analysis can allow to: i) create models of players’ and team normatives, ii) identify the game-related statistics that best justify sport success iii) identify tendencies and evolutions in the sport. The aim of the present study was to compare the average game-related statistics from the Portuguese and the South African team.

Methods

The sample was constituted by 11 rugby games, 4 were played by the Portuguese team and 7 were played by the South African team during the Rugby World Cup 2007 (IRB, 2007). The games were analyzed though descriptive statistics and independent t-tests.

Results

The obtained results allowed identifying significant differences in the game-related statistics and the game-result variables for the two teams (p<0.05). The Portuguese rugby team performance (game averages) was 60 runs, 77 passes and 28 kicks. The South African rugby team performance was 58 runs, 106 passes and 33 kicks. The Portuguese team points scored came from 4 tries, 3 conversions, 3 penalty kicks and 1 drop kick. Conceded 29 tries, originate from 16 losses lineout situations, 2 scrum, 3 penalty goal, 5 kick and 3 turnovers. South African team scored through 53 tries, 25 conversions, 2 penalty kicks not having obtained points through the drop kick in 6 attempts. Conceded 9 tries, originate from, 2 losses of ball in lineout, 2 in scrum, 3 kicks and 2 turnovers. The average ball possession time for Portuguese team in poll stage was 14 minutes and 37 seconds and for the South African team was 15 minutes and 56 seconds.

Conclusions

The comparison among the obtained results allowed diagnosing significant differences between the Portuguese and South African rugby teams for tries, conversions and penalty kicks. The statistic results of the game and of the game analysis in relation to the game actions (runs, passes and kicks) were not significant to differentiate teams (p>0.05).

We concluded that the differences found in game and result variables and between the Portuguese and South African rugby teams allowed to find enough reasons so that we can describe behaviours to understand some significant differences between variables and teams in competition. Coaches can use these results for players’, team preparation and for directing the competition.
A MODEL OF THE PROCESS OF REGAINING BALANCE AFTER PERTURBATION FROM QUIET STANCE: WITH APPLICATION TO TRAINING IN ELITE JUDO

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Using tools from dynamical systems we investigate stability and the maintenance of balance in elite Judokas. We model and analyze the ground reaction forces resulting from an athlete being perturbed from quiet upright stance, for the two legged and single legged condition. The maximum correctable angles between the resultant ground reaction forces and the vertical in the anteroposterior and mediolateral directions are obtained via a force platform. A closed critical curve is fit through these maximum correctable angles outside which the perturbations cannot be corrected and the motion of the body back to the position of quiet stance is analyzed. We then analyze the curve to identify non-symmetric behavior caused by muscle imbalances, postural problems, structural problems and differences in the ranges of motion on either side of the body. We also show how the model can be used in elite judo regarding injury prevention and identifying competitive strengths and weaknesses which may be addressed and corrected via training once they have been discovered.

References
5. A. Lopez Diaz de Durana, ‘Use of the RPE scale as a tool for the quantification of intensity of effort in endurance training with specific application to Judo’ PhD thesis UCLM in preparation.

A COMPARISON BETWEEN ELITE AND WELL TRAINED CROSS-COUNTRY SKIERS IN PHYSIOLOGICAL RESPONSE TO VARIATIONS IN INTENSITY DURING PROLONGED EXERCISE

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Introduction: Cross-country ski racing includes continual variations in intensity due to terrain and tactics. Consequently, the recovery between periods with higher intensity may affect the outcome of the race. Both blood metabolites and respiratory variables are used for standard performance evaluations for endurance athletes, although there is a lack of information if respiratory variables respond similar to blood lactate and acid/base values during prolonged variable exercise. Therefore, the aims with the present study were to 1) evaluate whether respiratory variables are associated with blood lactate and acid/base variables, 2) how these variables might predict physical performance and 3) whether a calculated heart rate-oxygen uptake (HR-VO2) relationship is valid during variable intensity exercise. Methods: 12 cross-country skiers classified as elite (E, n=6) and formerly well-trained (FWT, n=6) performed two roller ski tests. 1) An incremental test to establish maximal oxygen uptake (VO2max), maximum heart rate (HRmax) and lactate threshold (LT). Submaximal and maximal VO2 and HR during the incremental test were used for calculating the individual HR-VO2 linear relationship and 2) a 48-min long variable intensity protocol (VIP) at alternating exercise intensities, 90% (HI90) and 70% (MI70) of lactate threshold (LT). Submaximal and maximal VO2 and HR during the incremental test were used for calculating the individual HR-VO2 linear relationship and 2) a 48-min long variable intensity protocol (VIP) at alternating exercise intensities, 90% (HI90) and 70% (MI70) of lactate threshold (LT). Cardiorespiratory variables and venous blood samples were continuously collected throughout the VIP. Comparisons between E and FWT were performed using a two-tailed unpaired Student’s t-test and a ANCOVA analysis was used to determine which physiological variable best could prognosticate time to exhaustion (TTE). A simple linear regression was used to establish the relationship between HR and VO2. Results: Blood lactate concentrations [La] were higher and base excess [BE] lower for FWT from the first MI70 (P<0.05). The expected HR were higher during the MI70 exercise intensities regardless of group affiliation (P<0.05). The blood [La] response predicted time to exhaustion earlier than respiratory variables (P<0.05). Discussion: Blood lactate and acid/base fluctuations were not reflected by RER and the ventilatory equivalents. Furthermore, blood lactate is to prefer, in comparison to ventilatory variables, to study performance related recovery processes during endurance exercise with variations in intensity. The expected HR-VO2 relationship was not valid during VIP.

References

NO CHANGES IN FATIGUE RESISTANCE AND CENTRAL FATIGUE FOLLOWING 4 WEEKS OF BALLISTIC STRENGTH TRAINING

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In some sports disciplines, strong ballistic contractions have to be repeated over a longer period of time. The aim of the present study was to assess changes in fatigue resistance and changes in central fatigue after exhaustive ballistic contractions in response to ballistic strength training (BST). Nine subjects (26±3 years) performed BST (few repetitions with maximal contraction speed) over a period of 4
weeks whereas five subjects (25±3 years) served as controls. Maximum rate of force development (RFD) during ballistic contractions was tested in the tibialis anterior muscle before and after BST. Fatigue resistance was measured by counting the number of contractions until fatigue. Fatigue was defined as the time, when subjects could not manage 75% of their MVC any longer. In order to assess peripheral fatigue, electrical stimulation of the peroneal nerve was used to elicit the maximal M-wave (Mmax) in the tibialis muscle and the corresponding twitch. By means of transcranial magnetic stimulation (TMS), motor evoked potential (MEP) recruitment curves were recorded. Comparison of changes in parameters obtained with peripheral nerve stimulation and cortical stimulation allows deduction of the amount of central fatigue. In the pre-measurement, fatiguing ballistic contractions did not alter Mmax and twitch torque, demonstrating that peripheral fatigue was not existent or at least minor. In contrast, the slopes of the MEP recruitment curves were reduced following ballistic contractions. These results indicated that mainly central fatigue was responsible for exhaustion. Following BST, subjects demonstrated enhanced RFD but did not change any of the fatiguing parameters. The results of the present study suggest that high intensity BST with low number of repetitions does not improve fatigue resistance and has no beneficial influence on central fatigue.

PEAK OXYGEN UPTAKE USING A TRAINING DEVICE FOR COMBINED RESISTANCE AND AEROBIC EXERCISE IN SPACE AND ON EARTH

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Astronauts traveling in Orbit are mandated to perform both aerobic and resistance exercise to combat cardiovascular and muscular deconditioning. A non-gravity dependent flywheel resistance exercise device (FWD), proven to be effective in blunting muscle atrophy when used by bedridden subjects, has been configured to allow for aerobic exercise as well. The current study aimed at determining aerobic energy yield and related physiological demands during exercise using this novel apparatus.

Methods Eight men and women (23±3 yrs, 65±5 kg, 170±6 cm) performed all-out, indoor, stationary rowing exercise randomly on either a commercially available Concept II ergometer (CII) or the FWD. Using a magnetic brake system, the FWD and similar to the CII, produced mainly concentric resistance exercise with the aid of the inherent inertia of rotating flywheels. Progressive exercise protocols (increased frequency and magnetic force) assessed peak oxygen uptake and heart rate, rate of perceived exertion and post lactate concentration.

Results Peak oxygen uptake averaged 3.18±0.50 and 3.11±0.49 l/min, respectively during exercise using CII and FWD. Peak oxygen uptake, plasma lactate concentration, heart rate and rate of perceived exertion were not different (p>0.05) across exercise using these two devices. However, time to exhaustion was somewhat (p<0.05) longer for the FWD.

Conclusion Collectively the current results suggest that the novel method of offering an aerobic exercise stimulus is as effective as the most established technology for indoor rowing used by crew. Given that the space agencies have recognized the need for effective exercise countermeasures hardware that has a feasible mass and envelope and features allowing for multiple purposes (e.g., concentric/eccentric resistance and aerobic exercise in a single piece of apparatus, the current technology should be considered for use in space.
Injuries to tendons represent a major problem in sports. Tendons are fibrous, tension-bearing elements interposed between the muscles and bones designed to transmit the forces generated by the muscles to the skeleton effecting limb movement. It is well established that skeletal muscle can adapt to changes in functional requirements and to increases in loading e.g. with exercise through quantitative mechanism based on changes in muscle mass and fibre size through muscle hypertrophy, and a qualitative mechanism based on a change in fibre type of the muscle fibres. The change in muscle power increases the forces distributed from the muscles through the tendons 5 and increases the stress on the connective tissue within the muscle as well as on the tendons in series with the muscles fibres. This may lead to a situation where the forces on the tendons exceed the strength of the tissue with the risk of sustaining injuries. It may thus be essential for the tendons to precede the potential to adapt to these changed by increases in strength and vascularisation to avoid injury. This is supported by data indicating a close relationship between cross-sectional areas of muscles and their tendons 6-8. In order to maintain this relationship and withstand the increase in load the tendons need to adapt to the new situation by increasing tissue strength either by hypertrophy, increased cross-links or increased tissue density. Overuse of tendon tissue resulting in pain and malfunc-
tion represents a major problem within sports and ergonomics 9-12 stressing that adaptation of the tendon tissue is not always sufficient to withstand the increase in loading on the connective tissue during physical activity. However in spite of the high incidence of tendon overuse injuries and compared with muscle tissue, only little is known about the adaptive response of tendons to changes in loading. It has been shown that 12-week of eccentric resistance training can reduce pain in runners suffering from chronic Achilles tendino-
sis 13, but the mechanism behind the effectiveness of this treatment is unknown. In a recent study on elite soccer players suffering from chronic Achilles tendinosis we showed that the local effect of a heavy-resistance eccentric training on top of their regular training and soccer activity results in an increased turnover of the peritendinous connective tissue 14. After training collagen synthesis was significant increased in the initially injured tendon whereas no change was found in the healthy tendons in response to training indicating that eccentric rehabilitation has strengthened the tendons. Whether this strengthening of the tissues alone can explain the positive effect of eccentric training is however not clear, just as it is not known if eccentric training can be use to all types of overuse injuries in tendinous tissue.

INTEGRATION OF PODIATRY ASSESSMENT AND GAIT ANALYSIS IN THE TREATMENT OF RUNNING INJURIES

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Injured athletes increasingly attend podiatry clinics to obtain customised orthotic devices. Traditional podiatry assessment relies primarily on static measurements (1). The availability of automatic tracking systems for realtime monitoring of three-dimensional movement and systems for measurement of plantar pressure provide methods for obtaining dynamic data that can potentially inform the treatment of athletes with injury problems. The aim of this paper is to describe the use of running gait analysis to help determine appropriate treat-
ment modalities for injured athletes. A typical assessment includes a podiatry examination and the collection of over-ground running data. Three-dimensional movement data are used to monitor rearfoot inversion-eversion, ankle dorsi-plantar flexion, lower leg (tibial) internal rotation, knee flexion, knee ab/adduction and knee internal rotation. Five running trials are performed, and the resulting mean initial and peak joint angles are compared with published averages for running populations (2). Right and left sides are also compared for individual clients. Barefoot plantar pressure data are collected to identify characteristic features of the footstrike during running. Case studies are presented to illustrate the use of gait analysis to complement podiatry assessment. For example, a runner recovering from a cuboid stress fracture was found to have a pressure profile suggesting increased load on the lateral aspect of the foot and no rearfoot eversion on the side of the stress fracture. The greater inversion of the foot indicated by these data are suggested to be linked to the development of this injury. A runner with left knee pain was found to have limited ankle dorsi-flexion on the left side during running and high internal rotation of the tibia and knee for the left side. This internal rotation was suggested to be a compensation for the limited rearfoot eversion and to be linked to the knee pain. A netballer who had recently recovered from a left navicular stress fracture was found to have a high static range of motion at both the ankle and subtalar joints for the left side compared with the right, but a limited rearfoot eversion during running. This was suggested to be a compensation for the previous injury. It is acknowledged that there is a degree of subjectivity in the interpretation of these data to inform the treatment of sports injuries. However, the examples provided demonstrate that the additional data provided can complement traditional clinical measures, leading to a more evidence-based approach. Through the increased use of such an approach, an improved understanding of links between structure and function will be developed, ultimately resulting in a more objective process.

References
THE IMPORTANCE OF PSYCHOLOGICAL PREPARATION IN INJURY PREVENTION

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Background: The impact of stressful life events on the risk of incurring sports injuries has been widely accepted although the directly explained variances are small. In addition there is some support that situation-dependent emotional states and poor coping resources influence the risk of injury in specific athletic populations. However the empirical evidence from intervention studies in injury prevention appears to be scant. The purpose of this study was to examine the recent scientific evidence for psychosocial factors predictive of sport injuries and the relative efficacy of psychological strategies in reducing vulnerability to sport injuries. Methods: A systematic search was carried out for literature published between 1998-2008 on EBSCO host CINAHLplus, PsycINFO, SPORT Discus, MEDLINE 78 potential articles were identified. After all exclusions 7 observational, cohort, prospective studies and 2 reviews were retrieved for scrutinisation. No RCT’s were found.

Results: The theoretical basis for the importance of psychological preparation in injury prevention is convincing however the evidence from intervention studies to date offers limited support that psychological measures have utility in predicting or preventing injury. The methodological quality of the studies is limited by lack of heterogeneity, poor design, inconsistencies in evaluation strategies and a lack of RCT’s.

Conclusions: While there is some support that cognitive-appraisal models of sport injury provide an explanation of athletic injury risk, there is insufficient evidence to make any firm conclusions regarding the efficacy of psychological interventions. Further well designed studies are required. It is recommended that psychological factors such as anger and aggression, concentration and reaction are considered alongside coping resources and other physiological indicators of allostatic load such as level of stress hormones.

Invited symposia (IS)
IS-PM14 EFSMA Exchange Symposium. Cardio-circulatory adaptation and efficiency in response to intensive physical training

CARDIAC ADAPTATIONS ON ENDURANCE AND STRENGTH TRAINING - A CRITICAL REVIEW

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Athlete’s heart has been described for the first time over 100 years ago by Herrschin in cross country skiers. In 1975 Morganroth hypothesized two forms of cardiac adaptation on exercise by echocardiography: 1) an eccentric hypertrophy with an increase in left ventricular (LV) cavity dimensions and LV mass in endurance athletes caused from volume overload during exercise, and 2) a concentric hypertrophy with an increase in LV wall thickness and LV mass without changes in LV cavity dimensions resulting from pressure overload during strength or resistance training. Although over the following years further studies were able to demonstrate an increase in LV enddiastolic diameters and LV wall thickness in endurance athletes, controversial data were reported for LV dimensions in strength athletes. As some authors described a concentric hypertrophy, others did not find elevated LV wall thicknesses and masses in strength athletes. Beside the need to relate cardiac dimensions to body dimensions, also the possible use of anabolic steroids and their influence on the heart has to be considered, as greater LV wall thicknesses and masses have been demonstrated in anabolic steroids abusing bodybuilders whilst strength athletes and body builders without the use of anabolic steroids did not present a concentric hypertrophy.

It also has to be considered that echocardiography underlies a relative high inaccuracy when small differences between athletes of different disciplines and untrained control subjects or cardiac adaptations on exercise are compared. Therefore, a few studies used magnetic resonance imaging (MRI), which is more accurate but more expensive and less available than echocardiography, to examine cardiac adaptations on exercise. These studies confirmed the echocardiographic findings in endurance athletes and, in addition, a balanced eccentric hypertrophy of the left and right ventricle (RV) was reported. In two cross-sectional MRI studies, LV mass in strength athletes was lower than in endurance athletes and similar or only moderately higher in comparison to untrained control subjects. MRI derived LV enddiastolic volumes in strength athletes were also similar to untrained controls, whereas endurance athletes demonstrated the highest LV enddiastolic volumes. In an own recent MRI study, strength athletes presented higher LV and RV masses and enddiastolic volumes in comparison to untrained control subjects matched for body dimensions - with similar ratios for LV and RV masses and enddiastolic volumes in both groups. In conclusion, more evidence for the Morganroth hypothesis exists for an eccentric hypertrophy in endurance athletes than for a concentric hypertrophy in strength athletes. However, cardiac adaptations on exercise are probably not simply “black or white”, but there will be a greyscale of cardiac adaptations on exercise, and a number of confounding variables has to be considered in previous and future studies.

PERFORMANCE LIMITATION IN HEALTH AND DISEASE

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The so-called cardiopulmonary fitness is a central criterion in metabolic exercise testing of health or disease. The commonly applied measurement of maximum oxygen consumption derives only accumulative diagnostic information. While widespread in clinical diagnostics for heart or lung patients, measurement of peak VO2 enables for preclusive diagnostics only. For the differential diagnosis of disease related factors, use of further measures and methods is essential in the exercise laboratory: Blood lactate levels, heart rate, other breath-gas related measures, rates of perceived exertion or calculation of the anaerobic threshold are thereby applied in routine exercise tests. But complex line-ups sometimes challenge a conclusive diagnostic interpretation of exercise tests, especially in the clinical environment. The physician or scientist must be aware of the interaction of various performance limiting factors and he has to consider how these limitations are expressed into the test results.

The aspects of cardiopulmonary performance limitation in health and disease are subject of current discussion in the field of exercise physiology. Mental, muscular, pulmonary, metabolic, cardio-circulatory or even neuronal factors are included in this discussion. Hence, this presentation will shortly overview modern concepts of cardiopulmonary performance limitation and value its relevance for the interpretation of exercise test results.
FUNCTIONAL AND STRUCTURAL VASCULAR ADAPTATION TO EXERCISE TRAINING

Sandrock, M. DE
Without abstract submission!!

RELEVANCE OF BIOMARKERS OF EXERCISE-INDUCED MYOCARDIAL STRESS IN ATHLETES

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During recent years, assays for the determination of cardiac troponin T (cTnT) and cardiac troponin I (cTnI) as well as brain natriuretic peptide (BNP or NT-proBNP) have significantly improved the diagnostic power to detect subclinical cardiac damage and dysfunction.

Increased concentrations of biomarkers reflecting myocardial stress such as cardiac troponin I and T and brain natriuretic peptide (BNP) have been observed following strenuous, long-lasting endurance exercise. The pathophysiological background is still not fully elucidated and the interpretations of increased post-exercise concentrations range from (i) evidence for exercise-induced myocardial damage or dysfunction to (ii) non-relevant spurious troponin elevations, presumably caused by assay imprecision or heterophilic antibodies.

In contrast to cardiac troponins that indicate a structural damage to myocardial cells, an increase in BNP is a biomarker reflecting functional myocardial overload or heart failure. In patients, both, resting values as well as the magnitude of exercise-induced rise in BNP have shown to be associated with the severity of myocardial insufficiency. Whereas short maximal bouts of exercise e.g. ergometry to exhaustion do not induce an increase in NT-ProBNP, long-lasting endurance events such as marathon running or triathlon competitions were associated with marked increases in NT-proBNP. There seems to be a trend for higher concentrations with increased exercise duration and age of the participants. Explanations for increased NT-proBNP concentrations following strenuous long-lasting endurance events include neurohumoral activation of BNP release as well as a temporary myocardial systolic and/or diastolic dysfunction involving both right and left ventricles due to mechanical or volume overload.

Today, we have no sports-specific recommendations which levels in post-exercise concentrations of these cardiac biomarkers may be tolerated or regarded as normal after strenuous endurance exercise. Therefore, a rise in these markers should always result in a comprehensive cardiac examination. However, there are also no accepted scientific statements if or when these markers should be measured following exercise.

Consequently, we clearly need more studies to elucidate the scientific background and to investigate the existence of sports-specific ‘cut-off-levels’ for cardiac troponins and brain natriuretic peptide.

Invited symposia (IS)

IS-SH08 Talent development and sports career

TALENT VERSUS NON-TALENT IN SPORTS: PSYCHOLOGICAL DIFFERENCES

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Understanding the psychological processes of sport talents has been one of the major aims of researchers and practitioners. The goals have been either founding the best selection procedures, or to develop strategies that may increase the psychological adaptation of the young athletes. Research on perfectionism in sports is not very common, although it has increased in the last decade. It is suggested that perfectionism is important to the athletes’ adaptation to competition and that top athletes are characterised by adjusted perfectionism. Adjusted or positive perfectionism seems to be related to high achievement patterns, motivation and task orientation, while negative perfectionists seem to be oriented to avoid failure and perceive the environment as threatening. Literature also suggests that sport young talents and low level young athletes have different interactive patterns with life and sports situations.

The aim of this research was to study perfectionism in Portuguese young soccer players as a component of young talents. Young talents were compared to non-talented players taking into account two phases of sports career (under-17 and under-19). Participants were 82 talented (participation in regional or national teams) and 129 non-talented players aged 13-18. The tool used was the Portuguese version of the Multidimensional Perfectionism Scale-MPS, 5-points Likert scale (Frost, Marten, Lahart & Rosenblate, 1990), administered to the athletes. When comparing the general sample of talents with non-talents, results suggest that talented players have higher values of achievement patterns (3.71 x 3.30) and organization (4.00 x 3.71), as well as lower levels of doubts about the actions (2.59 x 2.82) and parental criticism (1.67 x 1.99). No differences are found when comparing under-17 with under-19 players in the talented group. However, non-talented older subjects reveal significant differences when compared to the younger ones in parental criticism (2.07 x 1.75) and parental expectations (2.70 x 2.30). Thus, we may conclude that talented players have higher adjusted and lower negative perfectionism when compared with the non-talented players. On the other hand, talented players seem to be stable regarding the perfectionism patterns along the career, unlike the non-talented players, and the parents’ role in their children’s perfectionism suggest the importance of the social influence in talents development reported in the international literature. Results will be discussed taking into account the coaching processes regarding the development of the psychological characteristics of sports talents.


COACH-ATHLETE RELATIONSHIPS - CURRENT APPROACHES AND NEW DATA

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Coaches are said to be the most influential agents in the process of athletes’ career development. In the past, popular approaches to measure and investigate coach-athlete interaction have been the Multidimensional Model of Leadership (Chelladurai & Riemer, 1998)
and the Meditational Model of Smoll and Smith (1989). Both models postulate a significant relationship of perceived and actual behavior of coaches to athletes’ psychological development, like satisfaction and motivation. A third approach is focused on the motivational climate. Seifriz, Duda and Chi (1992) postulate a mastery climate and a performance climate with different impact on athletes motivation and satisfaction. In two former studies we could show that leadership style and motivational climate not only contribute to athletes’ psychological development but also to skill development (Alfermann, Lee & Würth, 2005).

All three approaches do not consider the emotional relationship between coach and athlete. As an alternative, Sophia Jowett developed a questionnaire, the CART-Q, to measure the social relationship between coaches and athlete (Jowett, 2007). Based on the CART-Q we developed a German version of the questionnaire and administered it to coaches and athletes. Data on factorial structure, reliability, and correlations with existing measures of leadership style and motivational climate are presented.

References.


THE DEVELOPMENT OF THE ATHLETE-COACH RELATIONSHIP THROUGHOUT THE ATHLETIC CAREER OF ELITE FLEMISH FEMALE JUDOKAS

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Little research has been conducted on the development of the athlete-coach relationship throughout and after the sports career. Using a semi-structured interview five male coach-female judoka dyads that worked together for at least two athletic stages were studied, taking coaches and athletes’ role in consideration during the athletic stages of initiation, development, perfection and discontinuation (Wyllie, and Lavallee, 2004). Judokas were selected for at least one European championship or had retired. Interpersonal constructs of closeness, co-orientation, and complementarity (Jowett & Meek, 2000) were used for comparing coaches and judokas’ behavior and coaches’ style of leadership were labeled using the Leadership Scale for Sports (Chelladura & Riemer, 1995). During the initiation stage, little closeness within each dyad was perceived. Coaches got to know athletes using observations. Co-orientation was still limited. Coaches nor judokas thought about results. Complementarity consisted of a motivational role of the coach using technical feedback, doing fun interactive games and gradually leading them into the world of judo. Judokas were motivated depending on the amount of fun experienced. Technical was a very important factor. The leadership style of the coach could be labeled as ‘Positive Feedback’. During the developmental stage more closeness within the dyads was found. Personal bonds between athletes-coaches became more important with the amount of trust in the coach growing fundamentally. Coaches supported athletes more often at tournaments. Co-orientation was expressed via coach-pupil communication with verbal communication changing to a two way communication. Coaches used open ended questions about training sessions. Judokas asked for specific exercises aimed at how to deal with particular opponents. Results and outcomes became important. The extent of complementarity varied a great deal among the five dyads. While technique continued to be a very important factor, tactics and competitions also came to play a central role during this stage. The coach leadership style could be labeled ‘Training and Instruction’ and ‘Social Support’. During the stage of perfection, communication between coaches and judokas was reciprocal and goals were set together. Athletes’ commitment to the sport, discipline and lifestyle became very important. Coaches motivated the judokas by conducting evaluation conversations and making them aware of their capabilities and performances. Coaches’ leadership styles ‘Training and Instruction’ and ‘Social Support’ became even more salient, but also more and more democratic. This new style may well be identified as ‘Democratic behavior’. During the discontinuation stage contact between coach-athlete became looser and more adult. In conclusion, it can be said that the characteristics of closeness, co-orientation and complementarity of the judoka-coach relationships adopted different forms throughout the athletic career.

Invited symposia (IS)

IS-SH09 (Un)healthy bodies?

BEST PRACTICES? SPORT SCIENCE AND BIOMEDICAL PHYSICAL ACTIVITY DISCOURSES IN THE UNITED STATES

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This project examines the various, and often competing, physical activity discourses developed within the biomedical and physical education domain during the past 35 years. Since the 1970s and the proliferation of irrefutable evidence of the health benefits of regular physical activity, government agencies, educational institutions, and biomedical research entities have worked to identify the determinants, barriers, and disparities that influence individual and societal physical activity behavior. Websites and published materials of such organizations as the Centers for Disease Control (CDC), the American College of Sports Medicine (ACSM), and the Surgeon General of the United States, will be considered for their efforts to encourage physical activity as personal responsibility while increasingly acknowledging the social, environmental, policy, and other barriers to engagement in physically active behavior. Explanations for physical inactivity are also explored as they parallel this paradigm shift from individual to social responsibility.
Changes in leg-spring behavior during a constant velocity run to exhaustion in elite triathletes

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Introduction
The spring-mass model has been recently used to investigate the effect of fatigue during running (Dutto et al., 2002; Hunter et al. 2007). These authors, who evaluated the leg-spring behavior during a running that lasted between 45 to 90 minutes, demonstrated a decrease of the leg stiffness (K_leg). Slawinski et al. (2008) has investigated the effects of fatigue induced by a supra lactic threshold running on the leg stiffness. This study did not show significant change in K_leg between runs performed before and after a 2000 m run. However, no measure was realized during the fatiguing test. The purpose of the present study was to explore whether fatigue induced by a high intensity constant velocity run 95% of VO2max leads to change in leg-spring behavior.

Methods
A group of 9 triathletes, 6 males [23.2 (SD3.2) years; 181.7 (SD2.4) cm; 68.3 (SD5.4) kg] and 3 females [25.0 (SD4.4) years; 166.7 (SD4.2) cm; 58.3 (SD3.2) kg] participated in the study. Two runs were required. The first run was a graded exercise test to determine the velocity corresponding to 95% of VO2max. Mechanical parameters were measured during Tlim from 5 force plates (Kistler; 500 Hz) integrated on a 5 m distance into the ground. Leg stiffness (K_leg) was calculated classically (McMahon and Cheng, 1990). Step temporal parameters were also analyzed with repeated measures ANOVA and Scheffe post hoc tests.

Results
Mean values of VO2max were 5.1 (SD 0.3) m.s-1 during the incremental test. For the constant velocity run, mean time (Tlim) was 10'43" (SD 2'37''). Leg stiffness was found to decrease (from 11.2 to 10.2 kN.m-1) with exhaustion (P=0.01). Vertical Force peak during contact (Fpeak) decreased significantly with fatigue from 1963 (SD262) to 1772 (SD219) N while the changes in leg spring compression (L) from 0.168 (SD0.007) to 0.175 (SD0.015) m was not significant. Despite a slight but significant increase (P=0.048) in contact time (from 0.199 [SD0.067] to 0.204 [SD0.005] s), the step frequency increased (from 3.03 [SD0.02] to 3.10 [SD0.02] Hz, P=0.015) because of a greater decrease (P<0.0001) of the aerial time (from 0.131 [SD0.02] to 0.119 [SD0.01] s).

Discussion
The results of the present study show that K_leg was significantly influenced by the fatigue resulting from a constant velocity run. The decrease of this mechanical parameter was more influenced by force changes during the contact phases than changes in leg spring compression. The analysis of temporal parameters suggests that, at this speed (around 5 m.s-1), the increase of the step frequency (despite a higher contact time) could be the strategy in elite triathletes to maintain the constant velocity. This strategy tends to decrease the force that has to be supported during the contact phase and then leads to a decrease in leg-spring behavior.

EMG of lower limb muscles and biomechanics of pedalling during a high intensity exercise performed until exhaustion

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Introduction
In contrast with several factors such as workload, pedaling rate or body position, the influence of fatigue on the pattern of muscles activation and/or the profile of forces exerted on pedals is more open to discussion (Hug and Dorel, in press). If some studies suggest that it could be mainly attributed to progressive recruitment of additional motor units (and hence an increase in EMG RMS for some muscles), it...
could also be assumed that fatigue induces changes of the coordination of the lower limb muscles. From a biomechanical point of view, only one study recently focused on the alteration of torque profile and index of effectiveness during a high intensity cycling exercise but EMG was not recorded (Sanderson et al., 2003). The aim of this study was, therefore, to simultaneously examine the coordination of the main lower limb muscles and biomechanics of pedal force production during a high intensity cycling exercise performed until exhaustion.

Methods
After a first session during which they achieved a classical incremental maximal cycling protocol, ten trained cyclists performed an exercise at 80% of the maximal power sustained during the first session (i.e. 328±22 W) until they were completely exhausted. The cycle ergometer (Excalibur Sport, Lode®, Netherlands) was equipped with instrumented pedals specifically designed for pedaling load measurements by VelUS group. Mechanical variables (effective force, total force, index of effectiveness: IE) and surface EMG of ten lower limb muscles (TA, SOL, GL, GM, VL, RF, VM, BF, SM, GMax) were continuously recorded during the protocol.

Results
Between the start and the last minute, GMax and BF RMS showed a significant increase of 29% (P<0.01) and 15% (P<0.05) respectively, whereas GM and TA RMS showed a decrease of 10 and 15% (P<0.05), respectively. Maximal total force and effective force as well as positive impulse values were significantly greater in the final (428 N, 400 N and 75.4 N.s) than in the first minute (409 N, 379 N, 69.1 N.s, P<0.01) and the negative impulse value was smaller in the first than in the final minute (-7.1 N.s vs. -8.3 N.s, P<0.05). The mean value of the overall IE did not change significantly but the cross-correlation technique indicated that instantaneous effectiveness during the last part of the upstroke phase (i.e. near the top dead central) decreased at the end of exercise.

Conclusion
These results provide additional evidence that fatigue leads riders to become less effective during the recovery phase, which increases the demand for forces during the propulsive phase. Neuromuscular adaptations (especially the increased activity of hip extensors and decreased activity of ankle extensors and flexors) observed with the occurrence of fatigue are strongly related to these results and could partly explain these adjustments in the force production.

References
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GENDER SPECIFIC KINEMATICS AND MUSCLE ACTIVITY DEPENDING ON RUNNING SURFACE

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Introduction
According to the literature, running injuries differ between female and male runners (Taunton et al., 2002). This is considered to be related to gender specific running mechanics (Ferber et al., 2003). Running mechanics is related to muscle activation. Within men, running kinematics as well as muscle activation are known to depend on running surface (Nigg et al. 1995, VonTscharner et al., 2003). Little is known concerning surface related running mechanics in female runners. Therefore the purpose of this study was to get information about kinematics and muscle activity of female and male runners while running on different surfaces in order to see if there are gender specific differences in kinematics and muscle activation and if muscular and kinematical responses to surface changes are gender specific.

Methods
14 subjects (5 female, 9 male) were tested during running barefoot (v=3.75+0.25m/s) on grass and on tartan. Surface EMG (10 steps per subject) was recorded (3000 Hz) from mm. tibialis anterior, peroneus longus, gastrocnemius lateralis (GL), semitendinosus, vastus medialis (VM) and tensor fasciae latae (TFL). Three-dimensional kinematics of knee and ankle joint were recorded by 12 infrared highspeed cameras (VICON, 250 Hz).

Results
Muscle activation and kinematics were different between gender groups in both running conditions. Changes in surface condition led to changes in muscle activation and kinematics within all subjects. Except for knee abduction/adduction time history, kinematical responses to surface changes were in trend similar between gender groups. EMG responses to surface changes were gender specific and in several muscles (GL, TFL, VM, FMI) converge between gender groups.

Discussion
Data indicate that dynamic segment alignment is different between gender groups. Possible explanations are gender specific differences in muscle strength, anthropometry, connective tissue properties or foot sensitivity.

Understanding gender specific running kinematics and muscle activation may lead to valuable information for future gender specific footwear design and prevention of running injuries.

References

HERITABILITY OF SPEED PERFORMANCE AND ITS BIOMECHANICAL CHARACTERISTICS

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The relative influence of genes and environment to the diversity of human performance has been extensively studied by using the twin model and deriving heritability estimates, based on comparisons between monozygotic (MZ) and dizygotic (DZ) twins (Kissouras, et al., 2007). However there is a scarcity of data regarding the heritability of running speed as well as its biomechanical characteristics and related functional abilities. For this purpose 12 pairs of twin brothers (5 MZ and 7 DZ), aged 19-29 years, performed an all out 60m run, while its kinematic characteristics were assessed with electronic photocells (Brower Systems) and high frequency cameras (125 Hz). In addition, the twins performed jumping trials on a force plate (Kistler 928AA) and isometric trials on an isokinetic dynamometer (Cybex II+). Data obtained were analysed using single-factor analysis of variance. The variance of intrapair differences (Clark equation) was used for
the computation of heritability estimates, provided that differences in genetic variance between the twin types (F I test) were significant at the level of 5% and the differences between means (t-test) and total variance (F I test) of both types of twins were not significant. These genetic hypotheses were not supported for running speed and hence the computation of heritability estimate was abandoned. However, the hypotheses were satisfied for biomechanical characteristics of the run and the computed heritability estimates were 0.891, 0.858 and 0.803 (p<0.05) for stance time, ankle angle and knee angle during landing respectively. The genetic hypotheses were also satisfied for critical functional abilities and heritability estimates were found to be 0.924 for take off velocity, 0.896 for velocity needed to attain maximum power and 0.931 for vertical displacement (p<0.05) during drop jumps from a 40cm height, jumping trials related to the utilization of elastic energy. Regarding the maximal isometric trials, heritability estimates were 0.841 and 0.846 for rate of force development at 100ms from the left and the right ankle plantar flexors respectively. In conclusion, genes do not seem to play a significant role to individual differences in running speed but they could explain some differences in its contributing factors such as the duration of stance phase, the utilization of elastic energy and the rate of force development.

References:

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ASYMMETRY OF UNILATERAL LEG STIFFNESS
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Vertical stiffness of the musculoskeletal system has been studied extensively using mass-spring modeling, however most studies involve the investigation of the bilateral stiffness of the lower extremities with only few examining unilateral leg stiffness (Dalleau 1998). The purpose of this study was to determine the relationship between bilateral and unilateral vertical stiffness during hopping. This was a part of a larger study evaluating how parameters such as stiffness during hopping and running are different between three distinct athletic populations.

Methods:
13 subjects (11 power lifters and 2 distance runners) were tested in bilateral and unilateral hopping for 15 seconds on a floor mounted force plate (AMTI). The average stiffness of 10 consecutive hopping cycles was used for analysis. Vertical stiffness was determined using the model of Morin et al. (2005) which is based on contact and flight time to predict force and displacement. For statistical analysis, the more stiff and the more compliant leg were identified and compared using paired t-test (N=13). In addition, dominant and non-dominant leg were identified and compared using paired t-test (N=12 as dominance was not identified for one subject).

Results:
Bilateral stiffness (18.7 ± 3.7 kN·m-1) was significantly greater than unilateral vertical stiffness (p<0.05). For unilateral stiffness comparisons, the stiff and compliant legs differed by about 14% (14.7 ± 3.6 vs 12.8 ± 3.2 kN·m-1, p<0.05). Dominant and non-dominant legs were not significantly different (13.7 ± 3.4 vs 12.5 ± 2.1 kN·m-1 respectively, p=0.10). Within subject variability across 10 hops was similar for each leg grouping (CV of 10-12%).

Discussion:
Dalleau et al (1998) distinguished leg contributions to running by identifying one leg as propulsive and the other as a stiffer, “stick” leg. While mean values were not significantly different, the dominant leg was generally stiffer in unilateral hopping than the non-dominant side. For 75% of subjects the stiffest leg was the dominant leg. Whether this dominant vs. non-dominant stiffness difference continues during bilateral hopping was not examined here as separate force measures were not obtained.

Conclusion:
Significant asymmetry of vertical stiffness was found between legs in unilateral hopping. The dominant leg was stiffer than the non-dominant side for most subjects.

References:

CHANGES IN MAXIMAL AND EXPLOSIVE STRENGTH, EMG AND MUSCLE THICKNESS OF LOWER AND UPPER EXTREMITIES INDUCED BY COMBINED STRENGTH AND ENDURANCE TRAINING IN SOLDIERS
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Military tasks are often exposed to multistressors, which are very challenging for the soldier’s physical and mental performance (Nindl et al. 2002). They consist of demanding tasks like carrying or lifting heavy loads and materials, digging foxholes or prolonged marches with extra loads of combat gear of 25-65 kg in harsh circumstances. Therefore, in the military operations require high levels of both aerobic and neuromuscular performance. The purpose of present study was to examine to what extent an 8-week endurance based military training (NT) period interferes with muscle strength development in the conscripts compared to that caused by sport related military training with added strength (ST) or added endurance training (ET). More specifically, we examined effects of these three training modes on maximal isometric force, maximal rate of force development (RFD), electromyography (EMG) and muscle thickness of the lower and upper extremities.

In the beginning of basic training (BT) season male conscripts were divided into ET, ST and normal training (NT) groups (n=24 in each group). Their mean age was 19.2±0.9 yrs., height 1.79±0.06 m, initial body mass (BMI) 73.8±12.4 kg, and body mass index (BMI) 23.0±3.8. The overall physical loading of the military training was the same in ET, ST and NT but the groups differed with regard to three specific training sessions per week (cycling, nordic walking and running for ET, strengthening for ST and overall sport related physical training for NT). The measurements included isometric force-time parameters of the leg and arm extensors and EMG activity from the vastus lateralis, vastus medialis, rectus femoris and triceps brachii muscles. The 8-week BT combined with added ST and ET significantly improved maximal bilateral isometric force of the arm extensors in ST by 11.8% (p<0.001), ET by 13.9% (p<0.001) and NT by 7.8% (p<0.05). ST and ET showed significant increases in maximal EMG activity of the trained arm muscles. A significant increase was also observed in maximal RFD of the upper extremities only in ST by 28.1% (p<0.05). Both ST and ET increased their maximal leg extension strength by 12.9% (p<0.01) and 9.1% (p<0.05), respectively, while no significant change occurred in NT (5.2%, p=0.45). No significant changes were observed in the
shape of the force-time curves of the leg extensors as well as in muscle thickness of the lower and upper extremities. The present BT training with a large amount of endurance based military training interfered with strength development, and especially, explosive power development of the lower extremities in the ST group. The optimal improvements in neuromuscular characteristics may not be possible without some decreases in the amount of the endurance based military training and/or some increases in the amount of the strength training during the BT.

References:

Oral presentations (OP)

OP-MB02 Molecular Biology 2

CHANGES IN THE RAT CARDIAC PROTEOME IN RESPONSE TO INTENSITY-CONTROLLED ENDURANCE EXERCISE

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Endurance training improves cardiac performance and provides greater protection against heart disease. The rodent model of intensity-controlled treadmill running replicates the prescription of endurance exercise in humans and can be used to investigate molecular adaptations in the heart. To further understand the beneficial effects of exercise, I have combined this model with an inductive proteomics approach to discover differences in protein expression between hearts of endurance-trained and sedentary animals.

Rats (n = 6, 280 ± 10 g) were exercised on a motorised treadmill within a metabolic chamber linked to a gas analyser, and their peak oxygen uptake (VO2peak) was measured using an incremental exercise test. Animals assigned to the exercise group trained for 30 min at 70% of their VO2peak, 4 days per week. Each animal’s VO2peak was measured at 2-week intervals and based on these data the treadmill speed or incline was increased in order to maintain a consistent relative training intensity. Rats were killed 4 h after a final VO2peak test and their cardiac proteome compared with weight-matched control animals (n = 6, 330 ± 5 g). Proteins were isoelectrically focused on immobilised pH gradient strips (pH 3-11 non-linear) and resolved by denaturing gel electrophoresis. Protein spots of interest were digested with trypsin and analysed using matrix-assisted laser desorption ionisation tandem time of flight mass spectrometry, and the peptide- and fragment-ion spectra were searched against the Swiss-Prot database using Mascot (www.matrixscience.com).

The average VO2peak of animals in the exercise group increased by 23% (P=0.008) over the 6-week training regimen, and the cardiac protein content of exercised animals was 11% greater (P=0.043) than that of the weight-matched controls. Proteome expression analysis identified 23 protein spots that differed significantly (P<0.05) between exercised and control groups. Increases were measured in the expression of myofibrillar proteins (e.g. alpha- myosin heavy chain and cardiac alpha-actin), and proteins associated with fatty acid metabolism (e.g. heart fatty acid binding protein, acyl-CoA dehydrogenase and mitochondrial thioesterase-1) and the maltate-aspartate shuttle (aspartate aminotransferase and cystolic maltate dehydrogenase). In addition, endurance training induced a shift in the gel pattern of heat shock protein 20 indicative of phosphorylation, and analysis of fragment ion spectra mapped this modification to serine 16.

These findings are consistent with microarray data that show elevated expression of genes associated with fatty acid metabolism differentiates adaptive from maladaptive cardiac hypertrophy. Phosphorylation of heat shock protein 20 at serine 16 is associated with improved cardiomyocyte contractility and protection against apoptosis, and has been identified as a therapeutic target against heart disease. These data show that endurance exercise is able to achieve this effect.

EFFECTS OF A SINGLE RESISTANCE EXERCISE BOUT ON MYOGENIC MARKERS IN SKELETAL MUSCLES OF ELDERLY MASTER WEIGHT LIFTERS AND SEDENTARY CONTROLS

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Introduction: Ageing is associated with a progressive loss of muscle mass and strength often resulting in reduced functional capacity. On a molecular basis it has been shown that ageing alters gene expression of muscle growth and remodelling such as the insulin-like growth factor-1 (IGF-1) or myostatin resulting in an impaired muscle protein turnover and/or a reduced function of muscle stem cells. It is known that resistance exercise training provides an effective measure to increase muscle mass and strength even in older individuals. However, the molecular response to exercise in the elderly seems to be diminished in comparison to younger subjects. In this study we hypothesized that elderly subjects who regularly underwent professional resistance exercise training such as elite weight lifters respond differently to a single bout of resistance exercise than sedentary age-matched controls.

Methods: Eight elderly (61±/-9 yr) still active master weight lifters (WL) and 8 elderly (61±/-8 yr) sedentary controls (SC) were recruited from the Tirana (Albania) area. They were free of disorders that might have affected their ability to complete resistance exercise and testing for the study. Subjects were not obese (BMI < 30) and none of the sedentary controls had undergone leg resistance training within the past 5 yr. At least 2 d after assessment of 1-RM on a leg extension device, a unilateral leg extension exercise session was applied (3 sets, 70-75% of the 1-RM until voluntary fatigue, 2-min rest between the sets). Three hours after termination of the exercise, skeletal muscle biopsies were taken from m. vastus lateralis using the Bergstrom needle technique. The tissue was immediately stored in RNAlater solution and frozen until analysis. After extraction of RNA from 10-15 mg tissue and cDNA synthesis, q RT-PCR was performed to measure mRNA levels of two splicing variants of IGF-1 (IGF-1Ea and MGF), the growth inhibitor myostatin as well as the transcription factors myogenin, and MyoD. mRNA levels of these genes were normalized to mRNA levels of GAPDH. Results: Both groups did not differ in age, BMI, height, and weight. As expected the relative 1-RM was significantly higher (+24%, p<0.05) in WL than in SC. On a molecular basis the single exercise session caused a loss of myostatin mRNA in both groups (52% in SC, -36% in WL, p<0.01). Although myostatin levels were similar in the control legs of both groups between the groups myostatin mRNA levels of exercised legs were significantly lower in SC (13%, p<0.01). We could not detect any differences in IGF-1Ea, MGF and myogenin neither after exercise nor between the groups.

Conclusion: This study clearly showed that a single bout of exercise is able to affect myostatin levels in trained as well as in untrained elderly individuals without affecting other myogenic markers. However, as this study provides only data from a single time point after exercise a further study is needed to address possible time effects.
MOLECULAR FACTORS INVOLVED IN THE ANGIOGENESIS PROCESS OF EXERCISED MOUSE HEARTS

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In the literature controversial results concerning to the myocardial capillary growth induced by exercise training are present and angiogenesis appears to depend on the animal age, exercise type and time course of exercise-induced adaptations in the coronary microvasculature (1). In our previous studies hearts from mice trained for 30 and 45 days by endurance protocol showed hypertrophy due to a significant increase in the capillary area (2). This modification was associated with an increase in vimentin and connexin-43 expression in interstitial connective tissue cells suggesting an enhanced request of vascular remodelling and growth factors and a new role of Cx43 in cardiac angiogenesis. In order to study molecular mechanisms involved in this process, we also examined the expression of vascular endothelial growth factor receptors (VEGFR) that have been shown to be fundamental regulators in the cell signalling of angiogenesis. We observed that the expression of VEGFR-1 and VEGFR-2 was differently regulated by endurance training and their expression pattern was affected by the time points of training protocol.

Among primary prerequisites for angiogenic process are included: 1) physical and haemodynamic forces, tissue ischaemia and hypoxia, 2) vascular relaxation by nitric oxide, 3) degradation of the basal membrane by matrix metalloproteinases (MMPs).

The aims of present study were to analyze the expression of hypoxia inducible factor-1α/β (HIF-1α/β) and inducible nitric oxide synthase (iNOS), and activity of matrix metalloproteinases 2 and 9 (MMP-2, MMP-9) in capillary growth of trained mouse hearts.

Sixty-three male Swiss mice, ten-week-old, were divided into control untrained groups (C0, C15, C30, C45) and groups trained for 15 (T15), 30 (T30) and 45 (T45) days by treadmill. The expression of HIF-1α and iNOS were respectively examined by western blot and RT-PCR analyses. MMP-2, MMP-9 activity was analyzed by gelatin zymography.

Results showed that HIF-1α expression was higher in T30 group than control, T30 and T45 animals. iNOS expression increased in T15 and T30 mice compared to control and T45 animals. MMP-9 activity showed an increase in T15 group compared to control, T30 and T45 groups. In T30 and T45 mice MMP-2 activity resulted to be slightly lower than control animals.

Expression profile of HIF-1α and iNOS suggests their involving in early events of angiogenesis process induced by endurance training. For instance, a hypothetical pathway might include HIF-1α as an upstream regulator of iNOS and induce capillary proliferation. Indeed, it is known that both factors are activators of VEGF system. The regulation of MMP-2 and MMP-9 activity suggests a role of these proteins in cell matrix remodelling in response to exercise.

References.

ANGIOTENSIN CONVERTING ENZYME INSERTION/DELETION POLYMORPHISM IS NOT ASSOCIATED WITH FAT FREE MASS OR STRENGTH IN POSTMENOPAUSAL BRAZILIAN WOMEN

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The age-associated loss of fat free mass (FFM) and muscle strength is broadly referred as sarcopenia and is related to physical disability among older individuals (Baumgartner et al., 1999). Although the heritability of FFM and strength have been well described (Carmelli and Reed, 2000), the identification of specific allelic variants contributing to these phenotypes requires future investigations. It has been suggested that the angiotensin-I converting enzyme (ACE) insertion/deletion polymorphism is associated to muscle-related phenotypes (Hopkinson et al., 2004), however, this observation is not consensual (Fooland et al., 2000). The present study examined the association between the ACE insertion/deletion polymorphism with FFM and muscle strength in postmenopausal Brazilian women. After exclusion criteria were applied, a total of 246 volunteers (age 66.51 ± 6.37 years) underwent knee extension isokinetic peak torque assessment using the Biodex System 3 dynamometer and FFM measurements by dual energy x-ray absorptiometry. ACE genotypes were determined by polymerase chain reaction and differences between genotype groups were examined by analysis of covariance. Genotype distribution was in Hardy-Weinberg equilibrium (DD 30.2%; ID 47.6%; and II 22.2%). The ACE insertion/deletion polymorphism was not associated with body FFM (0.908) and relative appendicular FFM (0.224). Furthermore, no difference between genotype groups was observed for quadriceps strength (p = 0.823). In summary, the present findings suggest that the ACE insertion/deletion polymorphism is not associated with FFM or strength in postmenopausal women. Further studies in different sample population are required to confirm these results.

References.

EXERCISE-INDUCED EXPRESSION OF ANGIOGENIC GROWTH FACTORS IN SKELETAL MUSCLE AND IN CAPILLARIES OF HEALTHY AND DIABETIC MICE

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Background
Diabetes has negative, and exercise training positive, effects on the skeletal muscle vasculature, but the mechanisms are not yet fully understood. In the present experiment the effects of running exercise on the mRNA expression of pro- and antiangiogenic factors were studied in healthy and diabetic skeletal muscle. The responses in capillaries and muscle fibers, collected from the muscle with laser capture microdissection, were also studied separately.

Methods
Healthy and streptozotocin-induced diabetic mice were divided into sedentary and exercise groups. Exercise was a single bout of 1 h running on a treadmill. Gastrocnemius muscles were harvested 3 h and 6 h post exercise, and angiogenesis-related gene expressions were analyzed with real-time PCR. In addition to muscle homogenates, capillaries and muscle fibers were collected from the muscle with laser capture microdissection method and analyzed for vascular endothelial growth factor A (VEGF-A) and thrombospondin-1 (TSP-1) mRNA expression.

Results

Of the proangiogenic factors, VEGF-A and VEGF receptor-2 (VEGFR-2) mRNA expression increased significantly (P < 0.05) in healthy skeletal muscle 6 h post exercise. VEGF-B also showed a similar trend (P = 0.08). No significant change was observed post exercise in diabetic muscles in the expression of VEGF-A, VEGFR-2 or VEGFR-1. The expression of angiogenesis inhibitor TSP-1 and angiogenic extracellular matrix protein Cyr61 were significantly increased in diabetic muscles (P < 0.05-0.01). Capillary mRNA expression resembled that in the muscle homogenates, however, the responses were greater in capillaries compared to muscle homogenates and pure muscle fibers.

Conclusions

The present study is the first to report the effects of a single bout of exercise on the expression of pro- and antiangiogenic factors in diabetic skeletal muscle, and it provides novel data about the separate responses in capillaries and muscle fibers to exercise and diabetes. Diabetic mice seem to have lower angiogenic responses to exercise compared to healthy mice, and they show markedly increased expression of angiogenesis inhibitor TSP-1. Furthermore, exercise-induced VEGF-A expression was shown to be greater in capillaries than in muscle fibers.

A SINGLE SESSION OF CIRCUIT RESISTANCE EXERCISE ENHANCES ABCA1 EXPRESSION IN HUMAN PERIPHERAL BLOOD LYMPHOCYTE

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A T P-binding cassette transporters (ABCs) belong to a large family and include 49 mammalian transmembrane transporters that transfer a variety of substrates across the lipid bilayers in an energy-dependent manner. ABCA1 is a member of this family which plays a crucial role in plasma HDL-C remodeling. The purposes of this study were to investigate peripheral blood lymphocytes (PBL) ABCA1 expression, plasma lipids, lipoprotein levels in response to single session of circuit-resistance exercise (CRE). Twenty-five young female college students (age 19-29 yr, height 155-171 cm, body weight 45-65 kg, BMI 18.49-24.17 kg/m2) volunteered and randomly divided control, exercise, 3 sets of 3 non-stop circuits, 1 min rest intersets). Plasma was collected before and immediately after exercise for extraction of PBL ABCA1 mRNA and glucose, lipids, and lipoprotein measurement. PBL ABCA1 mRNA expression was significantly (P<0.001) increased in all exercise intensities with more pronunciation in mixed and 60% of 1RM groups. Plasma glucose concentrations were significantly increased in all exercise intensities with more pronunciation in mixed and 60% of 1RM groups. Plasma glucose concentrations were significantly increase immediately following exercise in all groups. Plasma HDL-C was significantly higher (P<0.005) in mixed group. Changes in plasma TC, TG, LDL-C, and VLDL-C concentrations were not significant. A significant TC/HDL-C and LDL/HDL-C ratios was observed in mixed group. In conclusion, a single session of CRE increased PBL ABCA1 expression and this increase was more pronounced in mixed group with higher HDL-C concentration. It seems CRE with mixed intensities is more suitable for PLB ABCA1expression and Plasma HDL-C change.
SPEED REGULATION DURING HILL RUNNING: A FIELD STUDY USING GPS, ECG, ACCELEROMETRY AND A PORTABLE METABOLIC ANALYSER

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Introduction

Though self-selected walking speeds have been investigated extensively, limits in available technology have constrained similar studies of outdoor running. This investigation utilised recent advances in portable monitoring systems to characterise the way in which runners continually regulate their speeds during overground running. A specific focus was on running in hilly terrain as this puts a premium on optimising the rate of energy expenditure through the control of running speed.

Methods

Eight well trained distance runners (VO2 max 69.8 ± 5.4 mls.kg.min⁻¹) ran three laps of a course incorporating uphill, downhill (approximately ± 8% grade) and level sections. A single-lead ECG supplied continuous heart rate data, while a tri-axial accelerometer and continuous speed data from a GPS receiver provided cadence and stride length estimates. Oxygen cost and ventilation data were collected breath by breath with a portable metabolic analyser, allowing comparison with indices of physiological capacity collected earlier in a laboratory trial.

Results

Runners ran faster on lap 1 (3.88 ± 0.40 m.s⁻¹), than lap 2 (3.66 ± 0.34 m.s⁻¹), but while four runners increased speed from laps 2 to 3 (+3.9%), the other four decreased (-1.7%). As expected, runners varied their speed inversely with gradient; (uphill 2.93 ± 0.27 m.s⁻¹, downhill: 4.35 ± 0.46 m.s⁻¹, level: 3.83 ± 0.34 m.s⁻¹). In addition, between subject variation of downhill running speed was 145% and 72% greater than corresponding values for uphill and level sections expressed relative to the runner’s individual ventilatory threshold, oxygen uptake was lower on downhills (82.1% ± 7.5%) than level sections (90.3% ± 8.5%) or uphills (101.2 % ± 10.1%). Stride length and cadence both increased on downhills and decreased on uphills, however, initial results suggest speed was primarily regulated by changes in stride length (88%) rather than cadence (13%).

Discussion

This study is among the first to examine continuous changes in gait parameters, energy cost and speed during outdoor running. The larger variability in downhill speeds, coupled with the finding that speeds were not limited by physiological cost, suggest that there is greater scope for improving performance on downhill sections. This requires that factors limiting downhill running speed be identified. Stride length and cadence data may partially reflect some of these limits. Runners who started faster than their speed at ventilatory threshold slowed from lap 2 to lap 3, while those who started slower accelerated in the final lap. This suggests that small departures from optimum starting pace may have major effects on performance at the end of the exercise bout. In turn, this could be a crucial factor in determining race outcome on hilly courses.

HEART RATE VARIABILITY AND PHYSICAL ACTIVITY MEASURED SIMULTANEOUSLY DURING WAKING HOURS

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PURPOSE: Heart rate variability (HRV) during ambulatory condition has been proposed to be affected by individual differences in frequency, duration, and extent of daily physical activity (PA) [1-3]. However, the association between PA and different spectral components of HRV during daily activities is not well known. We examined correlation between simultaneously measured HRV and PA during waking hours in healthy subjects.

METHODS: Fifteen healthy adults (seven men, eight women; age 36±3 yr, body mass index 25±3 kg/m²) wore a Polar accelerometer and an R-R recorder (Polar Electro Oy, Kempele, Finland) for 24 hours. We identified PA bouts during waking hours from minute-by-minute accelerometer data as metabolic equivalent (MET) values, and calculated mean METs for 30 minutes. Spectral components of HRV were analyzed concurrently at epochs of 30 minutes. Within-individual correlation analyses were performed to study relations between HRV and PA.

RESULTS: The mean PA time was 14:58±0:37 hours and the mean METs was 1.97±0.13 (range 1.62-1.99 METs). In the within-individual correlation analyses between PA and HRV of 30 min epochs, HR associated clearly with PA (r=0.78, p<0.0001). Similarly, high-frequency (HF, 0.15-0.4 Hz) power of HRV was related to PA (r=-0.57, p=0.031). Low-frequency (LF, 0.04-0.15 Hz) or very-low-frequency (VLF, 0.003-0.04 Hz) power of HRV were not associated with PA (r= -0.37, p=0.102 and r= -0.22, p=0.310, respectively).

CONCLUSION: The PA is most powerfully associated with HR and vagally mediated short-term HRV during daily activities. The association between PA and long-term HRV indices is relatively low during daily activities. These findings may emphasize the intrinsic, physiologic origin of long-term HRV, which is only partly modulated by PA.

References.


BONE SPEED OF SOUND, PHYSICAL ACTIVITY AND CALCIUM INTAKE IN OVERWEIGHT VERSUS NORMAL-WEIGHT PRE- AND LATE-PUBERTAL GIRLS

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In females, adiposity provides a protective effect for bone during adulthood. However, increased body fat may be associated with low bone strength during childhood. The purpose of this study was to compare bone strength, as reflected by speed of sound (SOS), of pre-pubertal and late-pubertal overweight and obese girls with normal-weight age-matched controls. Data of 58 girls include pre-pubertal normal-weight (PPn, body fat 20%, n=19), pre-pubertal overweight and obese (PPo, body fat 25%, n=10), late-pubertal normal-weight (LPn, body fat 25%, n=10) and late-pubertal overweight and obese (LPo, body fat 25%, n=10).
(LPn, body fat 20%, n=15) and late-pubertal overweight and obese (LPo, body fat 25%, n=14) groups. Using quantitative ultrasound (Sunlight OmnisenseTM), bone SOS was measured at the distal radius and mid-tibia. Habitual physical activity was measured for one week using accelerometry and energy intake was assessed by a 24-hour recall. No differences were found between groups in daily total energy, calcium or vitamin D intake. The average daily calcium intake for all groups (1152±1165 mg) was below the recommended daily intake values for their age (1300mg as per FAO/WHO 2002), with no differences between groups. No differences were observed in habitual physical activity between the adiposity groups, although PP girls were active between the ages of the day compared with the LP girls (16% for both PPn and PPs versus 6% for LPn and 4% for LPo, respectively). Younger girls had significantly lower radial SOS (3770±90 versus 3988±60 m/s for PPn and LPn, respectively), and tibial SOS (3699±99 versus 3871±86 m/s for PPn and LPn, respectively) than late-pubertal girls. Although the differences were not statistically significant, tibial SOS tended to be lower in the overweight and obese groups (3637±107 m/s and 3833±103 m/s for PPo and LPo, respectively) as compared with the above values for the normal-weight controls (p=0.06). In addition, partial correlation analysis, controlling for age, revealed that radial SOS was negatively correlated (r=-0.28, p=0.04) with percent body fat. These results suggest a possible negative effect of adiposity on bone SOS among girls. However, more research is required to elucidate the effects of adiposity, physical activity and nutrition on bone in the different stages of growth.

**EFFECT OF LOW-DOSE ENDURANCE TRAINING ON HEART RATE VARIABILITY AT REST AND DURING AN INCREMENTAL MAXIMAL EXERCISE TEST**

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Recreational physical activity promotes health and regular endurance training has additional health benefits, including improved cardiovascular health and fitness and decreased mortality (Haskell et al. 2007). One possible pathway by which endurance training benefits cardiovascular health is through causing a shift in autonomic control of heart rate (HR) towards increased vagal dominance. Not much information is available about the minimum amount of endurance training for improving autonomic HR control and cardiovascular fitness. Autonomic HR control, particularly quantified by spectral analysis of heart rate variability (HRV) (Aksealf et al. 1985). The aim of the present study was to evaluate the effects of low-dose endurance training on autonomic HR control. We assessed the HRV of 11 untrained male subjects [36.8 (7.2) years] at rest and during an incremental maximal aerobic exercise test prior to a 7-week preparatory period and prior to and following a 14-week low-dose endurance training period, including low to high intensity exercise twice a week. High frequency power (HF, 0.15-2 Hz) and low frequency power (LF, 0.04-0.15 Hz) were computed by short-time Fourier transform (STFT) that can be applied to non steady-state HR settings (e.g. Martinmäki et al. 2006). Venous blood noradrenaline (NADR) and adrenaline (ADR) concentrations were determined as blunt estimates of sympathetic nervous system activity at rest.

The results showed that the preparatory period induced no change in either aerobic power or autonomic HR control. The low-dose endurance training period increased peak aerobic power by 12% (p < 0.01) and resulted in lower HR (p < 0.01) and higher HFP (p < 0.05) and LFP (p < 0.01) at the same absolute exercise intensity levels, but not at rest. Despite no change in resting HR, NADR at rest was lower after the endurance training period. There was no difference in the pre- and post-training ADR values.

In conclusion, the present low-dose endurance training period that slightly improved cardiovascular fitness was sufficient to induce enhanced vagal control during exercise, but insufficient to alter autonomic HR control at rest. More frequent and/or intense training would most likely have been needed to induce changes in resting autonomic HR control in these healthy untrained subjects.

**References.**


**THE ROLE OF SPIROEROGYMETRY IN SWIMMING FOR THE ASSESSMENT OF SWIM ECONOMY**

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Spiroergometry in the swim flume as an online method in combination with metabolic and cardiocirculatory parameters facilitates the simultaneous, reciprocally influencing differentiation between physiological (metabolic-cardiocirculatory) and technical-coordinative performance within the framework of performance diagnosis and training control. Results of a study with 36 male swimmers (age: 26.6+/-4.9 years; years of practice: 13.9+/-5.2 years) showed that in lower exercise intensities (0.90-1.10 m/s) endurance swimmers had lower and in higher exercise intensities (1.15-1.40 m/s) endurance swimmers had higher (on average by approx. 9%) VO2 values compared to sprint swimmers (sp), who carried out an standardized stepwise spirometry in the swim flume (initial velocity: 0.90 m/s; increase of 0.05 m/s every 3 min, break of 1 min after each exercise step) showed that in lower exercise intensities (0.90-1.10 m/s) and in higher intensities (1.15-1.40 m/s) sp had higher (on average by approx. 9%) VO2 values compared to sp. dVO2/dv was lower for sp at higher exercise intensities. Stroke frequencies, lactate values and heart rates were on average higher for sp on equal exercise levels, for lower and higher exercise intensities.

In another study, 32 swimmers (age: 17.9 +/- 4.0 yrs.) performed a standardized stepwise test in the swim flume (first step: 1.10 m/s, increase: 0.09 m/s every 3 minutes, break: 1 minute between each step) with and without a mask. While performing the test with a mask, the spirometric data were registered in an online manner. During the test without a mask, the mask was put on immediately after the end of each exercise step and the spirometric data were registered during the one-minute break (rebreathing method). With reference to the data from extrapolation applying the exponential regression equation y=ae-bx, it could be demonstrated that the test results with and without a mask did not show any substantial differences (1.10 m/s: 2350+/-397 ml vs. 2183+/-598 ml; 1.19 m/s: 2616+/-441 ml vs. 2557+/-616 ml; 1.28 m/s: 2924+/-483 ml vs. 2810+/-470 ml; 1.37 m/s: 3247+/-549 ml vs. 3195+/-606 ml; 1.46 m/s: 3620+/-533 ml vs. 3779+/-700 ml). It can be concluded that spiroergometry in swimming may play an important additional tool in the field of performance diagnosis and training control as well as talent search. Due to the fact that spiroergometry monitors alterations in swimming technique by registration of changes in oxygen consumption, spiroergometry may be suitable to gain more knowledge of a swimmer’s economic and technical capabilities. The present data indicate that the rebreathing method may be suitable for employment in the pool. Therefore, the rebreathing method could serve as a link for interpretation of spirometric data ascertained during the afterload phase in the pool and those registered online in the swim flume.
INTRODUCTION: We defined that the latent time of H wave of medial gastrocnemius (MG) significantly shortened after arm crank exercise which intensity was 60% peak oxygen uptake. And we clarified that the latent time of H wave returned to the pre exercise level with recovery examination. Human histochemical studies have shown that muscle fibers type differs between the MG and the soleus (SOL). There is an approximately equal distribution of slow type and fast type twitch fibers in the MG, while the SOL has about 70-90% slow and 10-30% fast twitch fibers. It is an unknown whether a similar result of H wave of MG is provided for the SOL. The purpose of this study was to investigate of the changes in latent time and amplitude of the H-reflex of soleus during recovery examination after arm crank exercise which intensity was 60% peak oxygen uptake. METHODS: Ten young males volunteered to participate in this study. After the H-reflex of SOL was elicited at time of rest, subjects performed arm crank exercise which intensity was 60% peak oxygen uptake for 10 minutes. When the exercise was completed, subjects were kept lying in the prone position, and H-reflex was measured immediately after exercise and recovery examination. The H-reflex of SOL was evoked by the electrical stimulation of the tibialis nerve in the popliteal fossa continuously for 10-15 times in all of one per four seconds interval. Analysis of the H-reflex signal showed an average 4-8 times wave patterns, the amplitude of the H wave was maintained the same. We compared relatively evaluated latent time by the use of the value that deducted the latent time of positive peak of M wave to the latent time of positive peak of H wave. The analysis of cardiac autonomic nervous system activity examine the R-R interval data for 30 seconds, which was calculated by the MemCalc methodology before each H-reflex. log HF was an index of cardiac parasympathetic nervous system activity. RESULTS and DISCUSSION: The latent time of H wave of immediately post exercise was -0.18±0.22 ms and significantly shorter than that of H wave of the pre exercise (P<0.05). The latent time of H wave gradually returned to the pre exercise with the recovery examination (ANOVA: P<0.05). The amplitude of H-reflex significantly inhibited in 3 of 10 subjects (P<0.05) and exited in 3 of 10 subjects (P<0.05) after arm crank exercise. It is considered that the spinal interneuron had occurred inhibition and excitation in immediately post exercise. The log HF of immediately post exercise was significantly inhibited as compared to at rest (P<0.05). The log HF also returned to a rest value with progression of recovery time (ANOVA: P<0.05). Those data suggests that autonomic nervous system activity has a meaningful influence on the threshold of motoneuron of the spinal cord in SOL. The present study show that SOL receives same results of H wave of MG after arm crank exercise which intensity was 60% peak oxygen uptake.

DIFFERENT RESISTANCE TRAINING PROTOCOLS INFLUENCE BASAL METABOLIC RATE AND RESPIRATORY RATIO IN NONDIETING INDIVIDUALS

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Even if exercise is considered fundamental for weight control, energy consumption during exercise may be less important than increase of energy expenditure after physical activity known as EPOC (Excess Post Exercise Oxygen Consumption) (1,2). Data of previous studies showed that EPOC is influenced more by exercise intensity than duration (3), but there are few data about effects of different kinds of resistance training on post exercise oxygen consumption. We tested the acute effects of a traditional weight training (TT) versus Rest Pause Training technique (RP) on energy expenditure, respiratory ratio, heart rate and lactate, immediately and 22 hours after 1 bout of exercise. TT was based on 4 sets of 12 repetitions with 2 minutes rest while RP was based on 6 Maximal Repetition, 20 sec recovery, 1 set to failure, 20 sec recovery, another set to failure, all this protocol was repeated twice with 2'30" of rest. We measured Respiratory Ratio (RR) and Rest Energy Expenditure (REE) of 8 resistance-trained males between 7 and 8 AM after night fasting. The week before testing athletes avoid training to limit disturbing factors. Athletes performed TT for quadriceps and latissimus dorsi (leg press 4 sets of 12 reps, pulley 3 sets of 12 reps, lat pulldown 3 sets of 12 reps with 2 minutes of rest between sets) and after a week, in the same conditions, subjects performed a RP session for legs and latissimus dorsi of same exercises. Student t-test showed significant differences for Lactate, VO2, RR and REE values. More specifically Lactate was higher after RP session than TT session (10.5 mmol/l RP versus 4.4 mmol/l TT); VO2 was higher 5’ after the end of training in RP session (9 102/min RP versus 7 102/min TT); heart rate was higher during RP than TT (115 bpm RP versus 115 bpm TT). After 22 hours post training REE was higher in the RP session than TT (1998 Kcal/die RP versus 1905 Kcal/die TT) while RR was lower (0.81 RP versus 0.87 TT). Our data suggest that high intensity resistance training technique as Rest Pause may increase REE in the 24th post exercise and reduce RR improving fat consumption after exercise.

References.
FUNCTIONAL AND PROTEOMIC ANALYSIS OF HUMAN SKELETAL MUSCLE FOLLOWING NEUROMUSCULAR ELECTRICAL STIMULATION

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Transcutaneous neuromuscular electrical stimulation (NMES) exerts significant effects on the skeletal muscle phenotype and function through increase of muscle mass, force and exercise capacity. As a consequence, NMES has been used as a tool for muscle strength training in athletes, in addition to a conventional conditioning routine, and in subjects variably enrolled in rehabilitation. The major advantage of NMES over voluntary training is the lower risk of traumatic lesions and falls in subjects with high degree of sarcopenia and the possibility of a very standardized training. Whereas the impact of NMES on skeletal muscle mass and function has been described in detail, no information are available on the molecular mechanisms underlying such adaptations. In this study, ten, young (18-35 years of age), healthy, male subjects were subjected to 24, 18-min sessions of isometric (bilateral) NMES of the quadriceps muscle over a period of 8 weeks with 3 sessions per week. Needles biopsies were taken from the vastus lateralis muscles pre- and post-training. Maximum voluntary contraction (MVC) and neural activation were found to be significantly higher post-training (+20% and +9% respectively). MHC isoform distribution showed a significant shift from MHC-2X towards MHC-2A and MHC-1, i.e. a fast to slow transition. Real-time PCR analysis of changes in MHC expression showed the same pattern. Interestingly, α-cardiac, embirional and perinatal MyHC isoforms, considered as transitional isoforms, were expressed at the levels of mRNA but not at the level of protein. Fluorescently stained proteomic maps showing ~600 spots were obtained pre- and post-training and differentially expressed proteins were identified and subdivided in different categories.

MUSCLE SWELLING AND ISCHEMIA-REPERFUSION CONDITION IN RESPONSE TO WALK EXERCISE WITH RESTRICTED LEG BLOOD FLOW

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INTRODUCTION

Studies have consistently shown that exercise intensity of >60% 1-RM is required to induce skeletal muscle hypertrophy. However, we have recently shown that chronic walk training combined with blood flow restriction of exercising limbs increases thigh muscle size and strength (1). Although we observed a significant growth hormone (GH) response after a bout of walk exercise with blood flow restriction (WBFR), it is not clear whether muscle hypertrophy can be explained solely by an anabolic hormone response. Recently ischemia-reperfusion condition and cell swelling, both of which may occur with WBFR, have been suggested to stimulate cell growth. Therefore, the purpose of the current study was to examine acute changes in leg muscle oxygenation, hormonal responses and muscle swelling after an acute bout of WBFR to further delineate the possible mechanisms of WBFR induced muscle hypertrophy.

METHODS

Ten young men performed treadmill walk at 50 m/min for five 2-min sets, with a 1-min rest between sets with blood flow restriction (WBFR) and without flow restriction (CTRL). Blood flow restriction was applied by placing an elastic cuff around the most proximal portion of each leg and inflating the cuffs to 200mmHg. A near-infrared spectroscopy was used to measure the muscle tissue oxygenation (MO2) and without flow restriction (CTRL). Blood flow restriction was applied by placing an elastic cuff around the most proximal portion of each leg and inflating the cuffs to 200mmHg. A near-infrared spectroscopy was used to measure the muscle tissue oxygenation (MO2)

RESULTS

Hematocrit (10%), albumin (14%), and MB-CSA (7%) of thigh increased significantly immediately after exercise in WBFR as compared to baseline (P<0.05), but not in CTRL, suggesting a water shift and muscle swelling with WBFR. Serum GH (79%) and free-testosterone (20%) increased significantly in WBFR from baseline (P<0.05), but not in CTRL. Due to venous blood pooling with flow restriction, BV was significantly higher in WBFR than in CTRL during exercise (P<0.05). Before start of walking, MO2 decreased in response to blood flow restriction (P<0.05). MO2 was significantly lower during exercise (16%) and stayed significantly lower during rest periods (19%) in WBFR as compared to CTRL (P<0.05), showing no indication of ischemia-reperfusion during exercise-rest interval.

CONCLUSIONS

Current study supports a previous finding that an acute bout of WBFR increases anabolic hormone concentrations. Furthermore, acute increase in mid-thigh MB-CSA, suggestive of muscle cell swelling, may trigger muscle anabolic and/or anti-catabolic signaling. On the contrary, we did not observe a significant ischemia-reperfusion condition during WBFR. Further studies are necessary to clarify the roles of anabolic hormones and muscle swelling in muscle hypertrophy associated with walk training with blood flow restriction.

References.

THE MUSCLE LENGTH DEPENDENCY OF THE MAXIMAL RATE OF ISOMETRIC FORCE DEVELOPMENT

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During many movements in daily life and sports, such as cycling, running, jumping and kicking, time for skeletal muscles to build up force is limited and consequently rapid force development is needed (De Ruiter et al. 2007). In the present study it was investigated how the maximal rate of isometric force development (MRFD) depends on muscle length. Depending on the time available for muscle activation, it was expected that the length dependency of MRFD would be different from that of maximal isometric force (Fmax), which force level is reached much later during a contraction. Based on studies on shortening contractions, it was specifically hypothesized that MRFD would be obtained at a length below optimum length for maximal isometric force production (Lo).

In situ rat medial gastrocnemius muscles (muscle length: ~35mm; fibre length ~14mm) with intact blood flow were maximally activated at a physiological temperature (35 °C). It is known that relatively high stimulation frequencies are needed for obtaining MRFD at different muscle lengths (De Haan et al. 2003). In this manner the present experiments mimicked maximal ‘explosive’ in vivo muscle contractions during which all motor units are recruited instantaneously and may fire at very high rates. MRFD and force time integral (FTI), reflecting the entire time history of activation, were calculated for different times (10-50 ms) of activation.
The highest absolute MRFD was obtained 1.94±0.42 mm below (p<0.05) Lo. When expressed relative to Fmax obtained at each individual length the optimum of MRFD was found at Lo-4.4 mm. For FT100ms and FT200ms, optimum length was obtained ~2 mm respectively ~1 mm above (p<0.05) Lo, whereas the optima for FT10ms, FT140ms and FT150ms were ~1mm below (p<0.05) Lo. In addition, at low lengths (<Lo-4mm) and for all activation times FTIs were relatively more decreased than Fmax.

It is concluded that length dependency of force output during rapid force development differed from that of maximal isometric force, specifically maximal rate of isometric force development was seen at a muscle length ~2 mm below the optimum muscle length for maximal force production.

References.


COMPARISON BETWEEN ELECTRICALLY EVOKED AND VOLUNTARY ISOMETRIC CONTRACTIONS OF THE ELBOW FLEXOR MUSCLES FOR CENTRAL AND PERIPHERAL FATIGUE

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Muscle fatigue is represented by a reduction in maximal voluntary contraction force (MVC) resulting from central and peripheral factors. It has been reported that muscle fatigue is greater after repetitive contractions evoked by electrical muscle stimulation (EMS) than voluntary contractions (VOL) at the same force output. However, it is not known if the mechanisms underlying the decrease in MVC are the same between EMS and VOL for a given MVC loss. It is possible that the contribution of central and peripheral fatigue on a reduction in MVC is different between EMS and VOL. This study tested the hypothesis that EMS would induce greater peripheral fatigue than VOL, when the magnitude of decrease in MVC of the elbow flexor muscles was matched between the two

The sample consisted of 619 female sport and PE students who were enrolled in three universities in the Czech Republic (n = 214), five universities and colleges in Norway (n = 193). The method of data gathering was the use of a questionnaire. Sexual harassment was measured through three questions based on a former study by Fastin and Sundgot-Borgen (2000). The experiences of authoritarian coaching behavior were measured through four questions about different types of authoritarian behavior. These four questions were answered only by the students who had been trained by both male and female coaches (n=399).

The findings will be discussed in relation to the unbalanced power distribution that often exists between a female athlete and a coach. The findings will also be discussed in relation to implications for coaching education.

References.

"PROMOTING GIRLS’ SPORTS PARTICIPATION" - A QUESTION OF POWER AND NORMALISATION

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Sport is an essential identity-producing arena and gender is a crucial part of the identities shaped and formed there. Previous research claims that the relationship between women and sport appears to be more problematic than that between men and sport, since sport is still discursively positioned as a masculine practice.

In Sweden, being a member of the sports movement is almost as common for girls as for boys. More than two out of every three boys and every other girl between the ages of 7 and 15 is a member of a sport club. The sports movement is considered to be a significant institution for socialisation - not the least gender construction.

Regarding gender as something that is produced and enacted through discourses, prompts an investigation into the discourses that form, and are formed by, the practice of sport. Inspired by feminist Foucauldian theory, the aim of the research is to analyse the discursive construction of "girls" in a large-scale government initiated sports project. Local sport clubs were in this context encouraged to work with projects that "promoted girls’ sports participation", for which they could apply money. Project applications written by sport clubs in three traditional male-dominated sports constitute the empirical material of the study. The study’s central questions, as well as the analytical ones, are: what does "promoting girls’ sports participation" mean, what is to be done and why? How are girls portrayed and what kinds of girls are targeted in the projects?

The analysis shows that girls and their participation in sport are portrayed in a rather homogenous way: girls are something “special”, and that so far their participation in these male dominated sports has been limited. This seems to motivate a separation of girls and their sports from “ordinary” activities, which implicitly means activities for boys.

Using Foucault’s concept of normalisation, distinguishing girls by accentuating their specialty make sense. Forming categories and ascribing them certain characters, interests and competences, in the way it is done in sports projects, makes these projects - and the sport itself - possible and meaningful. But in practice, this normalisation could be a way of governing and disciplining individuals in certain directions, i.e. a form of modern power, in Foucault’s words. One consequence of normalisation is that projects aiming at “promoting girls’ sports participation” target certain girls and the resulting category of girls is attributed certain features. The group of girls is thus stereotyped and homogenised, something that limits the possibility of alternative and flexible identities and makes other types of girls invisible. From a feminist point of view, these are crucial issues.

ELITE ATHLETES’ PERSPECTIVES ON PROVIDING WHEREABOUTS INFORMATION: A SURVEY OF ATHLETES IN THE NORWEGIAN REGISTERED TESTING POOL

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Aim: According to current anti-doping regulations, all elite athletes have to provide information about their whereabouts to the relevant anti-doping organisation(s). This system was introduced in 2003 to protect ‘clean’ athletes and to be able to carry out effective out-of-competition testing without advanced notice. Since then the World Anti-Doping Agency (WADA), sport federations and anti-doping organisations have discussed the operation of the system while athletes have been only minimally involved. This is an important omission since the co-operation and compliance of athletes may be important, at least in part, in determining the effectiveness of the system. This paper fills this gap by reporting on the perspectives of a sample of elite athletes in the Norwegian registered testing pool on anti-doping work in general and the whereabouts system in particular.

Method: A cross sectional survey of all the athletes in the Norwegian registered testing pool (n = 236, response rate = 80.8%) was carried out. A structured questionnaire was used to explore elite athletes’ views on the whereabouts systems.

Results: 43 % of the athletes agreed that the whereabouts information system made a contribution to a cleaner sport. However, 19.1 % of the athletes did not trust the technical part of the system; 62.2 % disagreed with the rule that three warnings for not providing whereabouts information leads to a doping sanction after; and 56.6 % of the athletes thought that the system was unfair because of international variations in the system.

Discussion: This study is the first to reveal some of the views of elite athletes in the Norwegian testing pool on anti-doping work and the whereabouts system. An important finding is that the whereabouts information system had, despite all good intentions, outcomes other than those planned and intended by anti-doping organizations. One consequence of this is that this has lead to a negative attitude towards anti doping work among some athletes. Thus athletes’ views might fruitfully be integrated with other perspectives of WADA’s policy and procedures, when anti doping work is developed further.

TOP-LEVEL FOOTBALL COACHES’ PRACTICAL SENSE OF TALENT

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Introduction: For many years, it has been the ambition of coaches and administrators of top-level athletes to be able to identify distinct characteristics in young athletes which enable them to become excellent and successful in their sport. However, before these feats of excellence are achieved, a complex process of identification, development and selection takes place. Therefore, it is a much-desired quality in top-level coaches to be able to identify “true” talent. This study explores the ways in which talent identification is carried out among top-level football coaches, and it aims to identify specific structures of expert knowledge related to talent identification. The underlying basis of the study is the assumption that “talent can only be talent and recognized as such where it is values” [1], and that talent identification in top-level football is a question of the coaches’ trained eye [2] and tacit knowledge [3]. In other words, the coaches’ practical sense [4] of talent apparently plays as central role in talent identification.
The theoretical foundation of the analysis is Pierre Bourdieu’s theory of practice and the concept of practical sense, i.e. the incorporated feel for the game. From this point of view, the study explores eight Danish National Youth Team football coaches’ expert knowledge and ways of identifying talents. The data compile from biographical, in-depth interviews [5] with the coaches. The in-depth interviews are conducted and analyzed using meaning condensation and meaning categorization.

Results:
The results are grouped in two themes characterizing core elements of the coaches’ practical sense: 1) visual experience and pattern recognition as the basis of the coaches’ expertise, and 2) recognition of individual paths and personal styles among the coaches. Furthermore, an agent based model of top-level coaches’ classificatory schemes in connection with talent identification is generated.

Conclusion:
The study supports the theory that talent identification in top-level soccer is strongly connected to the coach’s practical sense. The study points at the importance of being aware of the person “behind” the coach, given that his practical sense will be the main identifier of future talents.

References:

‘FROM TRACKSUITS TO SUITS’: A FIGURATIONAL ANALYSIS OF ORGANIZATIONAL CHANGE IN SPORTS DEVELOPMENT IN ENGLAND
Smith, A., Bloyce, D., Mead, R., Morris, J.
University of Chester, United Kingdom

Drawing on aspects of figurational sociology, which has grown out of the work of Norbert Elias, in this article we seek to examine: (i) the reality of ‘doing sports development’ within a period of rapidly changing social and political policy climate from the perspective of sports development officers (SDOs) themselves, and (ii) the ways and extent to which SDOs managed their experiences of organizational change. The study was based on semi-structured interviews conducted with 16 SDOs in the west-midlands and north-west of England. The main themes that emerged from the interviews included SDOs’ perceptions and experiences of organizational change, their preferred views of sports development, and their experiences of sports development in practice. It was also clear from the SDOs comments that the kinds of organizational change that they experienced was strongly associated with a perceived increasing bureaucracy of their

RESULTS:
The results are grouped in two themes characterizing core elements of the coaches’ practical sense: 1) visual experience and pattern recognition as the basis of the coaches’ expertise, and 2) recognition of individual paths and personal styles among the coaches. Furthermore, an agent based model of top-level coaches’ classificatory schemes in connection with talent identification is generated.

CONCLUSION:
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References:

CONSUMPTION FOR ANOTHER PEOPLE: A STUDY ON SYMBOLIC CONSUMPTION HABITS OF TURKISH WOMEN IN LEISURE TIME
Sabirli, T., Argan, M., Sevil, T., Aydn Sönmez, G.
Anadolu University, Turkey

Invitation day is a leisure activity that Turkish women in different ages get together and make some kinds of activities. Women, participating to invitation days in Turkey purchase symbolic consumptions for preparation before invitation days. The aim of the study is to determine the priorities of Turkish women as a symbolic consumption for the invitation day. A questionnaire was used in the study to collect the data. The questionnaire consisted of three parts. First part of the questionnaire is to determine the equipments for the invitation day and consisted of 9 items. Second part is to determine the decorative modification for the invitation day and consisted of 7 items. 5-likert scale was used to evaluate these items. Second part of the questionnaire is consisted of demographic factors and participation characteristics of the women. Questionnaire was applied to a total of 379 women, participating to “days” as a leisure activity in different levels.

Methods:
The theoretical foundation of the analysis is Pierre Bourdieu’s theory of practice and the concept of practical sense, i.e. the incorporated feel for the game. From this point of view, the study explores eight Danish National Youth Team football coaches’ expert knowledge and ways of identifying talents. The data compile from biographical, in-depth interviews [5] with the coaches. The in-depth interviews are conducted and analyzed using meaning condensation and meaning categorization.

Conclusion:
The study supports the theory that talent identification in top-level soccer is strongly connected to the coach’s practical sense. The study points at the importance of being aware of the person “behind” the coach, given that his practical sense will be the main identifier of future talents.

References:
Male subjects (N=57, 19.7 ± 0.3 yrs.) were measured by a treadmill test until exhaustion to evaluate VO2\(_{\text{max}}\) (ml/min/kg) in the beginning of BT (baseline). Serum samples for testosterone (T) and cortisol (C) were collected between 6:30-7:30 am (basal) and before and after the 45-min submaximal marching test (EX) of 70% of VO2\(_{\text{max}}\) at baseline, in the middle (wk4) and at week 7 (wk7) of BT. Body mass (BM), fat free mass (FFM) and fat mass (FM) were measured by bioimpedance (InBody 720). The symptoms of overloading was assessed by weekly questionnaires. Totally 33 subjects were healthy on the test days and were able to perform all three EX. Basal T did not change throughout the whole BT, while basal C decreased from wk4 to wk7 (p<0.001). EX induced an increase in T at every time point (p<0.05 - 0.001), but C increased due to the EX only at wk4 (p<0.01). From baseline to wk7 FM increased (p<0.05), whereas BM and FM decreased (p<0.001). The change in FM from baseline to 7 wk was negatively related to baseline basal T (r=-0.55, p<0.001). Subjects who felt themselves overloaded at wk6 and wk7 had higher (p<0.05) basal C both at baseline and at wk4 compared with their not overloaded counterparts. Furthermore, symptoms of overloading at wk4 were positively related to baseline BM (r=0.38, p<0.05) and negatively to baseline VO2\(_{\text{max}}\) (r=-0.37, p<0.05), and symptoms of overloading at wk6 were positively related to change in basal C from wk4 to wk7 (r=0.41, p<0.05). From wk4 to wk7 the change in T was positively related to the change in FFM (r=0.49, p<0.01). Those 39% of the subjects who showed decreases in T and FM from wk4 to wk7 had no increase in C during EX at baseline, which was observed in the other subjects (-11% vs. 16%, p<0.05). The present results indicate that the subjects who were more susceptible to overloading during a stressful military training period were fat and unfit as well as the subjects who had high basal serum C levels and weak exercise related increase in C when entering military service. In addition, the subjects whose basal serum C levels increased during the training period were more vulnerable for symptoms of overloading at the end of BT. The results showed that serum C could be a useful tool in monitoring the risk for overloading.

### DISCRIMINANT PHYSIOLOGICAL RESPONSES TO HIGH-INTENSITY INTERMITTENT EXERCISE BETWEEN PROFESSIONAL AND AMATEUR SOCCER PLAYERS

Rampinini, E., Sassi, A., Morelli, A., Menaspà, P., Carloomago, D., Azzalin, A., Couffs, A.
Sport Service MAPEI srl, Italy

Soccer is team sport that requires prolonged, high-intensity, intermittent exercise. During match play, players change activity every 5s and perform approximately 1300 different actions with 200 of these being completed at high-intensity. Additionally, decisive phases during a soccer match often require players to work at high-intensity, usually consisting of several repeated efforts. It seems logical that soccer players that cope better with high-intensity bouts of intermittent running would be suited to playing at higher levels. At present, however, it is unknown if players at higher levels are better able to cope with high-intensity intermittent exercise bouts. Therefore, the aim of this study was to compare performance and the physiological responses to specific high-intensity intermittent running tests in professional and amateur soccer players.

#### THE HEART RATE PERFORMANCE CURVE DURING INCREMENTAL CYCLE ERGOMETER EXERCISE IN HEALTHY YOUNG FEMALE SUBJECTS

KF-University Graz, Medical University Graz, University of Vienna, Austria

The deflection of the Heart Rate Performance Curve (HRPC) was shown to give the anaerobic threshold (CONconi et al. J. Appl Physiol. 52, 1982, 4, 869-873 although there has been a substantial debate on the validity of the concept (see review Bodner and Rhodes Sports Med 2000; 30: 31-46). This non-invasive determination of the anaerobic threshold relies on the existence of a clear deflection of the HRPC. Most recently we described the HRPC to be non-linear and not uniform in a great number of healthy male subjects (Hofmann et al. Med Sci Sports Exerc 1997, 29: 762-768). However, studies including female subjects are sparse.
Aim of the study was to describe the pattern of the HRPC in a homogenous group of healthy female subjects. Results from 235 female (F) sports students (age: 20.4 +/- 2.6 yrs; height: 166.9 +/- 8.6 cm; weight: 59.5 +/- 6.0 kg) were included in the study. All students performed a maximal incremental cycle Ergometer exercise starting at 20 W and increasing work load by 15 W.min-1 until subjective maximal effort. Tests were routine tests for medical check up at the start of the sports science study. Heart rate (Polar Electro, Finland), gas exchange variables (MetaMax I, Cortex Biophysik, Germany) were obtained at rest, throughout exercise and during recovery. Blood lactate concentration (Biosen S-line, EKF Diagnostik, Germany) was obtained from blood samples collected from ear lobe at rest, after each work load increase and during recovery. The first (LTP1) and the second (LTP2) lactate turn point were determined and used as reference regions for subsequent HR analysis. The HRPC was analysed using a computer supported approach. A second degree polynomial function was calculated between LTP1 and Pmax and the degree and the direction of the HRPC was quantified by factor kHR as described earlier (Hofmann et al. Med Sci Sports Exerc 1997; 29: 762-768).

Female subjects presented a similar pattern of the HRPC’s compared to the male counterparts. The number of regular HRPC’s was greater in number in F (88.9% vers. 85.9%) and the degree of the deflection was more distinct (kHR=0.499±0.226). The number of non-regular and inverted HRPC was less than half in the female subjects (3.0% vers. 7.9%) compared to the male subjects. Linear HR was found comparable to the male counterparts in 81% of cases. No significant difference was obtained for exercise performance variables (power output oxygen uptake), blood lactate concentration and HRRmax between groups of female subjects presenting a different HRPC pattern. However, HR and %HRmax at LTP2 was significantly different between groups and related to kHR (R=0.455, P<0.001).

Similar to age matched male subjects female subjects present a different distribution of kHR with a lower number of inverted HRPC, however, a similar number of subjects showed no deflection at all, questioning the concept of the HRPC method to determine the anaerobic threshold.

**DOES STRENGTH TRAINING-INDUCED FASCICLE LENGTHENING AFFECT CONTRACTILE RATE OF FORCE DEVELOPMENT IN THE HUMAN QUADRICEPS?**

Blazevich, A., Cannavan, D., Horne, S., Coleman, D., Aagaard, P.
Edith Cowan University, Australia

**Introduction**

A muscle's contractile rate of force development (RFD) depends greatly on its rate of activation, and can be improved by both fast and slow forms of strength training. However, an inverse relation between series compliance and RFD during contraction in single muscle fibres has been demonstrated (Falkner & Josephson, 2007). Given that longer fibres have greater series compliance, increases in fibre, or fascicle, length in vivo should negatively affect RFD. Such increases in fascicle length tend to occur with large range of motion strength training, creating a possible paradox for the use of strength training for RFD improvement. Shifts in the length-tension relation of a muscle are fibre/fascicle length dependent, so to investigate the paradox further we tested the hypothesis that strength training-induced shifts in the torque-angle relation (TAR) of the architecturally complex quadriceps muscle would be well related to changes in RFD.

**Methods**

In 21 previously untrained consenting men and women, RFD measured to 30, 50, 100 and 200 ms from the onset of a maximal isometric knee extension contraction, the rate of EMG rise (RER) and mean average EMG voltage (MAV; area under EMG curve) measured from the vastus lateralis (VL) fascicle length and shifts in the EMG-angle relation were examined alongside shifts in TAR. Repeated measures ANOVA (log-transformed) was used to examine training-dependent changes in the measured variables. Correlation analysis was used to examine relationships among the variables. Alpha level was set at 0.05. Testing procedures were approved by the Research Ethics Committee.

**Results**

The training was associated with significant increases in RFD, which were not different between the training groups. After 10 wk training, increases in RFD were strongly related to increases in RER and MAV (i.e. rates of muscle activation), but not shifts in the TAR. Nonetheless, early (5 wk) changes in RFD were negatively correlated with shifts in the TAR, which shifted towards longer muscle lengths. Shifts in TAR were associated with changes in VL fascicle length, whereas the EMG-angle relationship remained unchanged for all muscles.

**Conclusion**

Our data support the hypothesis that training-induced increases in fascicle length may have a negative impact on RFD, at least in the initial weeks of training. Although neuromuscular activity was initially enhanced in those who increased their RFD significantly, the impact was only fully realised after months of training when fascicle length adaptation is complete. These data highlight the importance of muscle architectural adaptations to rapid muscle force generation.

**THE INFLUENCE OF STRENGTH TRAINING VOLUME ON MUSCLE HYPERTROPHY**

Bubeck, D., Dallinger, B., Krause, K., Alt, W.
University of Stuttgart, Germany

Muscle hypertrophy training plays an important role for the periodization in many sport disciplines. The manner and the magnitude of hypertrophy effects are determined by the configuration of the training program. Intensity and volume of the training can be detected as important prerequisites for strength and muscle mass. A great amount of studies dealing with the optimal number of sets in strength training exists but no clear answer to the question of the optimum of sets during hypertrophy training can be given. This is due to different methodical weak points of these studies.

In order to get more informations about the optimum of sets in hypertrophy strength training of well trained athletes, the purpose of this study was to clarify the effects of different training volumes to the morphological and neuromuscular adaptation processes. 35 athletes with a strong background in intensive strength training were randomized divided in two training groups and a control group. Due to injuries and inconsistent realization of the training program only 24 athletes were taken into account presenting the results of the study. Two times a week the training groups performed a special designed training program (full body, 12 different exercises) with strategies to enhance the training intensity immediately 20% training weight reduction after repetition failure - again repetitions until failure. Intensity was 70-80% of MVC within 8-10 repetitions. Differences were only made in the training volume: High volume training (HVT) means 3 sets, low volume training (LVT) only 1 set per muscle group. Training duration was 8 weeks followed by a crossing over after one week of regeneration. Each training set was individually documented by training weight and performed number of reps.
Before, after 8 weeks and after the total training process (16 weeks) CSA and MVC of the m. quadriceps femoris was measured with MRT and isometric strength test. EMG data was recorded during the MVC test in order to detect neurophysiological changes. Additionally body composition and girth were measured.

After the different training phases no changes in CSA of the m. quadriceps femoris were observable in the MRT data. MVC values of isometric knee extension only showed sig. changes in the HVT_LVT group. No sig. changes in IEMG values during the total training process were observable.

Due to the fact that both training groups showed nearly the same amount of non-sig. changes in CSA and MVC it could be stated that within strength trained athletes the training volume is not the hypertrophy determining factor. Additionally it could be assumed that a lower amount of training volume for 2/week is able to maintain strength qualities also in highly strength trained athletes. So the cause for muscular hypertrophy must thereby be found in the intensity of the training stimulus.

ISOKINETIC STRENGTH RATIOS AND RANGE OF MOTION OF THE SHOULDER ROTATOR MUSCLES IN PORTUGUESE MALE JUNIOR (16-18) TENNIS PLAYERS

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INTRODUCTION

The goal of the present work was to characterize the shoulder muscle balance between the internal and external rotator muscles in Portuguese male tennis players (ages 16-18).

METHODS

32 young male tennis players classified in the first 50 of the junior (aged 16-18) Portuguese ranking of 2005 participated in the study. Concentric strength measures of ER and IR for both arms were performed on a Biodex Medical System isokinetic dynamometer at 90 and 180º/s. During testing the subjects were seated, the arm was positioned in 45º abduction in the scapular plane and elbow flexed to 90º. Based on a reference position (0º) with the forearm horizontal, rotation movements were performed between 15º of IR and 60º of ER, with a 75º of range motion. The ROM of the ER and IR movements of both shoulders was passively measured by goniometry with the subject lying supine on a table with the arm abducted 90º and the elbow flexed 90º. Mean values and SD were calculated for the isokinetic force and amplitude parameters. To analyse dominant (D) to non-dominant (ND) arms differences the paired samples T test was used (p<0.05). Correlation coefficients were measured to determine relationships between variables.

RESULTS AND DISCUSSION

With the exception of Peak Torque/Body Weight of ER, all the isokinetic parameters of ER and IR force were significantly (p<0.05) higher in the D arm at both velocities. The mean values of ER:IR ratio observed in the D arm (0.61 ± 0.10 at 90º s-1, 0.63 ± 0.09 at 180º s-1) were lower than in the ND arm (0.67 ± 0.13 at 90º s-1, 0.67 ± 0.11 at 180º s-1) but significant differences were only found at 90º s-1 (p<0.014). With respect to shoulder flexibility, there was significant (p<0.001) less ROM of IR and significant (p<0.001) higher ROM of ER in the D shoulder. The total rotation arc was significantly (p<0.05) reduced in the D shoulder (158.6 ± 19.3º) when compared with the nondominant shoulder (166.2 ± 23.7º), meaning that the loss of IR in the dominant side exceeds the gain in the ER amplitude. Negative significant correlations were found between age and ROM of D (r = -0.458; p<0.01) and ND arm IR (r = -0.510; p=0.01). A positive significant correlation (p<0.001) was found in the ROM between both shoulders in both movements, IR (r = 0.787) and ER (r = 0.679). We also found a positive correlation (p<0.05) between shoulders in both velocities and movements for all the isokinetic force parameters (PT, PT/BW, TW, API, indicating that, independently of the specific shoulder adaptations produced by tennis training, the shoulder flexibility and strength depend on the individual characteristics.

CONCLUSIONS

Our results with Portuguese junior tennis players confirm adaptive changes in the dominant arm of tennis players (16-18): deficit in external rotator strength combined with loss in stretching capacity. Those adaptations may predispose the tennis player to shoulder instability and injury.

10:15 - 11:45

Invited symposia (IS)

IS-BN09 Limitations and advantages of musculoskeletal modelling

CROSS-BRIDGE MEMORY AND HISTORY-DEPENDENT PASSIVE PROPERTIES

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Introduction: The cross-bridge theory of muscle contraction is defined by a series of mechanical and biochemical states that are connected by thermodynamically consistent rate constants which in turn are exclusively functions of Huxley’s (1) so-called x-distance, the distance from the cross-bridge equilibrium position to the nearest actin attachment site. From this theory, it immediately follows that the steady-state force for a given contractile condition must always be the same and independent of the contractile history. However, it has been known for a long time that this is not the case. Abbott and Aubert (2) demonstrated more than half a century ago that steady-state isometric forces following muscle stretch are greater and following shortening are smaller than the corresponding isometric reference force.

For the past 30 years, these observations have been explained with the development of structural non-uniformities on the sarcomere level, but recent evidence has all but dismissed this idea. We asked the question if force enhancement following stretch and force depression following shortening might be explained by a memory in the actin-cross-bridge interactions or a history-dependent passive element.

Methods: We determined history-dependent properties in skeletal muscle for human skeletal muscles, isolated animal muscle preparations, single fibres, single myofibrils and sarcomeres isolated from rabbit psoas and in single actin-cross-bridge interactions using laser trapping (3).
LIMITATION AND ADVANTAGES OF HILL TYPE AND FINITE ELEMENT MUSCLE MODELING

Huijing, P.
Vrije Universiteit Amsterdam, Netherlands

The Hill-type model, involving the pooling of contractile properties into one contractile element (CE) and of all serial and elastic parallel elements of the muscle tendon complex, into one serial elastic component (SEC) and one parallel elastic component, has contributed to our understanding of elastic effects in human and animal movement. The strength of this type of model is of course also its weakest point: it’s relative simplicity. The contractile element acts as one giant sarcomere. This means that in the classical Hill model, no interaction with the environment, other than via myotendinous pathways can be studied. Therefore, distributions of sarcomere lengths (both parallel and serial) are excluded. Even in maximally dissected muscle (intact blood supply and innervation; with epimuscular myo-) can be modeled and major interaction with surrounding tissues is relatively easy to represent. Examples will be given of application of a finite element (FEM) model that also represents intracellular (muscle elements) and extracellular matrix elements. As the name indicates, finite element modeling (e.g. Yucsesoy et al., 2002, 2003, 2007) divides the muscle into a finite number of elements calculating mechanical equilibrium in nodes of each element. FEM assumes continuity, i.e. sarcomeres can not act totally independent of its surrounding sarcomeres within the same or other muscle fibers. Between nodes, stresses and strains are interpolated within the element. A major difficulty is. Penalty functions are used to impose the condition of constant volume for muscle fibers. A major drawback of FEM is a much more complex mathematical context and higher computer time. A major advantage is that actual geometry of muscle can be modeled and major interaction with surrounding tissues is relatively easy to represent. Examples will be given of application of a model that also represents intracellular (muscle elements) and extracellular matrix elements.

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ASSESSMENT OF INDIVIDUAL PARAMETERS IN HUMAN MUSCLE MODELLING

Arampatzis, A., Albracht, K., Mademli, L.
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Assuming homogenous muscle density, muscle volume is a determinant of muscle mass, a parameter, which is needed to gain insight into the specific muscle tension and to determine energy cost and muscle efficiency of certain contractions through modelling[2]. For in vivo measurement of muscle volume, magnetic resonance imaging (MRI) is considered to be the most useful non-invasive imaging device. Despite recent improvements in image processing, a muscle reconstruction by MRI is still laborious and not widely applicable. Therefore we investigate whether it is possible to assess the individual muscle volumes within the triceps surae muscle group (TS) by means of easily measurable parameters based on a theoretical consideration. Magnetic resonance images of the right calf of 13 male subjects were acquired and each muscle of the TS was reconstructed. Muscle length (lm), the maximum anatomical cross-sectional-area (ACSAmax) and muscle volume were obtained from the 3D-Models. In general, muscle volume can be expressed as a fraction of the product of maximum anatomical cross sectional area (ACSAmax) and muscle length (lm). The size of the fraction depends on muscle shape and its coefficient of variance among the examined population was considerable low (SO 6%, GM 4%, GL 7%) in the present study. The product of ACSAmax and lm was, therefore, suitable to assess muscle volume (RMS 4 to 7%). The non rigidity of tendon has a profound influence on the force-length-velocity relationship of the muscle (contractile element) and consequently on its force generating potential. The development of the ultrasound technique enabled the investigation of the mechanical properties of tendon from different muscle-tendon units in vivo in the last years. However, earlier in vitro studies have demonstrated that static and cyclic short term mechanical loading can affect tendon compliance[2]. Although numerous in vitro studies have demonstrated the acute effects of long-lasting static and cyclic mechanical loading on tendon compliance, there is little information about the in vivo effects of long-lasting submaximal and maximal mechanical loading on the compliance of tendon and aponeurosis. Therefore, in a series of experiments we examined the strain-force relationship of the gastrocnemius medialis and vastus lateralis tendon and aponeurosis of young and old adults before and after three fatigue protocols: a) a sustained submaximal isometric contraction, b) submaximal concentric isokinetic contractions until task failure and c) maximal isokinetic contractions until task failure. The results show that neither static nor cyclic long-lasting mechanical loading that produces strains of 2-6% has an acute effect on the in vivo strain-force relation of the tendon and aponeurosis at the lower extremities. Warm-up exercises precondition the tendons and minimize the possibility of an...
alteration in their mechanical properties. Muscle is unable to sustain the force for a sufficient duration during fatiguing contractions to induce an alteration in tendon properties.

Invited symposia (IS)

IS-PM15 Gatorade Sport Science Institute: The challenges of exercising in the heat

EXERCISE, HEAT SHOCK PROTEINS, AND CYTOPROTECTION

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Cellular adaptation to physiological disturbances is a fundamental requirement for cell survival. Although the molecular events involved in cellular adaptation to stress continue to be investigated, it is clear that the cell’s response to exercise-induced heat stress includes a highly ordered set of events that involve rapid changes in gene expression and the synthesis of several heat shock proteins (HSPs) that participate in the adaptation to stress. This lecture will be presented in a tutorial format and will provide an overview of the protective role that HSPs play in both cardiac and skeletal muscle fibers. First, a brief history and nomenclature of HSPs will be provided. This will be followed by a discussion of the molecular basis for exercise-induced HSP expression in muscle fibers. The lecture will conclude with a discussion of the protective effects of HSPs in muscle fibers during periods of cellular stress.

EXERCISE AND THERMOREGULATION: A MATTER OF TIME

Atkinson, G.
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Knowledge about human thermoregulation is fundamental to both exercise physiology and chronobiology (the study of biological rhythms). Chronobiology can help us understand human thermoregulation during exercise in terms of the measurement of core body temperature, the underlying homeostatic mechanisms, as well as the impact of exercising at different times of day on health and performance. Depending, in part, on environmental (Cable et al., 2007) and seasonal (Atkinson and Drust, 2005) factors, core body temperature varies by about 0.4 degrees Celsius over a 24-h period, peaking between 18:00 and 21:00 h (Cable et al., 2007). The diurnal variation in core body temperature persists during and after exercise (Waterhouse et al., 2005), although the magnitude of variation depends on the measurement site of core body temperature (Gregson et al., 2008). Intestinal temperature, measured during exercise with an ingestible thermistor, shows a larger diurnal variation than rectal or oesophageal temperature, probably because of circadian variation in gut transit time. Such interactions between measurement site and time of day could have significant implications for research inferences about thermoregulation and for diagnosing heat injury in athletes. The origin of the circadian rhythm of core temperature is mainly due to circadian changes in the rate of loss of heat through the extremities, mediated by vasodilatation of the cutaneous vasculature (Aldemir et al., 2000). During the initial response to exercise, body temperature rises more quickly and thermoregulatory reflexes are recruited less rapidly in the morning compared to the evening hours (Waterhouse et al., 2007). Synchronisers of human circadian rhythms such as melatonin (Atkinson et al., 2005) and light (Atkinson et al., 2008) have also been found to influence thermoregulation during exercise, as has sleep deprivation (Winors et al., 1999). Such understanding of the chronobiology of thermoregulation may reduce potential hazards due to the time of day when exercise is performed and optimise coping strategies for optimal performance in the heat.

References:
Cable, N.T. et al. (2007). Physiol Behav 90: 267-273

CARDIOVASCULAR LIMITATIONS TO EXERCISE IN THE HEAT

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Exercise in the heat poses a severe stress on multiple regulatory systems that inexorably limit both the ability of bodily cells, organs and systems to maintain homeostasis and the capacity of the human body as a whole to perform exercise. While this notion is not new, the precise contribution of the circulatory system to fatigue, particularly the role of locomotor skeletal muscle perfusion and its influence on muscle metabolism, has remained largely elusive until recent years. This talk focuses on how the blunted O2 delivery resulting from restricted blood flow with heat stress and dehydration combined with hyperthermia contribute to the accelerated fatigue occurring during prolonged and high intensity exercise in the heat. Specifically, data will be presented demonstrating that fatigue during prolonged moderate and short maximal exercise is preceded by significant reductions in cardiac output and skeletal muscle and brain blood flow, which in turn lead to a significant drop in the provision of vital oxygen to the locomotive leg muscles and the brain. The diminished peripheral oxygen delivery is associated with a significant reduction in exercising muscle VO2, but does not compromise brain VO2 because of the concomitant larger increase in brain O2 extraction. Importantly, this phenomenon is not exclusive to exercise in the heat, as fatigue is also preceded by cardiovascular strain during maximal and supramaximal exercise in thermoneutral environments. Therefore, our findings points towards the failure of the heart to maintain cardiac output and oxygen delivery, particularly to the locomotor skeletal muscles, as a major limiting factor limiting prolonged and high intensity exercise performance in the heat.

References:
FLEXIBILITY IS FITNESS RELATED TO ARTERIAL STIFFNESS
Yamamoto, K., Kawano, H., Gando, Y., Iemitsu, M., Murakami, H., Sanada, K., Tanimoto, M., Higuchi, M., Tabata, I., Miyachi, M.
Waseda University, Japan

PURPOSE: Fitness, especially cardiovascular endurance, has been identified as determinants of age-related arterial stiffening. Health-related components of fitness include cardiovascular endurance, muscular strength and endurance, and flexibility. Although the flexibility is one of the components of fitness, the relationship between flexibility and arterial stiffness remains unknown. Using the cross-sectional study design, we tested hypothesis that the flexibility associated with arterial stiffness independent of other components of fitness. METHODS: A total 314 adults, 20 to 39 years of age (young), 40 to 59 years of age (middle-aged) and 60 to 77 years of age (older), who were either poor-flexibility or high-flexibility, were studied. The flexibility was evaluated by sit-and-reach test. Cardiovascular endurance and muscular strength were measured by peak oxygen uptake and leg power, respectively. The arterial stiffness was assessed by brachial-ankle pulse wave velocity (baPWV). RESULTS: In young group, the sit-and-reach values of poor-flexibility and high-flexibility were 35.0 +/- 6.2 and 47.9 +/- 5.2 cm, respectively (P<0.001), those in middle-aged group were 32.1 +/- 5.3 and 45.9 +/- 4.9 cm, respectively (P<0.001), and those in older group were 27.1 +/- 6.5 and 42.2 +/- 5.0 cm, respectively (P<0.001) in each age group, age did not differ between poor-flexibility and high-flexibility groups. In older group, baPWV was higher in poor-flexibility than in high-flexibility peers (1542 +/- 245 vs 1361 +/- 202 cm/s, P<0.01). However, in young and middle-aged groups, there was no significant difference between two flexibility groups. In the pooled population, a univariate regression analysis indicated that baPWV correlated with sit-and-reach (r=0.34, P<0.0001), peak oxygen uptake (r=0.42, P<0.0001) and leg power (r=0.19, P<0.001). A stepwise regression analysis revealed that among components of fitness, sit-and-reach and peak oxygen uptake were independent correlates of baPWV. Leg power did not enter as significant predictors of baPWV. CONCLUSION: We concluded that (1) poor-flexibility was associated with the higher arterial stiffness in older group, (2) age-related arterial stiffening was greater in poor-flexibility than in high-flexibility, and (3) flexibility independently associated with arterial stiffness. These findings are consistent with the idea that flexibility is identified as determinants or predictors of age-related arterial stiffening independent of other components of fitness.

ADAPTABILITY OF ALPHA-ACTININ-3 IN SKELETAL MUSCLE
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The alpha-actinins are an ancient family of actin-binding proteins. Mammalian tissues contain four alpha-actinin isoforms, including two skeletal muscle-specific isoforms: alpha-actinin-2 and alpha-actinin-3. The former is found in all skeletal muscle fibres, while alpha-actinin-3 is restricted to fast glycolytic skeletal muscle fibres. Therefore, it is reasonable to consider alpha-actinin-3 as being associated with fast fibre functions, which are responsible for rapid, intense muscle contractions. Recently, several studies have suggested the importance of alpha-actinin-3 in muscle function in humans based on the association of physical exercise performance with polymorphisms of the ACTN3 R577X gene, which encodes alpha-actinin-3. Thus, this protein seems to be one of the key determinants of skeletal muscle adaptability and diversity among individuals; however, the adaptive responses of alpha-actinin-3 to various physiological stimuli remain unclear. Therefore, we investigated the influences of skeletal muscle fibre type transformation on the alpha-actinin-3 expression levels in this study, ten female SD rats were assigned randomly to control (C, n = 5) or hindlimb-unloading (S, n = 5) groups. The S animals were tail-suspended for 30 days to prevent loading of their hindlimbs. After 30 days, the soleus muscles in both groups were sampled to determine the soleus wet weight of the S animals was significantly (P < 0.01) lower than that of the C animals. The %type II MyHC determined using SDS-PAGE, and the fast myosin expression level determined using Western blot analysis, were significantly higher in the S animals than in C animals (P < 0.01 for %type II MyHC, P < 0.01 for fast myosin level). Along with these increases in fast fibres, the alpha-actinin-3 expression level analyzed using Western blot was significantly (P < 0.01) and dramatically higher in S animals than in C animals. The alpha-actinin-3 increases concomitantly with the skeletal muscle fast myosin content in rat. Based on the expression pattern specifically localised in fast type fibres, our results indicate that the fast skeletal myosin content is one factor that determines alpha-actinin-3 adaptation.

NEW ASPECTS OF THE HORMONE AND CYTOKINE RESPONSE TO TRAINING
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Exercise training is associated with peripheral-cellular and central-cerebral processes, hormonal-neuronal regulation and transmission mechanisms. During the acute training response, peripheral cellular mechanisms are mainly metabolostatic to achieve energy supply and involve associated cytokine and hormonal reactions. During prolonged training, glycogen deficiency occurs; this is associated with increased expression of local cytokines, and decreased insulin secretion and beta-adrenergic stimulation and lipolysis in adipose tissue which loses energy. This is indicated by decrease of adipocyte hormone leptin, which has inhibitory effects on excitatory hypothalamic neurons. Leptin, insulin, and cytokines such as interleukin 6 (IL-6) contribute to the metabolic error signal to the hypothalamus which result in decrease of hypothalamic release hormones and sympathoadrenergic stimulation. Thyroid stimulating hormone (TSH) is correlated to the metabolic hormones leptin and insulin, and may be used as indicator of metabolic control. Because the hypothalamus integrates various error signals (metabolic, hormonal, sensory afferents, and central stimuli), the pituitary’s releasing hormones represent the functional status of an athlete. Long-term overtraining will lead to downregulation of hypothalamic hormonal and sympathoadrenergic responses, catabolism, and fatigue. These changes contribute to myopathy with predominant expression of slow muscle fiber type and inadequacy in performance. Thyroid hormones are
closely involved in the training response and metabolic control. These alterations are influenced by exercise-induced hypercortisolism, and by decreased somatotropic hormones (e.g. IGF-II).

The hormonal and cytokine pattern of prolonged overtraining and performance incompetence syndrome are complex and can only be interpreted together with clinical findings and data on training and performance.

Invited symposia (IS)

IS-SH10 Pain and injury in sport. Social and ethical perspectives

THE SOCIAL CONSTRUCTION OF CLINICAL DIAGNOSES OF SPORTS INJURIES
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This paper addresses clinical practice in sport medicine. Twinning notions of medical uncertainty with a figurational sociological approach, the paper draws on relevant literature in sport medicine journals and data derived from interviews with various personnel in English elite rugby union. The paper illustrates how uncertainty characterizes the medical understanding, clinical treatment, and patient experience of concussion. Clinicians consequently come to replace officially prescribed and medically-based diagnostic and treatment guidelines with understandings of concussion dominant in the sport subculture. The rejection of medical guidelines, however, threatens the traditional view of clinicians as experts and thus they invoke strategies which bolster their professional position. The paper advances our understanding by arguing that sport physicians’ negotiations with players and coaches not only structure the treatment of injury, but also the ways in which physicians come to think about, understand, and define clinical conditions.

THE BODY - AND THE UNMENTIONABLE EMOTIONS: A DANISH CASE STUDY ON THE BODY IN PHYSIOTHERAPY
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The article highlights that emotions have an absent presence in physiotherapy. Research in the sociology of emotions emphasizes the need to see the individual as a whole and argues that emotions and bodyliness are overlooked aspects of human existence. The article introduces the concept of bodily emotion regimes to designate those social rules that govern emotions in a treatment situation. The present case study is an observational study of the rehabilitation of patients with sports-related injuries at a physiotherapy clinic. The study involves 17 women with (acl) knee injuries who were followed during rehabilitation. Concrete events during treatment, and quotations from qualitative interviews with patients undergoing treatment, are used to illustrate the lack of spoken reference to emotions. The taboo on emotions can be seen as a result of the treatment system’s neglect of the body as a living unity of physical, psychic and social dimensions. The neglect of emotions can be characterized as an unintended consequence of the fact that physiotherapy is anchored in medical science and in the positivist mode of measuring and weighing the body. On the other hand the phenomenon can also be explained in terms of the organization of work in the clinic, the way in which time is structured and the fact that treatment takes place in groups.

PREVENTING SUFFERING IN SPORT: HYPERTROPHIC CARDIOMYOPATHY AND THE ETHICS OF GENETIC SCREENING
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Within the last years the development of genetic diagnoses advanced rapidly. The identification of disease related genes seems to be an effective preventive tool especially in the field of sport. But why is sport different form other areas? One answer is that the detection of genes which are associated with hypertrophic cardiomyopathy (HCM), for example, could prevent athletes suffering severe cardiac incidents or even from dying ‘on the pitch’ when participating in competitive (high performance) sports. Indeed, in the non-sport related context ‘genetic defects’ can be diagnosed as well, but often without a preventive or therapeutic perspective. However, the question at hand is how to interpret the test results? The Italian/ the European recommendations (non-genetic cardiol. screening), worked out by the sport cardiology study group might serve as a model for genetic testing (2, 3). The Italian pre-participation screening recommendations, however, cause some tensions (4). They potentially violate the athlete’s autonomous decision making capacities (even the athlete’s right of self-harm). Consequently, the implementation of a preventive genetic testing can not be decided without taking ethical aspects into consideration (5). On the one hand genetic screening and testing might prevent an athlete from dying. On the other hand a strict exclusion from competitive sports on that basis might be seen as paternalistic. If, however, athletes choose to be tested voluntarily the knowledge about their genetic makeup can be seen as a form of self-empowerment, i.e. to make their own choices (6).

References:
(3) A. Pelliccia et al., Evidence for Efficacy of the Italian National Pre-Participation Screening Programme for Identification of Hypertrophic Cardiomyopathy in Competitive Athletes, Eur Heart J 27, no. 18 (2006).
JUMP CAPACITY IN RELATION TO PERFORMANCE OF TOP FEMALE ARTISTIC GYMNASTS

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Jump capacity has been measured by different studies with female artistic gymnasts (1,2). Jumping height correlated significantly with the mark for floor and horse vaulting exercises (3). Purpose of this study was to determine the relation between muscle power evaluation with vertical jump tests and judges scores of the different Women Artistic Gymnastics apparatus. 16 gymnasts from Junior and Senior Spanish National Team participated for the study. Three measurements were carried out during the preparation period of the World Championship (Stuttgart'07). Jump capacity was measured with a force plate (Kistler Quattro Jump) at 500 Hz. Gymnasts executed Squat Jump (SJ) and Counter Movement Jump (CMJ) tests. Variables selected were height (m), Peak Force (N), Peak Velocity (m/s-1) and Peak Power (W/Kg) of highest jump execute at each test. Jump tests were carried out during the week before a competition or an official technical control. International judges evaluated all exercises. We selected Difficult Value (DV), Composition Value (CV) and Final Score (FS) from the four apparatus to correlate with jump evaluation data.

It was showed a significant correlation between SJ and CMJ Peak Power with the DV (SJ: r= 0.49, p<0.05, CMJ: r= 0.59, p<0.01) and FS (SJ: r= 0.49, p<0.05, CMJ: r= 0.58, p<0.01) of horse vaulting exercise. It revealed the importance of achieve a high muscle power of lower extremities to improve the performance of this exercise.

We also found significant relation between CMJ Peak and DV (r= 0.67, p<0.01) and CV (r= 0.63, p<0.01) at uneven bars exercise. The relation between CMJ and SJ Peak Force at balance beam was also significant. Although it's difficult to establish a relation between the uneven bars and balance beam performance and the jump evaluation results the analysis revealed that gymnasts who achieved high muscle power level had better scores.

At floor exercise we found significant relation between SJ Peak Power and DV (r= 0.56, p<0.05), CV (r= 0.49, p<0.05) and FS (r= 0.58, p<0.05). The CMJ Peak Power was also significant correlated with the DV (r= 0.57, p<0.05) and FS (r= 0.55, p<0.05).

This study showed the significant relation between muscle power measured by jump tests and performance of high level female gymnasts. Jump test results were revealed as an important tool that can be used for the control of the performance level of our gymnasts during the season.

References:

ANALYSIS OF THE SWING HUB OF THE GOLF SHOT

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An analysis and functional description of the golf swing hub path is presented. The swing hub is defined as the path of the hand/club connection point or interface between the golfer and the club. Here the golfer controls the club kinematics and energy transfers from the body. An analysis of the swing hub was performed using a combined full-body golfer model with a parametric club model. This modeling approach removed the constant radius hub path constraint of traditional double-pendulum models.

The swing hub and associated parameters during the downswing were compared for four diverse amateur subjects (male-0 hdcp, male-5 hdcp, male-13 hdcp, fem-18 hdcp. data is presented in this order). While the hub paths of all subjects were unique and deviated considerably from a constant radius path, a three phase pattern emerged. During phase I the radius of the swing hub was max and nearly constant from the initiation of the downswing to the point were the club was vertical. The large initial hub radius reduced the initial centrifugal acceleration which in turn diminished the tendency of the club to move outward. During phase II the hub path radius decreased at a constant rate by a redirection of the linear force until the club reached the horizontal position where the radius obtained its min value. The result was a rapid increase in the centrifugal acceleration which caused the club to move outward. From this position the radius remained constant then increased slightly near impact (phase III). During this phase the golfer primarily controlled the path of the club as its momentum carried it through impact. The slight upward movement of the hub path near impact appeared to transfer additional energy to the club. There was considerable horizontal movement of the hub path center of rotation from the golfer’s left to right counter to the horizontal movement of the golfer CG. Vertical movement was relatively minimal.

Among the subjects, the max hub linear velocities (and profiles) were nearly identical (11.7, 11.6, 11.4, 11.2 m/s) though the max club head velocities were quite different (52.0, 49.7, 46.3, 42.1 m/s). The ratio of the max to min hub radius was related to skill level (1.39, 1.25, 1.19, 1.13). The better players had lower min path radii, and reached their min values later in the downswing. The overall linear distance of the hub path was related to skill level (2.42, 2.20, 1.96, 1.70m). The better players applied greater max linear forces (512, 453, 390, 304 N) over the hub path which resulted in a greater amount of energy (linear work) being transferred to the club (355, 289, 288, 235 N-m). The delay in achieving the min path radii coincided with achieving max power (3875, 3005, 2310, 1720 m/s). The data supports the opinion that linear work is more important than angular work (function of wrist torque) in transferring energy from the golfer to the club thus highlighting an important action of the hub path.

CHARACTERISTIC CURVE PATTERNS OF 3D BOAT MOTION IN INTERNATIONAL ROWING RACES IN ALL BOAT CATEGORIES

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Introduction.
For success in international rowing, athletes must use their technical skills and entire performance capability (e.g., physical, condition, coordination) to achieve and retain a high average boat velocity throughout the 2000m race. For Rowing - a cyclical motion - a consistently high technical skill level under various velocity conditions and stroke rates is a necessary prerequisite for an efficient race. However, rowers are not perfectly symmetrical in applying forces on the pin, handle and footstretcher and must correct for intra-stroke boat balance and external perturbations. Measuring multi-dimensional boat-related aspects of rowing performance during racing, is seen as an area of opportunity to extend our knowledge of the 3D boat motion characteristics in all boat categories, which could in turn contribute to rowing superiority.

Methods

In the last two World Championships all Australian boats (n=31; 13 (2006); 18 (2007); 18 boat categories) were equipped with the Mini-maxX tracking device (Catapult Innovations, Australia, sample rate 100Hz, datalogger) during racing. Propulsive, transverse and vertical boat acceleration were directly measured. Yaw, roll, pitch of the boat and boat velocity were derived. The data were analysed and the stroke by stroke data detected using proprietary software. Every boat was analysed twice (e.g. semi final/ final). Graphical displays and statistical analysis were performed for each variable, and compared between categories. The coefficient of variation (CV) of the intra-stroke curve patterns (separately for drive/ recovery phases) was defined to assess the stroke consistency and the particular curve pattern.

Results

Characteristic curve patterns were found for each crew for all variables throughout all boat categories and ratings. All variables revealed a high consistency in the drive phase, high variations were found in the recovery phase and between different boat crews, except for the propulsive boat acceleration (aiprop), boat velocity (vb/boat) and pitch - they revealed a particular curve pattern for all boat classes. Transverse boat acceleration (latrans), roll and yaw showed a crew-related, however highly consistent curve pattern.

Discussion/Conclusion

Characteristic curve patterns were found for each crew for all variables throughout all boat categories and ratings. All variables revealed a high consistency in the drive phase, high variations were found in the recovery phase and between different boat crews, except for the propulsive boat acceleration (aiprop), boat velocity (vb/boat) and pitch - they revealed a particular curve pattern for all boat classes. Transverse boat acceleration (latrans), roll and yaw showed a crew-related, however highly consistent curve pattern.

References


STEPWISE MULTIPLE REGRESSION MODEL OF THE HAMMER THROW

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Previous studies had shown that the reached distance of the hammer throw depends mainly on the three release variables, the angle in relation to the horizontal plane, the height and the velocity of the hammer and the forces exerted by the air resistance on the hammer during the flight. A well known theoretical model to predict the thrown distance was proposed by de Mestre (2000). The present paper proposes and compares with de Mestre model an empirical model of stepwise multiple linear regression for hammer throw distance, in function of the release variables. The empirical model was built starting from 33 throws analyzed in two Brazilian high level competitions in 2006, being 21 male and 12 female. The DiVideo System was used for the 3D kinematical analysis. All statistical analysis used the level of significance of P<0.05. The averages of the release variables of the 33 Brazilian throws were 37.2° for the angles, 22.8m/s for the velocity, 113m for the heights, and 48.24m for the reached distances. The stepwise regression allows each variable can be separately included in the model, and the order of importance and inclusion is suggested in function of statistical parameters. The model was defined as y = -3.78v0 + 0.39a0 + 52.6 where y is the predicted distance, v0 the release velocity and a0 the release angle. The R² value of the model was of 0.96. In order to compare the predictions provided by the theoretical and empirical models, an independent data collection was used. The data set consisted of 6 throws and was acquired in the 1999 Athletics World Championship by Gutiérrez et al. (2002). The regression analysis of the predicted against measured values using this empirical proposed model showed a linear coefficient of -31.80 with the confidence interval [-137.56, 73.96], an angular coefficient of 1.46 with [0.02; 2.91] and the percent of explained variability equal to R²=0.66. A regression analysis using the de Mestre model showed a linear coefficient of -4.73 with the confidence interval [-36.54, 76.87], an angular coefficient of 0.97 with [1.02; 1.91] and the percent of explained variability equal to R²=0.65. The average difference between predicted and measured value was -2.01 m to the empirical model and 6.97 m to the de Mestre model. These results show that both models provide similar results for predicting hammer throw distance from release variables. However, it is important to emphasize that just a small number of truthful analyzed hammer throws were found in the literature for validating the models.

References


Acknowledgement

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COMPARISON OF MOMENT-ANGLE PROFILE OF ELBOW FLEXORS - EXTENSORS IN ELITE YOUNG OVERHEAD ATHLETES

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In in-vivo conditions, the moment vs. joint angle curve (M-A profile) is typically used to examine the force-length characteristics of muscles. During attack in volleyball (VB) and water-polo (WP), the elbow moves through an arc of 60°-70° joint flexion suggesting that the flexors and extensors operate in similar joint configurations, therefore muscle lengths. Previous studies (Herzog et al., 1991) have shown different extensor moment-knee angle relations between different athletes that were attributed to adaptation of muscle function to different functional requirements. The purpose of this study was to compare the moment-elbow angle profile between elite young overhead athletes.

Sample consisted of 10 VB and 10 WP athletes with body mass, height and age values being 80.0±8.0 kg, 185.7±5.1 cm and 17.2±1.0 years, and 76.1±5.0 kg, 174.8±8.0 cm and 15.2±0.9 years, respectively. Subjects executed 0.0 sec maximum dominant elbow flexion-extension contractions on a Cybex II+ at angles of 45-60-75-90-105-120° of joint flexion (0°=full extension), being in a supine position with

Saturday, July 12th, 2008
10:15 - 11:45
the shoulder joint at 45° of horizontal abduction and the forearm in neutral position. Maximal isometric flexor–extensor moment (Nm) was calculated. Data collection (Fs=1000 Hz) and data analysis used the AcqKnowledge software. A 2nd-order polynomial curve fitting approach was used to predict the M-A profile and the optimal elbow joint angle (Aopt). Possible differences in Aopt of the M-A profile and in the flexors-extensors moment magnitude across tested elbow joint angles between groups were examined with 1-test for independent samples and univariate analyses, respectively (p < 0.05).

In both groups, results showed that the flexor moment was stronger on positions of greater elbow joint extension and was reduced as the joint became more flexed, while the extensors showed a relatively constant moment-generating capacity across the tested elbow angles. The predicted Aopt of the flexors M-A profile was at 72° and 70° and the corresponding one for the extensors M-A profile at 74° and 70° of elbow flexion in VB and WP athletes, respectively, however no significant differences were observed between groups. VB athletes generated higher elbow extensor moment than WP athletes at 45° of elbow flexion, whereas no significant differences were found for the flexor moment.

The identical shape of the elbow flexor – extensor M-A profile in VB and WP athletes suggests similar adaptations of the elbow muscles to similar functional requirements. However, the observed difference at a joint configuration (greater elbow extension), which is more frequently seen in volleyball, provides evidence for adaptations of muscle function that may either relate with different competition conditions or may result from existing differences in muscle volume between groups, which become more pronounced in critical elbow joint angles for these sports.

AUTOMATIC DETECTION OF KEY EVENTS DURING THE TAKEOFF PHASE OF SKI JUMPS USING BODY FIXED INERTIAL SENSORS

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INTRODUCTION: Takeoff is one of the most important phases of ski jumping. It is then of particular interest to study meaningful kinematics parameters relating the takeoff movements to the overall performance. This requires to precisely identify key events such as when the takeoff movement is initiated (TS), when the toe leaves the ground (TO) or when the ski jumper achieved his final flight posture (TE). Unfortunately, this proved to be impractical using common equipment (i.e. video cameras). In this paper, we propose an ambulatory system that records the accelerations and the angular velocities of ski jumpers’ segments during jumps. Based on these signals, we then automatically extract three key events during takeoff: TS, TO and TE. We use these instants to derive timing information during takeoff in hill jumps.

METHODOLOGY: We first carried out in-lab measurements on 5 ski jumpers using a wheeled board on a 5m platform with an inclination of 5deg. Each jump was recorded using an optical motion capture system (VICON, 200Hz) considered as the reference. The key events TS_ref, TO_ref and TE_ref were then manually labeled using both the 3D reconstructions of the simulation jumps and the angle curves. In parallel, the athletes were equipped with 3D inertial modules placed on the thighs and the shanks. Each module was composed of one triaxial gyroscope, one triaxial accelerometer and an embedded datalogger recording the signals at 200Hz. The X-axis was defined as pointing towards the left, Y-axis as pointing upward and Z-axis as pointing forward. TS events were automatically identified by detecting peaks on the thighs angular velocities around the X-axis (pitch). TO events by detecting peaks on the shanks accelerations along the Y-axis and TE by detecting peaks in the shanks angular velocities around the Y-axis (roll). Finally, we applied our ambulatory system in real conditions on the Einsiedeln (Switzerland) medium jumping hill (hs-77 m) and determined takeoff duration (TO-TS) and spring movement duration (TE-TS).

RESULTS AND DISCUSSION: A total of 40 simulation jumps and 3 hill jumps were obtained. We compared our results to the reference (VICON + manual labeling). The standard deviation (SD) between TO and TO_ref was 15ms with a mean error (ME) of -12ms. The SD between TE and TE_ref was 29ms with a ME of 20ms. Finally, the SD between TS and TS_ref was 63ms with a ME of -6ms. This larger latter error may be explained by the fact that it is difficult to precisely determine when the thighs start to rotate even using angles curves. We finally applied our system in real conditions measuring 3 hill jumps. The average takeoff duration was 330ms. The average spring duration was 377ms.

CONCLUSION: we have proposed a new method using inertial sensors to automatically determine key events during takeoff. We validated our system in-lab and applied it on hill jumps to derive important timing information during takeoff.

Oral presentations (OP)

OP-HF10 Health and Fitness 10 - Sedentary

PHYSICAL ACTIVITY STATUS IN MIDDLE-AGED MEN: CONFUSION AND CONFLICT BETWEEN VARIOUS PUBLIC HEALTH RECOMMENDATIONS

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Introduction: Physical activity recommendations prescribe the minimum dose of physical activity required for general health in order to identify those people who are not sufficiently active. We do not know whether the various recommendations that are available unambiguously prescribe a similar amount of physical activity and therefore we sought to determine whether ten commonly-used physical activity recommendations similarly classify activity status in middle-aged men.

Methods: Following ethics approval, ninety men aged 45-64 years volunteered for the present investigation. We determined habitual minute-by-minute free-living physical activity energy expenditure in kcal/min over a full seven-day period of observation using synchronised accelerometry and heart rate with branched equation-modelling (Actiheart, Cambridge Neurotechnology Ltd., Cambridge, UK) as validated previously by our group (Thompson et al., 2006, J Nutr. 136: 1037-1042). We then examined individual attainment of ten permutations of commonly-used physical activity recommendations that originate from ACSM (US), CDC (US), Institute of Medicine (US), and Department of Health (UK).

Results: There was very poor absolute agreement between the recommendations, with an intraclass correlation coefficient (A,1) of 0.21 (95% CI, 0.12 to 0.31). The proportion of men defined as active ranged from to 11% to 98% for individual recommendations (mean 59%, SD 32%). Only 8% of men (n=7) met all 10 recommendations and would therefore be unanimously classified as active and only one man
NA
THE EFFECT OF RESISTED PHYSICAL EXERCISE PERFORMED AT DIFFERENT HOURS OF THE DAY IN THE SLEEP PATTERN OF SEDENTARY INDIVIDUALS

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The past decades have seen a great variety of studies conducted in an attempt to assess the effects of physical exercise upon sleep. But because of the differences in methodologies and the fact existing studies have assessed the effects of aerobic exercise (AE) over sleep only, those of resisted exercise (RE) as well as how the time when exercise is performed affects the sleep pattern remains unknown.

Objective: The aim of the current investigation was to verify the effect of a session of RE performed at different times of the day (morning - 7:00 to 9:00, afternoon - 13:00 to 15:00, and evening - 18:00 to 20:00) in the sleep pattern of sedentary individuals who have good sleep quality.

Methods: 92 volunteers part took in this investigation, 34 of whom were men and 58 women, aged 30 ± 9 years of age, sedentary and with good sleep quality. The experimental protocol consisted of a session of RE composed by 3 series of 15 repetitions each, with a load equivalent to 50% of the 1-RM, after 130” intervals. The delta parameters of the polysonographies at the different hours of exercise were carried out by means of one way ANOVA, p <0,05.

Results: No significant differences were found in the sleep parameters when RE was performed at different hours of the day: sleep latency (p = 0,86); REM sleep latency (p = 0,85); total sleep time (p = 0,08); sleep efficiency (p = 0,13); stage 1 (p = 0,96); stage 2 (p = 0,80); slow wave sleep (p = 0,74); REM sleep (p = 0,60); vgl (p = 0,37).

Conclusion: Sedentary individuals with good sleep quality did not present any significant alterations in the sleep parameters when they performed a session of RE with a load equivalent to 50% of 1-RM.

Acknowledgments
The authors are greatly thankful to AEP, CEPI/FAESP (process 98/14303-3), CNPQ, CEPE and FADA/UNIFESP for the financial support granted to this study and are also thankful to Prof. Dr. Benedeto Sérgio Denadai for his important contribution.

INDIVIDUALILITIES EFFECTS OF RESISTANCE TRAINING UPON RESTING METABOLIC RATE IN OVERWEIGHT FEMALE 39-49 YEARS OLD

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It is known, that a rise of energy consumption by aerobic endurance training and energy restricted diet may results in decrease of resting metabolic rate (RMR) in healthy man (Donnelly, 2000; Ross, 2000). Therefore have to be assessed the effects of other exercise training programs. Recent studies have reported that strength training represents an adequate alternative to aerobic exercise in women obesity (Moos, 2004). We reasoned that an increase of muscle mass contribute a rise of RMR and has positive effects on energy balance in overweight female 39-49 years old. The aim of the study was to compare the effect of high intensity resistance training in middle age women with relatively decreased RMR versus others without a concomitant diet upon RMR.

17 untrained overweight female (BMI 33,2±2,5 kg/m2) were matched for RMR and assigned to relatively decreased RMR (D, n=8, BMI 33.5±2.4 kg/m2) and others (O), n=10. BMI 33,0±2,3 kg/m2, p<0.05) training groups. The subjects’ rest (supine) oxygen uptake measured in the morning for 10 min 3-4 hours after a light meal. The subjects of D and O group participated in the same resistance training program 2 day per week for 3 months with slow-speed isokinetic strength exercises of lower and upper body at 75-85% and 60-70% 1RM (8-10/12-15 repetitions per set, 3-5 sets). The determining of fat folds and oxygen uptake was performed before (week 0) and on week 12. The results showed that after 12 weeks training resting oxygen uptake significantly increase in D group only from 103.1± 5.6 on week 0 to 124.4± 6.5 ml/min/m2 on week 12 (p<0,05). The whole increase of lower and upper body maximal strength in D and O group were 20.1± 3.4 and 16.7± 3.9%, respectively (p<0,1). Post-trained decrease of body fat in D group was significantly more (-8.7±1.3%) than in group A (-5.4±0.9%). Resting oxygen uptake related to fat-free body mass showed a significant more increase in D group (from 4.02± 0.06 to 5.03± 0.07 ml.kg-1.min-1) than in group O. BMI decreasing was significantly more in D group (-11.9 ± 1,9%) than in group O (-8.1 ± 1,2%). This decreasing was related to changes of RMR (r=-0,62; p<0,05).

We concluded that two sessions per week of high intensity resistance training for 12 weeks improve resting metabolic rate in women with relatively decreased RMR only. BMI decreasing was significantly related to changes of RMR The results support the supposition, that strength training represents an adequate alternative to aerobic endurance training in women rehabilitation training programs. We supposed that long-term maintenance positive effect of weight loss programs of overweight middle age women may be provide by increasing of resting metabolic rate in persons with relatively decrease RMR.

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"THE SLEEP OF A LABOURING MAN IS SWEET": THE EFFECTS OF PRIOR EXERCISE ON THE ARCHITECTURE AND QUALITY OF DAYTIME SLEEP

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As illustrated by the Biblical maxim in the title of this abstract, relationships between sleep and exercise have been of interest for thousands of years (Atkinson and Devenne, 2007). Although the acute and chronic effects of exercise on nocturnal sleep quality have been studied previously, most researchers have employed subjective or activity-based indices of sleep quality rather than gold-standard polysomnography for formal definition of sleep architecture. Moreover, no previous researcher has considered how a bout of exercise influences the architecture of subsequent daytime sleep, which is important for the growing European population of shift-workers. Therefore, we hypothesised that quality and architecture of daytime sleep are improved by prior exercise.
Following a night of restricted (~4 h) sleep, 9 normative adults, aged: 34±6 y, either exercised at 70% VO2max or remained sedentary between 09:30-10:00. At 14:00, subjects were allowed to nap for up to 1 h in our sleep laboratory. After a 10-min period of relaxed wakefulness before lights-out, polysomnographic data were analysed to describe sleep latency (the time between lights-out and onset of stage 1 sleep) and the duration of stage 2 sleep. Wrist accelerometers were worn throughout the daytime sleep as a global measure of "restlessness". Subjective sleep quality (1-4 Likert scale) was also recorded. Data are described as means±SE and 90% confidence intervals (CI).

Wrist activity gradually decreased during the 10-min before lights-out in both trials. Nevertheless, the mean activity during this period was 11.5±0.6 units following exercise compared to 16.0±0.7 units without prior exercise (CI for difference = 0.5 to 8.5, P=0.029}. Sleep quality was perceived to be 1.2±0.2 units better in the exercise trial (P<0.0005). Daytime sleep latency reduced, although not significantly, from 421±100 s without prior exercise to 257±57 s following exercise (CI for difference = -368 to 41 s, P=0.085). Prior exercise did not affect the duration of stage 2 sleep (P=0.24).

These data suggest that prior exercise decreases restlessness during the preparation phase for daytime sleep and improves subjective sleep quality. There is some evidence that daytime sleep latency is also shorter following exercise. Therefore, we conclude that exercise could be beneficial to the shift-worker who has disrupted nocturnal sleep and is required to sleep during the daytime hours.

References:

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Oral presentations (OP)
OP-PM17 Physiology 17 - Performance

PROTECTIVE EFFECT CONFERRED BY SLOW VELOCITY LENGTHENING CONTRACTIONS AGAINST MUSCLE DAMAGE INDUCED BY FAST VELOCITY LENGTHENING CONTRACTIONS

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A bout of eccentric exercise confers protection to subsequent bouts of the same or similar eccentric exercise, and this adaptation is known as the "repeated bout effect". Previous studies have identified factors influencing the repeated bout effect, but no previous study has investigated the effect of lengthening contraction velocity. This study tested the hypothesis that slow velocity lengthening contractions would not provide protection against muscle damage induced by a subsequent bout of fast velocity lengthening contractions. Eighteen men (26.3 ± 4.2 yrs) were randomly placed into two groups: repeated bout group (n=10) and control group (n=8). The repeated bout group performed two bouts of exercise consisting of 210º·s⁻¹ for the first bout and 210º·s⁻¹ for the second bout. The control group performed the fast velocity bout only. Changes in maximal isometric strength, range of motion (ROM), upper arm circumference, muscle thickness, muscle soreness, serum creatine kinase (CK) and lactate dehydrogenase (LDH) activities were measured before, immediately after, and 24, 48, 72, and 96 hours after exercise. Changes in the measures over time after the fast velocity exercise were compared between groups by a two-way repeated measure ANOVA. For the repeated bout group, changes in the measures were compared between bouts by the two-way ANOVA. Comparison was also made between the first bout of the repeated routine exercise and control group (fast velocity exercise) by the two-way ANOVA. All criterion measures except muscle soreness indicated less muscle damage for the slow than fast velocity eccentric exercise, which supports the findings of our previous study (Int J Sports Med 27: 591-598, 2006). No significant differences between the first (slow velocity eccentric exercise) and second (fast velocity eccentric exercise) bouts were evident for changes in all criterion measures except ROM. The recovery of muscle strength and ROM was enhanced, and increases in upper arm circumference, muscle thickness, and blood markers of muscle damage (CK, LDH) were attenuated when the fast velocity eccentric exercise was preceded by the slow velocity eccentric exercise bout. Thus, the results of the present study suggest that the slow velocity eccentric exercise that results in less damage than the fast velocity eccentric exercise conferred some protection for a subsequent bout of the fast velocity eccentric exercise. The findings of the present study are in line with previous studies showing that an initial bout of eccentric exercise resulting in less damage can still confer protection against a more demanding eccentric exercise; however, the magnitude of protection is affected by the magnitude of muscle damage induced by the initial bout.

EFFECT OF HIGH-INTENSITY INTERMITTENT PRIMING EXERCISE ON 3KM CYCLING PERFORMANCE

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Background: Priming exercise, or the ‘warm-up’ (WU), is an accepted practice prior to sporting competition. Previous research suggests that a high-intensity intermittent WU may be required to optimise performance (Bishop et al. 2001). The aim of this study was to determine the effects of three high-intensity intermittent WUs strategies on 3km laboratory time-trial (TT) cycling performance.

Method: Ten endurance-trained male cyclists (mean ± SD: age, 28.3 ± 8.4 yr, body mass, 81.8 ± 11.6 kg, stature, 1.8 ± 0.1 m, VO2peak, 4.6 ± 0.5 L.min⁻¹) participated. After an initial incremental exercise test to exhaustion, participants completed four 3km TTs on four separate occasions and in random order, each preceded by a different WU strategy of fixed duration. These included: a ‘self-selected’ (control) WU, and three different high-intensity intermittent WUs strategies of varying intensity (100% and 150% of the power at VO2peak, and all-out). Mean power during the subsequent 3km TT (Wmean) was determined for each trial. Measures of heart rate, oxygen uptake and blood lactate were also measured throughout each WU and 3km TT.

Results: The self-chosen WU resulted in a Wmean (379 ± 44 W) that was slightly, but not significantly, greater than both the 100% WU (376 ± 45 W, 0.7%, p = 0.570) and 150% WU (374 ± 48 W, 1.5%, p = 0.301), and was significantly greater than the ‘all-out’ WU condition (357 ± 45 W, 5.8%, p = 0.003). Similar differences were observed for 3km TT time.

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Conclusion: A priming strategy that is overly intense is detrimental to subsequent 3km cycling performance. Other intermittent WU strategies did not improve 3km-TT performance above that of a self-chosen WU. That a self-chosen WU resulted in a comparable performance to prescribed high-intensity intermittent priming, suggests that athletes are able to self-select (consciously or sub-consciously) a WU that is of an appropriate intensity/duration to optimise performance.

References:

PACING STRATEGY USED DURING THE RUNNING LEG OF ELITE OLYMPIC DISTANCE TRIATHLON: EFFECTIVE, BUT NOT OPTIMAL?
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Introduction
The selection of an optimal pacing strategy allows an athlete to exercise to their physiological potential. For endurance events greater than 4 minutes the optimal pacing strategy is an even-paced strategy [1]. The aims of the present study were to compare: (i) pacing strategies during the running leg (10km) of elite Olympic distance triathletes with 10,000m athletic running performances; and (ii) pacing strategies of Successful (top 50% of observations) and Unsuccessful (bottom 50%) triathletes.

Methods
Data were collected at 8 major draft-legal Olympic distance triathlons between 2005-06. These events included the Commonwealth Games, ITU World Cups, and ITU World Championships. Timing data were collected at 3-4 points during the run with the first collection point positioned close to the 1km mark. The distance to each collection point was measured with a Rolson Tools 13-inch measuring wheel. Data collected ranged from 48-100% of triathletes finishing within 10% of the winning time in each race and consisted of 179 female and 326 male performances. Data for 10,000m run performance consisted of km splits for 10 male and 10,000m World Records (set since 1988) and km splits from 4 male and 4 female World Championship 10,000m finals between 2001-07. Data was provided courtesy of Ross Tucker and the IAAF website.

RESULTS
Elite triathletes exhibited a different pacing strategy during the running leg of their event compared with athletes competing in 10,000m running races. Triathletes adopted a ‘fast-start’ strategy, which resulted in the athletes slowing during the middle and latter stages of the run. In contrast to triathletes, the pacing strategy adopted by runners in 10,000m running races was either ‘even-paced’ for male World Record performances or ‘fast-finishing’ for World Championship races. Male triathletes typically adopted a more aggressive ‘fast-start’ strategy compared to their female counterparts, although regression analysis showed both started 6-8% faster than their average running speed for the 1st km of the 10km run. The pacing strategy adopted by the Successful was not consistently different from the Unsuccessful triathletes. On average, the winners (both male and female) of each triathlon ran the first kilometre approximately 5% faster than their average pace for the 10km run.

CONCLUSIONS
The structure of a triathlon means each triathlete does not necessarily commence the running leg of the event at the same time as their competitors, which may result in attempts to capitalise or minimise differences within the early stages of the run. However, the race comparison with world-class distance runners suggests that elite triathletes are not optimally pacing the running leg of their event, and that overall performance during a triathlon may be improved by adopting a more even-paced running strategy.

References.

MUSCLE OXYGENATION AFTER DOWNHILL WALKING-INDUCED MUSCLE DAMAGE
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It has been well documented that exhaustive downhill walking (DW) exercise, which involves repetitive eccentric contractions, may result in delayed onset muscle soreness and/or muscle damage. Some of the known consequences of repetitive and uncustomised eccentric exercise include long-lasting decreases in force generation, loss of flexibility and decreased range of motion. Increased muscular pain, tenderness, oedema and an efflux of intramuscular proteins into the blood stream are also secondary outcomes after eccentric exercise. The purpose of this study was to investigate changes in muscle oxygenation and other markers of DW-induced muscle damage within vastus lateralis, over five days following the exhaustive exercise.

Nine healthy males performed 40-min DW on a treadmill at walking velocity of 6.4 km/h and gradient of -25%. To increase the likelihood that DW would induce muscle damage, subjects were loaded with 5% of their body weight carried in a back pack. Maximum voluntary torque (MVT), subjects’ perception of muscle soreness (SOR), plasma creatine kinase (CK) activity and myoglobin (Mb) concentration were assessed before and after DW exercise on the first day, and then again on days 2, 3, 4 and 5. To determine if markers of muscle damage were associated with changes of muscle oxygenation, near infrared spectroscopy (NIRS) of vastus lateralis was employed at rest and during isometric exercise at 50% and 80% MVT on the days following DW. Repeated-measures ANOVA revealed that MVT decreased while SOR and Mb concentration significantly increased after DW (p<0.05). Up to a 25% decrement in MVT was observed after DW. The significant changes in MVT and CK activity along with significant increments in Mb concentration and SOR demonstrated the effectiveness of our experimental protocol to evoke muscle damage. Resting muscle oxygenation increased immediately after DW, but recovered within 24 hours. Other NIRS-derived variables at rest varied little from pre-DW values, suggesting either these were either insensitive to exercise-induced muscle damage or that muscle oxygenation is little changed in the days following DW. In contrast, the volume of muscle oxygen desaturation during 80% isometric MVT ranged from 4% to 28% greater after DW, and was still elevated by 11% four days later. Muscle oxygen desaturation immediately after 80% MVT was significantly higher after DW, and remained elevated by 11% over pre-DW values on day 5. Similarly, NIRS-derived muscle oxygen desaturation and re-saturation kinetics were significantly faster than pre-DW values.

Collectively, the findings of our study supported the hypothesis that DW-induced muscle damage may affect muscle oxygenation kinetics, as evidenced by the changes in resting and exercise muscle oxygenation. The possible mechanism responsible for these changes might be increased resting muscle oxygen utilization after muscle damage due to an increased requirement for aerobic energy-demanding repair p
THE EFFECT OF GRADED COMPRESSION SOCKS ON EXERCISE CAPACITY AND POST-EXERCISE RECOVERY

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Due to intense training programmes and competition schedules, athletes are keen to explore any strategy which may enhance their post-exercise recovery. Various methods have been investigated, including active recovery, hydrotherapy and compression garments. It has been suggested that compression socks may improve venous return during and after exercise and therefore facilitate the clearance of waste products. Manufacturers of compression garments further claim that it will enhance exercise performance. The aim of this study was to compare the effects of graded compression socks on the exercise capacity and lactate recovery profiles of athletes during short maximal exercise and prolonged submaximal exercise.

In experiment 1 (maximal exercise), ten trained athletes completed two incremental running exercise tests to exhaustion separated by at least 7 days, in random order, with and without socks. In experiment 2 (prolonged submaximal exercise), 7 trained athletes completed two submaximal treadmill tests at 70% VO2max, separated by at least 7 days, in random order, with and without socks. The latter protocol lasted two hours and simulated a hilly route, including level, uphill and downhill sections. During the ‘with socks’ trials, athletes wore the compression socks during the exercise and up to 30 min into recovery. In all cases, subjects sat passively on a chair for 30 min after exercise. Cardio-respiratory parameters were measured with the Cosmed Quark b2 metabolic system and blood lactate concentrations were measured using the Lactate Pro analyzer.

Wearing compression socks did not result in higher maximal exercise capacities or better performances during the prolonged exercise test. Directly after the maximal exercise test, there were no differences in blood lactate concentrations. However, trials with the compression socks resulted in significantly lower blood lactate concentrations after 30 min recovery (4.4 ± 1.9 mmol/L vs 5.8 ± 2.0 mmol/L; P = 0.008). After the prolonged exercise tests, the blood lactate concentrations directly after exercise were significantly higher without the compression socks (1.9 ± 0.8 mmol/L vs 2.3 ± 0.9 mmol/L; P = 0.041), despite no differences in distances completed (18.9 ± 1.1 km vs 19.0 ± 1.2 km). After 30 min recovery, the blood lactate concentrations were significantly lower in the tests with socks (1.6 ± 0.5 mmol/L vs 2.4 ± 0.4; P = 0.008).

Our results show that exercise capacity and performance are not enhanced by wearing compression socks during exercise. Our study supports previous findings that compression socks aid post-exercise lactate recovery during both short- and long-term exercise. However, the effects were more pronounced after prolonged exercise where lactate recovery was significantly faster with compression socks. Our results therefore suggest that endurance athletes may benefit most through this strategy during exercise of longer duration.

EXERCISE-INDUCED PEAK FAT OXIDATION IS INCREASED BY ENDURANCE TRAINING AND DIET

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Aim: To investigate if exercise-induced peak fat oxidation is increased by 12 weeks of endurance training with or without weight loss or by an energy-reduced diet.

Methods: Forty young, overweight male volunteers (age: 32±5 [mean±SEM] years, BMI: 28.1±1.1 kg.m-2) were randomized to 4 intervention groups: Training (T), Training without weight loss (Ttwl), Diet (D) and Control (C). An energy deficit of 600 KCal day-1 was induced by either endurance training or diet in T and D. Ttwl had an identical training regime of 600 KCal day-1, but had to increase dietary energy intake by 600 KCal day-1. C maintained their habitual lifestyle during the 12-week intervention period. Before and after the intervention, maximal oxygen consumption (VO2max) was measured and peak whole body fat oxidation (FATmax) estimated by indirect calorimetry using bicycle ergometer exercise protocols with an initial warm-up followed by work load increments of 25 watt min-1 and 30 watt 13 min-1, respectively. Body Mass (BMI), Fat Mass (FM) and Lean Body Mass (LBM) were determined by DXA scanning.

Results: After the intervention BM was reduced 5.0±2.7 and 5.0±1.6 kg in T and D, respectively, and decreased in D by 1.1±0.9 kg (P<0.01). No change in BM was observed in C. VO2max increased in T and Ttwl by 0.5±0.3 and 0.5±0.1 L.min-1 (P<0.01), respectively. VO2max was not changed in D and C. FATmax was increased in T, Ttwl and D by 0.17±0.14 (P<0.05), 0.13±0.08 (P<0.05) and 0.10±0.06 gfat.min-1 (P<0.05), respectively, and remained unchanged in C. The relative workload (%VO2max) at which FATmax occurred was increased in T and Ttwl by 8.2±6.0 (P<0.01) and 9.9±7.3 (P<0.05) %VO2max, respectively, and was unchanged in D and C. The change in FATmax was related to the change in FM and VO2max (r=0.53, P<0.001 and r=0.49, P<0.005, respectively). The change in %VO2max at which FATmax occurred was associated to the change in FM and VO2max (r=0.36, P<0.05 and r=0.40, P<0.01, respectively).

Conclusion: FATmax (gfat.min-1) was increased both by endurance training and dietary-induced weight loss, whereas the relative workload at which FATmax occurred was increased only by training. Endurance training regardless of weight loss is hence the most beneficial way to increase FATmax. The association between co-occurring changes in FATmax and FM suggests that the increase in FATmax by endurance training or energy-reduced diet is coupled to the activation of mechanisms involving both mobilization and utilization of fat.

Oral presentations (OP)

OP-PM18 Physiology 18 - Metabolism

DOES LOW-INTENSITY RESISTANCE EXERCISE WITH VASCULAR OCLUSION FOR LOWER-LIMBS ENHANCE TRAINING EFFECTS OF HIGH-INTENSITY RESISTANCE EXERCISE FOR UPPER-LIMBS?

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Our previous study has shown that a low-intensity resistance exercise with vascular occlusion for leg muscles causes increases in the size and strength of arm muscles subjected to normal resistance exercise, the intensity of which was lower than that can induce muscular hypertrophy (Madarame et al. 2008). We assume that any systemic factor released after the occlusive exercise are involved in this...
remote effect. However, the remote effect of the occlusive exercise on other muscles subjected to normal high-intensity resistance exercise has not been studied.

PURPOSE: The purpose of this study was to see whether low-intensity resistance exercise with vascular occlusion for lower-limbs enhances training effects of high-intensity resistance exercise for upper-limbs.

METHODS: Sixteen men volunteered to participate in a resistance exercise regimen consisted of bench-press (BP) and squat (SQ) exercises, twice a week for 10-wk. They were assigned into either an occlusive training group (OCC, N=8) or a normal training group (NOR, N=8). Both groups performed the BP exercise at an intensity of three-repetition maximum IRM without occlusion (3 sets x 3 reps). After the BP exercise, the OCC performed the SQ exercise (30-40% of IRM, 3-4 sets x 15-30 reps) with restricted venous blood flow (200-250 mmHg), whereas the NOR performed the same SQ exercise without occlusion. Before and after the 10-wk training period, the IRM strength and the cross-sectional area (CSA) of muscles with MRI were measured. The data were analyzed with a two-way ANOVA (group x time) with repeated measures.

RESULTS: There was a significant main time effect for the SQ IRM (P<0.001), and the SQ IRM increased in both OCC and NOR. In addition, there was no significant time x group interaction for the SQ IRM (P<0.05), and the relative increase of the SQ IRM in the OCC (12.9%) was larger than in NOR (9.7%). The BP IRM increased in a similar manner in both OCC and NOR. Although there was a significant main time effect for the BP IRM (P<0.001), there was no time x group interaction. Similarly, CSA of triceps brachii increased in a similar manner in both OCC and NOR. There was a significant main time effect for the CSA of triceps brachii (P<0.001), but no time x group interaction. CONCLUSION: These results indicate that low-intensity resistance exercise with vascular occlusion for lower-limbs does not enhance training effects of high-intensity resistance exercise for upper-limbs.

References:

THE EFFECT OF HIGH FAT DIET AND TRAINING ON MITOCHONDRIAL FUNCTION IN HEALTHY SUBJECTS

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The effect of combined high fat diet and training on mitochondrial function has not previously been investigated. Also, a link between mitochondrial function and insulin sensitivity and VO2 max accompanying these interventions is not defined. Twenty healthy untrained male subjects were randomized to a high fat diet (55-60% fat, 25-30% carbohydrate and 15% protein) HFD, n=10) or normal diet (25-35% fat, 55-60% carbohydrate and 10-15% protein, ND, n=10) initially for 21 wk, followed by addition of exercise training (exT) for 21 wk (cycle ergometry, 45 min per day, alternating between continuous (65% VO2 max) and interval training (75% VO2 max). Frequent registration of diet, body weight and resting energy expenditure ensured matching of caloric intake to energy expenditure. Insulin sensitivity was measured by isoglycaemic hyperinsulinaemic clamp (40MU/m2/min) and expressed per lean body mass (LBM). Mitochondrial function was determined in permeabilized muscle from vastus lateralis by high resolution respirometry (Oroboros Oxygraph-2k). VO2max, but not insulin sensitivity did not change in either group after the intervention. State 3 mitochondrial respiration with substrates for complex I +II (malate+glutamate+ADP + succinate) increased (from 59±5 to 73±5 pmol.sec-1.mg-1, P=0.05) with training in ND but not in HFD. Changes in mitochondrial function were unrelated to VO2 max and insulin sensitivity. Respiration upon stimulation with lipids (octanoyl carnitine) tended to be increased by training only in ND (6.3±1 to 8.2±1 pmol.sec-1.mg-1, P=0.08). Both groups showed an increase in state 4 respiration HFD =7±2, ND =10±3 pmol.sec-1.mg-1 increase, P=0.05) in the presence of oligomycin indicating a potentially higher membrane leak. However, no effect of diet or diet + training was found on the regulation of coupled and uncoupled respiration expressed by the respiratory control ratio (RCR= state3/state4a) and uncoupling control ratio, (UCR= state3u/state3). The results of this study indicate that a HF diet can suppress the normal increase in muscle mitochondrial state 3 respiration with exercise training, including the potential to oxidize lipids.

SKIN SURFACE MENTHOL APPLICATION ON SWEATING RATE DURING EXERCISE

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At rest, application of menthol on the skin stimulates cold-sensitive afferent pathways, which may activate norepinephrine release and thus probably lead to local cutaneous vasoconstriction and body heat conservation. On the other hand, sustained exercise initiates sweating for heat dissipating purposes. It is not known, whether application of menthol, a widespread ingredient of various cosmetic and therapeutic skin creams could affect sweating rate during exercise. The purpose of the present study was to investigate the effect of the skin surface menthol application on sweating rate response during steady state exercise.

For this purpose eight subjects cycled at 50% of their maximum heart rate (HR, 220-age), so long as to reach 38 oC in rectal temperature (Trel) on two separate conditions (control-C, menthol-M) administered at random order. In M condition, a 5-min resting period was followed by application of 4.6 gr menthol per 100 ml of water on the skin all over the body. At rest and during exercise, HR, Trel, sweating rate (SwR), forearm skin temperature (Tskforearm), the proximal-distal skin temperature gradient (Tskdiff) and oxygen consumption (VO2) were measured.

Throughout exercise, power output and HR were similar between the conditions (power output: 139.5±8.8 Watt and 150.6±9 Watt, HR: 132.5±10.3 bpm and 133.8±10.8 bpm in M and C, respectively). Trel was similar between the two conditions at rest and during the first 15 min of cycling, but during the last 10 min of exercise the rate of rise in Trel was higher in M (0.24 vs. 0.14 oC/min for M and C, respectively, p<0.03). The average sweat rate during exercise was lower in M 0.97±0.16 g cm-2.min-1 vs. 3.32±0.22 g cm-2.min-1 for M and C, respectively; p<0.01), while the initiation of sweating was observed 4.4 min later in that condition (7.63±0.48 vs. 3.25±0.21 min for M and C, respectively, p<0.01). However, once sweating had started, the increase was similar between conditions (regression slope 10.23±0.66 vs. 10.00±1.28 for M and C, respectively). Tskdiff and VO2 were higher in menthol condition only in the first 12 min of exercise (Tskdiff: 2.8±0.1 oC vs. 1.0±0.1 oC and VO2: 1.89±0.3 l vs. 1.75±0.3 l for M and C, respectively, p<0.05) without being different from this time and onwards. Overall, Tskforearm was not different between experimental conditions. At the first stages of exercise, menthol application on the skin seems to induce vasoconstriction, thermogenesis and inhibition of sweating, responses, which are released at later stages due to the accumulated amount of heat.
EFFECTS OF GROWTH HORMONE RECEPTOR ANTAGONIST TREATMENT ON FAT METABOLISM DURING ENDURANCE EXERCISE

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Backgrounds: Growth hormone (GH) administration has become a prevalent doping technique used in athletics II. It has been generally shown that acute exposure to GH during exercise exaggerates lipolysis during exercise (2, 3, 4). However, the effect of GH blockade on metabolic and substrate responses remains unclear. The present study was designed to determine effects of GH receptor (GHR) antagonist treatment on fat metabolism before, during, and after prolonged exercise.

Methods: Twenty healthy young men were assigned to either GHR antagonist treatment (N=10, 25 ±1 yrs, 184 ± 2 cm, 80 ± 5 kg) or placebo group (N=10, 23 ±1 yrs, 182 ± 2 cm, 81 ± 5 kg). The subjects received either GHR antagonist (somavert, 10 mg daily by sc injection) or placebo for 16 days (every second day). After the treatment period, they performed 60 min of submaximal bicycling (30 min of exercise at 55 % of VO2max followed by 30 min of exercise at 70 % of VO2max) followed by all-out exercise at 90 % of VO2max. Blood and respiratory gas were collected, before exercise and post-exercise. Muscle sample of leg was taken after exhaustion to measure muscle lactate content.

Results: The treatment group showed higher concentration of serum GH before the exercise (Treatment, 18.5 ± 1.43 µg/l; Placebo, 0.1 ± 0.04 µg/l, P < 0.001). During the 60 min of exercise, GH concentration was consistently higher in the treatment group than in the placebo group (P < 0.001). However, no significant observation was observed in responses of serum glycerol, free fatty acids, glucose, insulin, plasma epinephrine and norepinephrine during the exercise between the groups. Oxygen uptake and respiratory exchange ratio showed no significant difference between the groups. In addition, muscle lactate content after exhaustion showed no significant difference between treatment (30.0 ± 4.7 mmol/kg dw) and placebo group (23.3 ± 3.7 mmol/kg dw).

Conclusions: GHR antagonist increased markedly baseline level of GH, possibly by negative feedback mechanism. However, the treatment did not affect significantly lipolysis and substrate oxidation pattern during exercise. These results suggest that GH is not a crucial factor for enhancements of lipolysis and fat oxidation during prolonged exercise in healthy men.

References.

ENERGY EXPENDITURE AND EXERCISE INTENSITY ESTIMATED BY HR-VO2 RELATIONSHIP DURING TRIATHLON COMPETITION

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Triathlon is a triple-event endurant sport in which athletes compete sequentially in swimming, cycling and running. In order to determine the energy expenditure and exercise intensity of triathlon, we recorded heart rate (HR) during triathlon competitions. Ten college-level male triathletes, 18-21 years old, volunteered in this study. HR was recorded with HR monitor (ITZ-MAX50, Acumen and Team System, Polar) during triathlon competitions in which wetsuits were used during swimming and drafting was not allowed during cycling. Three incremental exercise tests until exhaustion in swimming, cycling and running were carried out in the laboratory and oxygen consumption (VO2) and HR were monitored. Using the individual correlating equation between HR and VO2, energy expenditure during triathlon race was estimated. Mean competition time (± SD) for Olympic distance (1.5 km swimming, 40 km cycling and 10 km running) was 2h24m(0's ± 14m45s). Time for swimming, cycling and running was 26m27s ± 3m50s, 1h12m12s ± 3m50s, and 45m23s ± 8m47s, respectively. Total heart beats and heart beats for swimming, cycling and running were 25,273 ± 2342, 4,641 ± 539, 12,663 ± 536 and 7,968 ± 1,565 beats, respectively. Mean HR for race and HR for swimming, cycling and running were 174 ± 7.2, 174 ± 8.3, 175 ± 7.3 and 175 ± 8.0 bpm, respectively. Total energy expenditure for Olympic distance triathlon race was estimated to be 2,196.4 ± 286.9 kcal (n=10). Mean exercise intensity during Olympic distance triathlon race was 0.252 ± 0.026 kcal/kg/min and 14.3 ± 1.5 METs, which is compatible to bicycling at >32 km/h without drafting (16 METs), running at 14 km/h (14 METs), speed skating (15 METs) and cross country skiing at >13 km/h (14 METs) and is more intense than the most competitive sports such as handball, boxing and squash (12 METs), rugby, soccer, American football and judo (9-10 METs), tennis, badminton, volleyball, basketball, and ultimate (7-8 METs), or baseball (5 METs)*. In conclusion, 1) HR monitoring revealed that Olympic distance triathlon is not only endurant but also intense sport with the HR as high as 175 bpm and with the exercise intensity as high as 0.252 ± 0.026 kcal/kg/min and 14.3 ± 1.5 METs. 2) Total energy expenditure to complete Olympic distance race was estimated to be about 2200 kcal.

References.

INFLUENCE OF CREATINE LOADING ON MUSCLE PHOSPHOCREATINe KINETICS DURING HIGH-INTENSITY KNEE-EXTENSOR EXERCISE

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Following the onset of exercise, muscle phosphocreatine concentration (PCr) and oxygen uptake (VO2) change with similar kinetic profiles until a new steady-state is attained. Meyer's 'electrical analogue' model of respiratory control posits that the time constant for the exponential rise in VO2 (and the exponential fall of PCr) is the product of the mitochondrial resistance and the metabolic capacitance (Meyer, 1988). The latter is determined predominantly by the total muscle creatine content. We therefore hypothesised that increasing the muscle metabolic capacitance through creatine loading would result in slower muscle PCr kinetics (as determined using 31phosphomagnetic resonance spectroscopy, 31P-MRS) following the onset of exercise.
Seven male subjects completed 'step' tests to heavy-intensity exercise (80% of peak work-rate) from a resting baseline using a single-leg knee-extensor ergometer situated inside the bore of a 1.5 T magnetic resonance scanner (Intera, Philips, Netherlands). Four-like transitions were performed both before and after a 7-day intervention in which subjects supplemented their diet with 20 g per day of creatine monohydrate to increase total muscle creatine content. Muscle [PCr], inorganic phosphate concentration and pH were determined every 6 s during 2 minutes of rest and 6 minutes of exercise, and the muscle [PCr] kinetics were described using standard non-linear regression techniques. The resting muscle [PCr]/ATP ratio increased – 8% from 4.66 ± 0.27 to 5.04 ± 0.22 (P<0.05), consistent with a significant increase in muscle total creatine content caused by the dietary creatine supplementation. The relative fall in [PCr] from rest to end-exercise was not significantly different between the control and creatine-loaded conditions ([PCr], Con: 55 ± 16 % vs. Cr: 51 ± 17 %; P>0.05). However, the [PCr] kinetics were significantly slower in the creatine-loaded condition (mean response time, Con: 75 ± 17 vs. Cr: 98 ± 27 s; P<0.05).

The principal finding of this study was that increasing muscle total creatine content through dietary creatine supplementation resulted in significantly slower muscle [PCr] (and presumably VO2) kinetics across the transition from rest to exercise. These data are consistent with Meyer’s electrical analogue model of respiratory control. The muscle metabolic capacitance is therefore an important mediator of the oxidative metabolic ‘inertia’ that is evident at the transition to an augmented energetic demand, with PCr hydrolysis temporarily buffering the stimulus i.e., ADP concentration, phosphorylation potential, etc.

References:

Oral presentations (OP)
OP-RE03 Rehabilitation 3 - General

QUANTIFIED WALKING BEHAVIOR AND ITS RELATION TO FEAR OF FALLING IN OLDER PERSONS
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Background.
The most common reason for losses in functional capabilities in the aged is inactivity or immobility. Physical activity may, amongst other factors, also be associated with fear of falling. A recent study reported that people with a high fear of falling were more often low active or moderately active compared with people who had no such fears and were more often very active (1). Because data on the reliability of self-reports are limited in older individuals (2) alternative methods are needed for long-term monitoring of daily physical activity and the assessment of motor functioning under real-life conditions. New possibilities for research in prevention and rehabilitation are offered by measurements that quantify physical activity with ambulatory monitoring systems (3). This study aimed at determining the association between quantified walking behavior and fear of falling in older Swiss persons.

Methods.
This was a cross sectional study with a convenience sample of older persons with different living status (independent living, residential settings). Physical activity was measured continuously with a StepWatch Activity Monitor (SAM) during one week. The Falls Efficacy Scale-International (FES-II) was used to determine a person’s fear of falling while performing physical and social activities (4). Sixty-two persons (39 female), aged 82.4 ± 7.1 years, participated in this study.

Results.
The older persons took on average 8678 ± 3928 steps per day (range 2318 – 20308) and had a mean of 20.5 ± 6.2 points on the FES-I (range 16 – 50). Pearson’s Correlation revealed a strong negative relationship between the average total daily steps taken and fear of falling (Pearson’s r = -0.459, p < 0.01). People with high fear of falling were all showing low quantities of daily steps compared with people who had no such fears who were exhibiting a broader range of daily step quantities.

Discussions.
Older persons with high fear of falling possibly restrict their walking activity which is expressed in the the quantity of steps taken. These findings suggest that the quantity of walking activity in older persons should be taken into account in studies that investigate the amount of falls in older populations. Although the relationship between fear of falls and the quantity of walking activity was based on cross-sectional data and, thus, does not imply a causal relationship, we know from previous studies (cf [5]) that people restrict their mobility because of fear of falling. The association between falls efficacy and walking quantity found in this study suggests that clinical rehabilitation programs should also focus on confidence.

References.

LOWERED AEROBIC EXERCISE CAPACITY IS ASSOCIATED WITH IMPAIRED SKELETAL MUSCLE METABOLISM IN PATIENTS WITH METABOLIC SYNDROME
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Background. Low aerobic exercise capacity is an independent, strong predictor for mortality in patients with type 2 diabetes (1). In patients with type 2 diabetes, impaired exercise capacity is related to downregulation of mitochondrial oxidative phosphorylation in skeletal muscle (2). Moreover, insulin resistance is associated with intramyocellular lipid accumulation (3). We thus hypothesized that there might be an intimate link between aerobic exercise capacity and the skeletal muscle proper (mitochondrial oxidative phosphorylation and fatty acid metabolism) in patients with metabolic syndrome (MetS). Methods: The incremental exercise tests with a cycle ergometer were
performed in 11 patients with MetS (age 52 ± 11 years), and 11 age- and sex-matched control subjects. Using 31P magnetic resonance spectroscopy (1H-MRS), phosphomonoesters (P), inorganic phosphorus (Pi), and intracellular pH were measured at rest and during a unilateral plantar flexion (40 times/min for 4 min) with a constant load of 20\% one-repetition-maximum (1RM) in the right calf. Using 1H MRS, intramyocellular lipid (IMCL), an index of the balance between uptake and oxidation of fatty acid) was measured in resting tibialis anterior muscle. Results: Body weight, percent body fat, waist circumference, fasting plasma glucose, insulin, and triglyceride were significantly increased in MetS as compared with controls. HDL-cholesterol was also significantly decreased in MetS. Lean-adjusted anaerobic threshold (ATlean) was significantly decreased (18.0 ± 2.4 vs 22.5 ± 4.3 ml/kg/min, p < 0.01) and maximal phosphomonoesters (P) loss during plantar flexion (denaturing impaired mitochondrial oxidative phosphorylation) was exceeded in MetS (33.5 ± 14.0 vs 21.5 ± 10.5, p < 0.05) without the change of intracellular pH. IMCL was significantly elevated in MetS (IMCL: 4.8 ± 1.4 vs 2.0 ± 1.6 mmol/kg wet weight, p < 0.01). ATlean correlated negatively with maximal PCR loss (r = −0.47, p < 0.05) and IMCL (r = −0.45, p < 0.05), indicating that lowered aerobic exercise capacity was associated with impaired skeletal muscle metabolic properties. There was also a correlation between IMCL and maximal PCR loss (r = 0.50, p < 0.05). Conclusions: Lowered aerobic exercise capacity might be associated with impaired skeletal muscle oxidative phosphorylation and dysregulation of intramyocellular fatty acid metabolism in patients with MetS.

References:

AMBULATORY PERFORMANCE AND COGNITIVE STATUS IN GERIATRIC REHABILITATION

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Introduction: Cognitive impairment could be viewed as one possible obstacle in motor rehabilitation. Due to the significant number of rehabilitation inpatients with cognitive deficits, this study was designed to further explore the effect of the admission cognitive status on gait and stair climbing rehabilitation outcome in geriatric patients. Methods: One hundred seventy nine geriatric patients (female 139; male 40; age: 67-97 years) consecutively admitted to a geriatric inpatient rehabilitation regimen (mean length of stay 28.7±13.9 days) participated in the study. Admission cognitive status was assessed by the Mini-Mental-State Examination (MMSE) and the population stratified in 3 groups: severe (0-17, 34 patients) and mild dementia (18-24, 43 patients) and unimpaired group (25-30, 102 patients). Ambulatory status and stair climbing ability were determined before and after rehabilitation by the Performance-Oriented Mobility Assessment (POMA) and standardized judgments. A POMA score of 19 or less was used for predicting a high risk of falling. An intervention effect of at least 5 points at the individual level of the POMA was defined as the minimum functional gain to emphasize the difference between severely cognitively impaired patients to the cognitively intact patients. The stair test required the subjects to ascend and descend a flight of steps one leg after another as fast and comfortably as possible. Performance was rated on a four-point ordinal scale scoring system based on the subject’s difficulty performing the task and the use of the handrail for support and balance. Results: Approximately 2/3 of all patients demonstrated functional ability improvements of at least 5 points (POMA scale) at the individual level during rehabilitation. The 95%-CI of the overall differences between the POMA admission and discharge scores ranged from 6.1 to 7.5 points (cognitive impairment: 5.4-7.3 severe, 5.8-9.2 mild, 5.6-8.7 unimpaired). However, at rehabilitation discharge cognitively impaired still demonstrated a 3.4 times (95%-CI = 1.4-8.6) higher chance for increased fall risk and only 24% of the cohort was able to negotiate stairs with slight or no limitations. Conclusion: Although cognitively impaired patients demonstrated an functional overall intervention response comparable with cognitively intact patients the present study evidenced that the geriatric cohort with reduced mental status (MMSE < 18) are at greater risk of falling and have a greater need for supervision, both in the hospital and at discharge. Herewith the study further elucidated the relationship between cognitive impairment and functional gain achieved during geriatric rehabilitation. Beside the enhancement of treatment strategies to restore and maintain function in the cognitively impaired longitudinal studies should quantify the number of falls and accident events.

AN ADAPTED ECCENTRIC TRAINING IN THE MANAGEMENT OF CHRONIC LATERAL EPICONDYLAR TENDINOPATHY

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Introduction: Lateral epicondylar tendinopathy represents a frequent overuse injury. In spite of many conservative treatment procedures, that injury frequently entails prolonged symptoms and relapse when returning to offending activities. Aim: To compare the outcome of patients performing an isokinetic eccentric training with that of age-, gender-, activity- matched patients receiving a non strengthening classical rehabilitation. Patients and Methods: 92 patients with unilateral chronic lateral epicondylar tendinopathy (mean duration of symptoms 8 +/- 3 months) were assigned either to a control group (n = 46) or to an eccentrically trained group (n = 46). The control group underwent from a passive standardized rehabilitation excluding strengthening exercises. In addition to this program, the trained group performed eccentric exercises based on the repetitive lengthening of the active musculo-tendinous unit. That program started with submaximal contraction intensity and slow speed movement. Modalities were progressively intensified in intensity contraction and speed movement over a long-lasting treatment. Program effectiveness was assessed through pain score evaluation, disability questionnaire, muscle strength measurement and ultrasonographic examination. Results: Compared to the non-strengthening control group, the eccentric training permitted to observe: (1) a significantly more marked reduction of pain intensity, mainly after one month of treatment, (2) the absence of strength deficit on the involved side through bilateral comparison for the forearm supinator and wrist extensor muscles, (3) an improvement of the tendon image as demonstrated by a frequent decreased thickness and recovered homogenous tendon structure, (4) a more marked improvement of the disability status during occupational, spare time and sports activities. In conclusion, these results highlight the relevance of implementing an isokinetic adapted eccentric training in the management of chronic lateral epicondylar tendinopathy.
THE INFLUENCE OF PROPRIOCEPTION TRAINING ON PERONEAL LATENCY TIME

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BACKGROUND: Injuries of the ankle joint, commonly known as ankle sprain, are the most common in sports activities [1][2][3] as well as in everyday life [2]. As such, proprioceptive training is often employed as an effective therapeutic approach for these type of injuries. In addition, proprioceptive training has an important role in the prevention of new injuries. However, until now, the majority of the studies were focused on the prevention of a new injury, lacking results on primary prevention (occurrence of a first injury).

OBJECTIVES: To investigate the effects of proprioceptive training on the onset of peroneal muscle activity in subjects with no history of injuries to the lower extremities.

METHODOLOGY: 34 participants (age = 19.5±1.5), physically active, with no history of injuries in the lower extremities took part in this study and were divided in two groups: experimental (EG) and control (CG). The participants in the experimental group underwent a proprioceptive training programme, with two sessions per week, in a 4-week total, using a wobble board. Reaction time of peroneus longus (PL) and brevis (PB) muscles were measured using surface EMG and a trap-door that opened to a 30° angle of inversion. Measurements were made before and after the training programme.

RESULTS: The reaction time values (ms) were registered before and after the training protocol: for the CG, PL=69.2±11.6 and 67.2±11.1; PB=67.7±12.4 and 66.2±12.7; for the EG, PL= 70.0±14.3 and 66.1±13.4; PB= 69.6±13.5 and 67.6±16.4. Parametric and non-parametric tests showed no significant differences between the control group and the experimental group (p<0.05) before or after the training programme. Nonetheless, a small reduction of onset time occurred with the subjects of the experimental group by the end of the training protocol.

CONCLUSIONS: These findings indicate that the use of a proprioceptive training, two sessions per week for a 4-week period, on physically active subjects, with no history of injuries in the ankle joint, did not cause noteworthy changes on the onset of peroneal muscles activity. The lack of significant changes in the onset of peroneal muscles suggests two possible explanations. The first one is related to the insufficient amount of trainings sessions per week, which weren’t enough to cause a considerable change in peroneal latency time. The second may be due to the fact that the subjects were all physically active, and as such not as susceptible of having a considerable improvement in their peroneal latency time.

References:

Oral presentations (OP)

OP-TT11 Training and Testing 11 - General

EVALUATION OF GROSS MOTOR SKILLS IN CHILDREN: APPLICATION OF TGMD - 2 IN THE CZECH REPUBLIC

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Gross motor skills are defined as skills that involve the large, force-producing muscles of the trunk, arms, and legs and are used to achieve a movement task or goal such as throwing a ball to a friend or jumping over a puddle (Ultrich, 2000). The measurement of gross motor skills is widely used to identify children with developmental delay as well. The test of Gross Motor Development-2 (TGMD-2) is one of the most employed tools for the examination of developmental delay in motor behavior or disorder in coordination. The test consists of two subtests: locomotor and object control. The aim of the present study was to assess the qualitative gross motor skills performance of children in pre school age. Forty nine children with a mean age of 5.90 years (SD = 0.64) participated; twenty eight were boys (M age = 5.87 years, SD = 0.63), and twenty one were girls (M age = 5.94 years, SD = 0.64). They were recruited from mainstream urban kindergarten. The TGMD-2 was used to assess their gross motor skills. Results show that there are some differences between norm population (U.S. children) and the Czech population. The meaningfulness of the differences can be estimated in many ways. The effect size (ES) was used in this study. There is no difference between Czech and U.S. girls on object control subtest. The difference between Czech and U.S. girls on locomotor subtest has a moderate effect. The ES of differences between Czech and U.S. boys equals to 1.49. It means that the differences of boys’ subsamples have large effect. These results probably indicate that use of standardized American norms of the TGMD-2 cannot be generalized to the Czech population and an additional study is needed on larger sample of children.

Acknowledgement
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References.

THE EFFECT OF PAST PERFORMANCE ON THE PROBABILITY TO SCORE IN A HANDBALL MATCH

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Introduction
Spectators and participants in many sports seem to believe that the outcome of sporting actions is related with previous events of the contest. This problem has been widely discussed in studies that focus on “hot hand” and streakiness phenomena, psychological momentum and critical moments. Most of these studies, which have been testing the hypothesis of independence and identical distribution of points scored in the match, were based only on the past performance of the player or team and paid no or little attention to the opponents’ behavior.
Therefore, the purpose of this study was to verify if the past offensive performance of the team and of its opponents influence the probability of scoring in Handball match. It was also tested if this influence is time-varying and if it changes with the match importance (round of championship) and "quality" (based on team's rankings).

**Methods**

The data from 17th, 18th, 19th Men’s Handball World Championship were pooled in a panel database that included information from 224 matches observed by ball possessions (32273 observations). It was assumed that matches were independent and in each match the two teams were modeled symmetrically. The data were used to estimate a dynamic linear probability model for the probability of scoring in a handball match as a function of the past offensive performance of both teams and point difference (dynamic regressors), as well as importance and "quality" of the match (nondynamic regressors). It was tested if the influence of past performance changes during the match. The model has been estimated for two groups of matches with different number of ball possessions (49-57 and 58-66).

**Results**

The results of model estimation suggest that the probability of scoring does not depend on the past offensive performance of the own team, but depends on the past offensive performance of the opponent (the own team defensive performance) and on the point difference in the last ball possession. It was found that the effects of the recent past performance of the opponent and of the point difference on the probability of scoring in Handball are time-varying and influenced by the "quality" and by the pace of the match.

**References**


**ANALYSIS OF TACTICAL PERFORMANCE IN TOP LEVEL HANDBALL SETTING THE RELATION BETWEEN TYPE, AREA OF BALL RECOVER AND PATH OF FIRST ATTACKING ACTION**

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In team sports interactive dynamics team’s behavior and contextual changeability are important features of tactical performance. This study intends to set the relation between type, area of ball recover and path of first attacking action with the ball in top level Handball. The way of ball recovering seems to be an indicator of defensive success, making possible the fast defence/attack transition, increasing situations of numerical and/or spatial team’s advantage and facilitating goal shooting.

The initial stage of the attacking sequence, when a player, after ball recovering, decides to carry or to pass the ball, it is an instant that may constrain the offensive game method to be used, also conditioning the time of opponents to relocate themselves on the playing field, what affects their capacity to counteract. This fact led us to question if handball teams seek to optimize some tactical routines concerning the path of the players and the ball, or, on the contrary, if players performance in interaction with team mates and opponents, may hinder tactical patterns.

To carry out the study, sequential analysis technique was used, aiming to relate the way of ball recover, taking into account the actions of goalkeepers as well as the field players.

The sample includes 3170 offensive sequences, registered in twenty-five games of the final phases of the 2002 European Championship and the 2003 World Championship, involving, in both cases, only teams placed in the top eight positions. In view of the results it seems pertinent to highlight the following: (1) The goalkeeper’s saving of the ball presents a significant probability of inducing ball recover in the goal-area and a pass to the central and lateral areas, near the free-throw line; (2) The ball recover performed by the defenders after disarming or interception, presents a significant probability of occurring at the goal-area and inducing a pass to the central and lateral areas, near the free-throw line.

The analysis of the results makes possible to figure out the probability of ball recover type influencing both the area where this occurs as well as the area towards which the first action with the ball will take place.

**EFFECTS OF MOVEMENT COMPLEXITY ON RHYTHMIC ABILITY**

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**Introduction**

The evaluation of rhythmic ability, intended as the capability to translate an acoustic perception into a corresponding motor behaviour (Fraisse et al., 1949), focused mainly on tapping. Although artistic sports are based on exercises performed according to rhythmic constraints, there is no information on the relationship between the complexity of a motor behaviour and the individual’s rhythmic ability. Thus, this study aimed at evaluating the rhythmic ability of individuals while performing different motor tasks.

**Methods**

Sixteen (8 men, 8 women) subjects (age: 29±3yrs) with no previous formal rhythmic training were administered a computerized rhythmic test (Perschini & Capranaica, 2004), consisting of two rhythmic sequences (R1 and R2) of 4/4 signature played with a 60 beat/min tempo and one (R3) of 12/8 signature played with a 80 beat/min tempo, having 6, 9, and 8 beats respectively. Actually, R3 presented a more complex signature than R1 and R2, while the beat ratio of R2 was more elaborated than those of R1 and R3. Subjects were asked to reproduce the rhythmic patterns by means of finger tapping on a table (T), stepping with no locomotion (S), and walking (W). A 9-camera Vicon MX stereophotogrammetric system (Vicon®, UK, frequency=120 samples/s) was used to reconstruct the 3D position of 6 retroreflective spherical markers located on the skin. Three parameters were used to evaluate rhythmic performances (0=correct performance): 1) the number of beats (NB); 2) total duration (D); 3) rhythmic ratio among beats (RR).

**Results**

Twelve subjects correctly reproduced NB in the three tests. More frequently, failures were found for R2 (31%) than R1 and R3 (6%), with 19% errors in W and 12% in T and S. Main effects (p<.0001) for test and pattern emerged for D and RR, while the interaction between test and pattern was significant only for D. For patterns, post-hoc showed differences (p<.01) only between R2 (D=1.14 ± 0.69s, RR=0.14±0.10) and the other patterns (R1: D=0.05 ± 0.34s, RR=0.08 ± 0.07; R3: D=0.21 ± 0.46s, RR=0.11±0.11). For tests, post-hoc showed differences (p<.01)
only between W (D=0.78 ± 0.86s, RR=0.18±0.11) and the other tests (T: D=0.16 ± 0.46s, RR: 0.07±0.04; S: D=0.41 ± 0.57s, RR=0.09±0.09). A significant (p=0.048) correlation (r=.52) was observed only between T and S in R.

Conclusions
The results confirmed that rhythmic ability is affected more by the ratio among beats rather the complexity of time signature of the patterns (Persichini & Capranica, 2004). The differences emerging between walking and simpler tasks, and the low correlation between tests indicate that rhythmic ability is specific to the complexity of the movement.

References

INTERACTIONAL EFFECTS OF BALANCE AND SUCCESS ON THE CRITICAL MOMENTS FROM BASKETBALL GAMES
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The influence of game balance and success on the Critical Moments (CM) from the basketball games seems to have different impacts. Game balance has shown a negligible effect on the quantitative occurrences of CM. However, winning and losing teams presented differences on the number of provoked CM’s particularity during the first three game periods (Ferreira, 2006). Taking account of this independent effect, the present study aims to identify the influence of this interactional effect.

The sequential casuistry of game final score differences (Ferreira et al. 2003, 2006) was used in order to determine and select the CM’s of eighty basketball games. According to expert coaches’ opinions, the games were divided in two main temporal blocks: the first three periods and the fourth period. The crossover of game balance and game success generated four team groups: the winning and losing teams for balanced and unbalanced games. The obtained CM’s for winners losers were studied according to the tempo they occurred per game. After a preliminary parametric exploration of the data, three categories were defined according to the general modal value.

The categories were called Presence of CM, At least 1 CM and More than 1 CM. The winning and losing teams were compared for each period. Despite the differences of 30% differences for the first three periods. The analysis of the adjusted residuals allows to specify the differences in the Absence of CM and the interactional effect of game balance and success is not reflected in the number of critical episodes of basketball balanced games.

Fatigue during intense exercise has been proposed to be a multifactorial phenomenon. Factors such as sarcotemmm depolarization, especially caused by accumulation of extracellular K+, as well as lowered muscle pH and creatine phosphate (CP) have been suggested to be contributing factors in the development of fatigue during repeated intense exercise. Thus, the muscle ion transport proteins are important when discussing fatigue development. The Na+, K+ pump is pivotal in maintaining the muscle membrane potential during exercise and it has in untrained been shown to be up-regulated by different types of exercise training, but little has been done with sprint training in well-trained subjects. In a study, endurance trained subjects replaced their normal training by 30-s sprint runs 3-4 times a week, and after 4 weeks the expression of the muscle Na+, K+ pump α1 subunit and Na+/H+-exchanger isoform 1 was 29 and 30% higher (P<0.05), respectively. Furthermore, plasma [K+] was reduced (P<0.05) during repeated intense running. Performance in a 30-s sprint test, Yo-Yo intermittent recovery test and two supra-maximal exhaustive runs was improved (P<0.05) by 7%, 19%, 27% and 19%, respectively, after the sprint training period, whereas maximum oxygen uptake and 10-K performance time were unchanged. Thus, it appears that the Na+, K+ pump plays a role in control of K+ homeostasis and in the development of fatigue during repeated high-intensity exercise. Furthermore, performance during intense exercise can be improved even with a reduction in training volume if the intensity of training is very high.
EXPLORING THE PSYCHOLOGICAL LIMITS TO HUMAN ACHIEVEMENT

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Many factors contribute to the development of expertise in sport. The contribution of hereditary characteristics and the importance of practice, instruction, and the mentorship of significant others are often debated. The common or lay opinion is that elite performers are born rather than made, creating the perception that less ‘gifted’ athletes may continually strive to reach excellence without making the necessary gains needed to compete at the highest level. However, recent research employing the deliberate practice theoretical framework has indicated that athletes achieve excellence in sport through many hours of deliberate, purposeful practice with the specific intention of improving performance. Typically, performers have to devote in excess of 10,000 hours of practice to achieve excellence, regardless of sport. This commitment and continual engagement in practice is the most important determining factor on the path to excellence. Hereditary factors may also be important in helping elite athletes develop the necessary ‘rage to master’ (i.e., the commitment and motivation to persist in practice over many years). The proposal is that expertise develops as a result of specific adaptations to the movement, and the signal should be filtered individually in each phase, by different filtering techniques. We tested the applicability of these new approximants, by comparing both usual and alternative filtering and smoothing techniques, in 2D kinematics, in order to increase the accuracy of the inverse dynamic approach in the calculations of intra-articular moments and forces. We tested the applicability of these new approximants, by comparing both usual and alternative filtering and smoothing techniques, in 2D kinematic signals collected with a high-speed video camera, during the performance of very demanding jumps from classical ballet. Three professional high level ballet dancers from The National Ballet Company, of Portugal, participated voluntarily in the study. The results show that the uniform treatment of the kinematical signal is not a reasonable strategy. The data must be cut in several phases, according to the movement, and the signal should be filtered individually in each phase, by different filtering techniques.

References.

EFFECT OF SWING VELOCITY ON BALL KICKING PERFORMANCES IN YOUNG MALE SOCCER PLAYERS

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The purpose of this study was to investigate an effect of swing velocity on ball kicking performances in Japanese young male soccer players. Two hundred eighty-seven Japanese male soccer players aged from 9 to 22 years old were participated as subject. The subjects were classified four groups (EG: Elementary school students group, n=56; JG: Junior high school students group, n=141; HG: High school students group, n=53; UG: University students group, n=37) based on chronological age. The anthropometric parameters for body height (BH), body weight (BW) and Fat-free mass (FFM) were measured in all subjects. All subjects were performed maximal ball kicking to measure maximal kicked ball distance (BD) by tape measure method. Kicked ball velocity (BV) was measured by Rader Gun IMizuho, Japan in distance of 5m with the three trials. Maximal swing velocity (SV) of the lower limb during ball kicking movement was measured by using a custom made measurement system of movement velocity connected to Speed Meter (VINE, Japan). Ratio of BV to SV (BV/SV ratio) was calculated in each subject.

BH, BW and FFM were significantly increased in each group. However, there was not significant difference between HG and UG in BH. Ball kicking performances were showed higher value in UG than the other groups. BD and BV were significantly differences between
DOES MUSCLE FATIGUE INFLUENCE VERTICAL JUMP LANDING BIOMECHANICS? EFFECTS OF REPETITIVE VERTICAL JUMPING TASK

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Successfully practice in any sport requires the domain of many abilities. One of these abilities, present in many sports, is the vertical jump (Tillman et al., 2004). A natural consequence of this ability is the return to the ground knowing as landing which has as objective to absorb the load created during the preceding aerial and propelling phase (Dufek & Bates, 1990). However, despite the many strategies that allow doing it efficiently, the jump landing offers injury risk factors optimal development instances, exposing the subjects to high loads (Madigan & Pidcoe, 2003). This potential is even higher when the structures are affected by fatigue (Gribble et al., 2004; Madigan & Pidcoe, 2003). Hence, our purpose was to assess muscle fatigue influence in jump landing external load.

Twelve healthy subjects (21.33±2.15 years, 61.67±100.68N weight, 168.33±7.86cm height) performed continuous cycles of ten repetitive jumping (starting from a squat position) at a 40 jumps per minute pace, followed by a unilateral dominant lower limb drop-landing (40cm) in a force platform. The subjects were considered fatigue if after failing to maintain jumping rate over three consecutive jumps. For the accomplishment of this study to determine the behaviour differences of the ground reaction forces in the antero-posterior, medio-lateral and vertical components, with and without fatigue influence in jump landing, a Kistler 9281B platform of forces was used and the results were analysed by the computer program Acqknowledge 3.2.6 of BIOPAC Systems.

Our results indicated that our suggested fatigue protocol only influence the posterior component of GRF (maximum value before fatigue: -12.31±9.49%BW, maximum value after fatigue: -23.81±13.65%BW, p<0.013).

Hence, we concluded that fatigue, affecting the peak value of the posterior component of GRF, also challenge antero-posterior joint stability, increasing injury risk.

References.

ENERGY COST, WALKING PATTERN AND WEIGHT LOSS IN OBESE CHILDREN

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During walking, an excessive body mass increases load and inertia of body segments and thus mechanical energy needed to maintain a given speed. As a consequence the energy cost of walking (Cr, respectively in J/m) is higher in obese compared to non obese, in both adults (Foster et al., 1994) and children (Maffeis et al., 1993). However, after weight loss in former obese adults, the relative decrease is higher for Cr than for body weight (Foster et al., 1994). More than a decrease in fat mass, it has been suggested that changes in mechanical gait pattern could be responsible for the additional reduction in energy expenditure (Foster et al. 1994) observed after weight loss. In line with this hypothesis, mechanical differences were observed during walking in obese adults (Browning and Kram, 2007) and children (McGraw et al., 2000, Nantel et al., 2006).

We aimed to further investigate both the metabolic and mechanical changes and their possible relationships, occurring after weight loss in obese children.

Ten obese children (body weight > 95th percentile aged between 13 and 17 were explored before and after a significant body weight loss of 7% due to 4 month dieting. Fat mass (FM, in %) and fat free mass (FFM, in kg) were measured by dual-energy x-ray absorptiometry (DXA, QDR 4000, Hologic inc., Bedford, MA USA). Body mass index (BMI, in kg.m-2) was also calculated. Metabolic and mechanical parameters were measured during walking at 1.25 m/s. Cr was calculated from expired gas measured using a breath-by-breath portable gas analyser (K4b2, COSMED s.r.l., Italy). Tri-axial accelerometer and gyroscope (MTx, Xsens, the Netherlands) fixed at the sacro-lumbar junction was used to asses external mechanical work (Wext, in J/m) and medio-lateral displacement (MLd, in m) of the centre of mass according to Meichtry et al. (2007).

After dieting, significant (Wilcoxon tests, P<0.05) decrease of FM (-22%) and BMI (7%) and increase of FFM (7%) were evidenced. Decrease in Cr (11%), Wext (15%) and MLd (4%) were also observed. Moreover, Cr and Wext were positively correlated (P<0.05) both before and after dieting.

These results show that like in adults, the relative decrease is higher for Cr than for body weight. The 15% decrease in Wext, as well as the Cr and Wext link, further support the possibility that changes in mechanical gait pattern could be responsible for the additional reduction in energy expenditure observed here during walking at 1.25 m/s.

References.

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THREE-DIMENSIONAL ANALYSIS OF CASCADE JUGGLING: EFFECT OF EXPERIENCE

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Introduction - Executing a cascade juggling is a complex task, demanding high levels of concentration, attention, and coordination. Motion complexity develops as number of implemented balls grows. Juggling is a cyclic activity, where jugglers move their hands along two nearly elliptical trajectories, one clockwise, the other counter clockwise, at an average phase difference of 180°. The ball is released inside the ellipse, and caught outside. The ball is thrown toward the contralateral hand along a parabolic path subjected to gravity laws. This movement has to be repeated cyclically how as long as possible. Therefore, it is necessary to gain a perfect movement control and a sufficient plasticity for corrections or recoveries, which can only be acquired by practicing (1).

Methods - In the current study, the 3D motion patterns of two groups of jugglers with different levels of experience and ability (6 skilled experts, aged 14-30 y, who could juggle with 7 or more balls, 7 unskilled jugglers aged 17-26 y, who could juggle with 6 or less balls) were compared. Symmetry, repeatability and frequency of execution were analyzed, following the ellipses drawn by the middle fingers of jugglers. Three juggling exercises (basic plays) with 3, 4 or 5 balls were recorded by an optoelectronic motion analyzer working at 120 Hz (2).

Results - More skilled jugglers showed lower execution frequencies than less skilled jugglers (Mann-Whitney's test, p<0.01 in the 3-ball scheme, p<0.05 in the 5-ball scheme). In all juggling exercises, significant differences (p<0.05) were found in the anterior-posterior symmetry of movement (skilled jugglers were less symmetric than less skilled jugglers), while no differences were found in the other directions. Ability significantly influenced movement repeatability in the 4-ball scheme during vertical (p<0.01) and right-left (p<0.05) movements, both in dominant and non-dominant sides, with a larger repeatability in the more skilled jugglers. In the 5-ball cascade, ability influenced more the dominant hand repeatability than the non-dominant one. In contrast, no effects of experience were found for the 3-ball exercise.

Conclusions - Specializing on a highly complicated scheme, like a 7-ball cascade, did not provide any improvement for simpler plays, like a 3-ball scheme. More experienced jugglers can better manage higher throws, gaining time to move balls and to face higher levels of movement imperfections, than less experienced jugglers. They also use higher throws and slower movements for simpler exercises. As predictable, more difficult exercises highlight differences between dominant and non-dominant upper limbs, a factor that has a minor role in low-difficulty exercises.

References.

CHARACTERISTICS OF TRUNK MUSCLES SIZE AND AXIAL ROTATION TORQUE ON DIFFERENT ROTATED POSITIONS IN BASEBALL PLAYERS

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Trunk movements are examined in many athletic activities. Above all, it is an important factor for pitching and hitting movements in baseball players. Therefore, this study investigated that the characteristics of trunk muscles size and axial rotation torque on different rotated positions in baseball players.

Twenty male collegiate baseball players (BP, age: 19.6±1.2 yrs, height: 175.1±4.6 cm, body weight: 72.4±7.3 kg) and 10 untrained male students (CON, age: 20.9±1.1 yrs, height: 174.3±7.3 cm, body weight: 64.8±4.3 kg) were served as subjects. The trunk axial rotation torque was measured by isokinetic dynamometer (Biodex system 3, torso rotation test). All the subjects performed trunk axial rotation movement for dominant (DR) and non-dominant (NDR) hand side directions with maximal effort. The position in turn to front of trunk was defined 0 and the position inside the ellipse, and caught outside. The ball is thrown toward the contralateral hand along a parabolic path subjected to gravity laws.

Results - More skilled jugglers showed lower execution frequencies than less skilled jugglers (Mann-Whitney's test, p<0.01 in the 3-ball scheme, p<0.05 in the 5-ball scheme). In all juggling exercises, significant differences (p<0.05) were found in the anterior-posterior symmetry of movement (skilled jugglers were less symmetric than less skilled jugglers), while no differences were found in the other directions. Ability significantly influenced movement repeatability in the 4-ball scheme during vertical (p<0.01) and right-left (p<0.05) movements, both in dominant and non-dominant sides, with a larger repeatability in the more skilled jugglers. In the 5-ball cascade, ability influenced more the dominant hand repeatability than the non-dominant one. In contrast, no effects of experience were found for the 3-ball exercise.

Conclusions - Specializing on a highly complicated scheme, like a 7-ball cascade, did not provide any improvement for simpler plays, like a 3-ball scheme. More experienced jugglers can better manage higher throws, gaining time to move balls and to face higher levels of movement imperfections, than less experienced jugglers. They also use higher throws and slower movements for simpler exercises. As predictable, more difficult exercises highlight differences between dominant and non-dominant upper limbs, a factor that has a minor role in low-difficulty exercises.

References.

MUSCLE STRUCTURAL CHANGES DUE TO ONE YEAR TRAINING IN JAPANESE JUNIOR SPEED SKATERS

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The purpose of this study was to clarify the characteristics of muscle structure and athletic performance due to one year training in Japanese male junior speed skaters. Forty male speed skaters aged from 12 to 17 years old were served as subjects. Subjects were divided in six age groups. All subjects had belonged to speed skating clubs and they performed training of the speed skating all through the year. In this study, muscle thicknesses of the thigh anterior (MTTal), thigh lateral (MTTll), thigh posterior (MTTp), leg anterior (MTLa) and posterior (MTLp) as muscle structural parameter were measured by B-mode ultrasonic method. The mean 500m skating velocity (SV), calculated from the individual best records recently attained, was used as athletic performance.
The significant increases were seen of body height in 12 to 15 yr groups. The skating performances were significant improved in all ages skaters. The significant differences in MTLa and MTtI were observed between before and after training in each group of 12 to 15 yr. However, no significant differences were observed in 16 and 17 yr groups. The MTtI in 16 and 17 yr skaters increased significantly from before to after training. In leg muscles, significant changes in MTLa and MTtI were observed only in 13 and 14 yr. Comparisons of increment ratio in anterior and posterior of the lower limbs muscle thicknesses, the increment ratio of MTtI showed significantly higher values than MTLa in after 15 yr. However, increment ratio of MTtI showed significantly lower values than MTLa in 13yr and 14yr.

The increment ratio of thigh muscle thicknesses and mean skating velocity were significantly correlated in all age groups. However, no significant correlation coefficients were observed between increment ratio of leg muscle thicknesses and mean skating velocity. These results indicated that the effects of speed skate training on lower limbs muscles were differ by each region and developmental stage in junior speed skaters. Moreover, it is considered that the improvement of athletic performance is affect by the structural development of thigh muscles.

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KINETICS ADAPTATIONS TO SHORT-TERM SLED TOWING AND SPRINT TRAINING

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INTRODUCTION. The use of resisted sprinting techniques is common in athletics and in a variety of sports. However, previous research has focused on studying the kinematics when applying these methods on untrained subjects. As neural adaptations in the neuromuscular system in elite athletes may differ from those adaptations reported for untrained athletes, the results from these studies may not be representative of experienced athletes. The aim of this study was to examine the effects of resisted and unloaded sprint training programs on stride length, frequency, and contact time of the maximum velocity phase on experienced athletes. METHOD: Five female and 12 male national-level athletes with 8-9 years of training experience participated. All athletes participated in a standardized three-week program (sprint, jump, resisted, and resistance training five days per week). Following the standardized program, participants took part in one of two 4-week programs: a) resisted sprint training (RS) (n = 8) with a load of 8% body mass or b) Traditional sprint training (TS) (n = 9). 50-m run pre- and post-tests from the starting blocks were done. A 2D photogrammetric analysis of the run was carried out A high-speed video camera was used operating at 250 Hz. The optical axis of the camera was perpendicular to the direction of running, and the field of view of the camera was zoomed so that the athlete was visible in a 10-m wide region at the 45-m mark of the 50-m run. The trials were digitised using a 22 points model. T-tests for dependent and independent samples were used. RESULTS. The RS group significantly improved the stride length (2.7 ± 2.5%), while the TS group decreased stride contact time (3.5 ± 3.2%) in the maximum velocity phase. In addition, there were between-group significant differences in stride contact time (RS = 2.4 ± 5.4 vs. TS = -3.5 ± 3.2%). CONCLUSION: Resisted sprint training with 8% body mass sled towing for four weeks improves stride length without causing a significant reduction in stride frequency. Traditional sprint training improves stride contact time and maintains the stride length. Caution and supervision must be used for stride contact time in resisted sprint training.

References:


PREDICTING ADDED MASS IN HUMAN SWIMMERS FROM BODY SIZE MEASUREMENTS

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Introduction: Added mass is the mass of water a swimmer has to accelerate in addition to his body during changes in velocity. It is an important concept in determining the total energy expenditure of human swimmers during unsteady motion. It is also important to know the added mass when using indirect methods to find a swimmer’s passive drag. As added mass determination is dependent on specific measurement methods often unavailable to the common sports scientist, it would be worth exploring the possibility to estimate AM from body size measurements. The aim of our study was thus to find the added mass for human swimmers and its relationship with body size measures, and to construct predictive linear regression statistics.

Methods: Eleven male adults aged 25.2±4.9 years, 10 females (22.7±3.6 years) and 10 boys (13.7±0.8 years) were included in this study. The subjects were connected to a 2.8m long bar with handles, attached with springs (stiffness k=318N/m) and a force cell. By oscillating this system vertically and registering the time period of oscillations it is possible to find the added mass of the swimmer, given the known distance of the swimmer at the oscillating bar may vary, affecting the added mass to a small degree. It is concluded that a reasonable variation in added mass other variables must be investigated, or is due to measurement errors. The human factor must not be forgotten, including other body size measures such as body width and depth improved the accuracy of this prediction to an r2=0.85. For the rest of the variation in added mass other variables must be investigated, or is due to measurement errors. The human factor must not be forgotten, the position of the swimmer at the oscillating bar may vary, affecting the added mass to a small degree. It is concluded that a reasonable prediction of added mass needs only body mass as input, and is further enhanced by including body with and depth, but not for the females.

Results: A mean added mass of 17.0±3.8kg, corresponding to 26.3±2.9% of body mass was found for the whole group, and 21.4±2.5, 15.0±1.2 and 14.5±3.1kg for the men, women and boys respectively. For the whole group of subjects, an r2 value of 0.79 was reached for linear regression with body mass (BM). Including frontal surface area, reaching height (representing the underwater characteristic length) and fineness ratio did not enhance the r2. Including body width (BW) and body depth (BD) to the regression increased the r2 to 0.85. Added mass (AM) can thus be predicted by: AM=0.22*BM+0.25*BW+0.17*BD-2.4 Looking at males and females separately, r2 was 0.90 for males (including BM, BW and BD) and r2=0.56 for females (including only BMI).

Conclusions: By including body mass in the regression we could explain 79% of the variations in added mass for the whole group. Adding other body size measures such as body width and depth improved the accuracy of this prediction to a r2=0.85. For the rest of the variation in added mass other variables must be investigated, or is due to measurement errors. The human factor must not be forgotten, the position of the swimmer at the oscillating bar may vary, affecting the added mass to a small degree. It is concluded that a reasonable prediction of added mass needs only body mass as input, and is further enhanced by including body with and depth, but not for the females.

References:

ANAEROBIC POWER PRODUCTION CHARACTERISTICS DURING CYCLING EXERCISE WITH DIFFERENT WORK LOAD IN MALE VARSITY ATHLETES
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Anaerobic power production capacity is an important factor in any athletic activities. Its power output capacity affected by athletic training mode was reported previously. The purpose of this study was to investigate the anaerobic power production characteristics during cycling exercise on athletes of various events. The subjects were consisted of 11 throwers, 17 sprinters, 34 baseball players, 29 soccer players, 36 kendo players, 29 judo players, and 16 long distance runners and 22 controls. All the athletes were performed muscle training and technical drills of each sports performance throughout the year. Fat free mass (FFM) was measured by body fat analyzer in all the subjects. The maximal anaerobic power (MAP) was obtained by bicycle ergometer (Power max V, Combi co. Japan). Subjects were performed ten seconds with the maximal efforts intermitted of three steps work load, and requested to have warm-up and two minutes rest. Relative maximal anaerobic power to fat free mass (MAP/FFM) was calculated in all the subjects. And also, the relative load and pedalling rate of 2nd and 3rd sets to 1st set were calculated. In addition, times to peak power on each exercise were measured in all the subjects. Throwers showed highest values in MAP among other groups. Lower values in MAP were found in long distance runners whose values were not significantly different from that of controls. On the other hand, MAP/FFM in baseball players and sprinters were showed highest values that of among other groups. MAP/FFM in judo and long distance runners were observed lower values compared with other athletes groups and control. In all the groups, the highest power was obtained the load of the 2nd set. In work load of MAP, throwers was showed highest value that of other groups. And also, pedalling rate of MAP in sprinters was observed highest value. Relative load and pedalling rate of 2nd and 3rd set to 1st set were observed differed by athletic event. Significant differences were observed time to peak power of MAP among the athlete groups. In all the groups, times to peak power of 1st set was faster than that of 2nd and 3rd set. From these results, it was cleared that anaerobic power production capacity on bicycle exercise was differed by the athletic event. Therefore, athletic training mode may affect to the maximal anaerobic power production time and capacity in male athletes.

References.

ALLOMETRICAL ANALYSIS ON THE DEVELOPMENT OF THROWING AND KICKING PERFORMANCES DUE TO PHYSICAL GROWTH IN JAPANESE MALES
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It is well known that development of athletic performance effected by physical growth. However, it was no reported development of differences for athletic performances such as throwing and kicking of the ball to physical growth during Japanese teenage males. Therefore, the purpose of this study was to compare the development of throwing and kicking performances to growth of body height in Japanese males.

The ninety-five baseball players and 99 soccer players aged from 10 to 19 years of old were served as subjects. They trained technical drills of each athletic performance throughout the year. These subjects were devided in five groups according to body height every 10cm. Body height, body weight and fat free mass were measured in all the subjects. Throwing velocity (TV) in the distance of 5m as a throwing performance was measured by radar gun (Mizuno, Japan) in baseball players. And also, kicked ball velocity (KV) as a kicking performance was measured by radar gun in soccer players. These parameters were used allometrical analysis methods to relative development on throwing and kicking performances due to physical growth. The throwing and kicking performances (y) corresponding to body height (x) were plotted on double logarithmic graph to obtain allometric equation y=bx^a, where a is a developmental index and b is constant. The developmental index of TV and KV were higher than 1 for growth index of body height. And also, developmental index of TV was higher value than that of KV. The one sharp bend in the graph showing the relationship between TV and body height. In addition, the one sharp bend in the graph showing the relationship between KV and body height. Accelerated development of TV begins earlier than that of KV in teenage males.

From these results, it was clarified that development of throwing and kicking performances were observed faster than compared with growth of body height. And, these developmental velocities were differed between upper limb and lower limb during teenage males.

References.

INCREMENTAL TREADMILL RUNNING: AN ELECTROMYOGRAPHIC AND METABOLIC ANALYSIS
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For the muscular fatigue analysis during incremental protocol, the electromyographic (EMG) signal amplitude breakpoint has been analyzed in function of exercise intensities (HUG et al., 2006) or in function of the significant increase on the EMG signal amplitude between the beginning and the end of each stage (HANON et al., 1998). Another methodology using surface EMG called electromyographic fatique threshold (EMGFT) has been used (MATSUMOTO et al., 1991; OLIVEIRA, GONÇALVES, in press). Considering the evident development of protocols aimed at analyzing the surface EMG signal as a non-invasive methodology to analyze the muscular fatigue and also due to the lack of use of incremental treadmill running protocols, the purpose of the present study was to determine the EMGFT of vastus lateralis (VL), vastus medialis (VM), biceps femoris caput longum (BFCL) and gastrocnemius lateralis (GL) muscles and to correlate it with the lactate threshold (LT) and anaerobic threshold (AT). Eighteen male and healthy subjects, physically active, ran to volitional exhaustion on a treadmill during incremental test. The EMG signals were recorded continuously, blood samples were collected from the ear lobe and the heart rate (HR) was directly monitored using a heart rate monitor. The RMs (Root Mean Square) values of each muscle were obtained in each stage for determination of the EMGFT. EMGFT velocities of VL, VM, BFCL and GL muscles correspond to 60%, 54%, 56% and 58% of
the maximum velocity (Vmax), respectively, being similar to LT (60% Vmax), and EMGFT and LT values were significantly lower than AT (77% Vmax). No significant correlation was found between EMGFT and LT / EMGFT and AT values. The present data demonstrate that EMGFT determined through incremental treadmill running test is presented as an aerobic index, being an alternative for the muscular fatigue analysis, however, further studies should be conducted in order to analyze whether it could be used for evaluate performance, prescribe exercise intensities and evaluate training effects, as achieved by the LT and AT. 

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References: 


BIOMECHANICAL ANALYSES AND PREDICTORS OF DIAGONAL STRIDE PERFORMANCE IN ELITE CROSS-COUNTRY SKIERS 

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Introduction: In cross-country (XC) skiing classical style was the only racing style until the mid 1980s and the main focus of early biomechanical studies was on the diagonal technique (DIAG). With the introduction of the new free style, research became more oriented toward this although both styles have gone through substantial development during the last decade (Smith, 2002). Recently, modern double poling technique has been thoroughly analyzed as regards its biomechanical characteristics and factors related to performance (Holmberg et al., 2005; 2006). However, there is still a lack of biomechanical data describing modern DIAG. Therefore, the aims of the present study were 1) to perform a basic biomechanical description of modern DIAG, and 2) to detect decisive factors related to DIAG performance. Methods: Twelve Swedish elite XC skiers (VO2max-DIAG: 72.3 ± 3.8 ml·kg⁻¹·min⁻¹) performed DIAG roller skiing at a treadmill inclination of 5° at 11 km·h⁻¹ for biomechanical analyses. DIAG performance was defined by time to exhaustion (TIEDIAG) during a DIAG incremental pre-test (4°-11° [1°/min]; with a constant velocity of 11 km·h⁻¹). Leg and arm joint angles (goniometers), pole forces (strain gauge transducers; 2000 Hz) and plantar forces (Pedar Mobile, 100 Hz) were recorded continuously. Correlations between DIAG performance (TIEDIAG) and biomechanical variables was examined using Pearson product-moment correlation coefficient tests (P<0.05). Results: Correlations were found for cycle time and cycle length (r=0.668; P<0.01), cycle rate (r=-0.731; P<0.01), relative foot ground contact time (r=0.658; P<0.05), absolute and relative leg swing time (r=0.756; P<0.01; r=0.638, P<0.05), amplitude and angular velocity of hip angle during leg swing (r=-0.634; r=-0.652; P<0.05), hip angle at ski plant (r=-0.616; P<0.03), absolute and relative hip extension time (gliding phase) (r=0.689; P<0.01; r=0.592, P<0.05), absolute peak foot force (r=0.606, P<0.05), duration and amplitude of the knee angle extension after ski in, e. g. when the skis came in contact with the ground, to the knee angle maximum (r=0.743; r=0.710, P<0.01), rear foot force at minimal hip angle before push-off (r=-0.634; P<0.05), relative (%BW) peak pole force (r=-0.706, P<0.01), pole force at start of forward swing of the opposite leg (r=-0.681; P<0.01), amplitude of elbow extension during poling (r=0.741; P<0.01) and duration of elbow extension after pole out (r=-0.615; P<0.01). Discussion: It can be concluded that better DIAG skiers have 1) a longer and more distinct forward swing in their legs, 2) shorter ground contact, characterised by a lower body position when the skis come into contact with the ground, 3) a more distinct hip and knee angle extension (preparation) just before push-off, 4) a higher absolute production of leg force during push-off and 5) arm work characterised by longer and later peak pole forces (late accentuation). 

THE KINETIC CHAIN OF TENNIS STROKES 

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INTRODUCTION The kinetic chain is coordinated activation of the body segments which starts with legs, trunk and back, then follows to shoulders, elbows, wrists and ends with the acceleration of the racket. Technique of ground tennis strokes plays a key role in sport performance. PURPOSE The purpose of this study was to obtain new and precise knowledge which can be applied in sport praxis. METHODS Six tennis players in age from 17 to 21 were recorded by 2 synchronized video cameras in two ground tennis strokes (forhand, backhand). This 3D space is real and good enough for understanding of each tennis stroke. 3D biomechanical analysis with the help of software Simi motion allows to find exact values of kinematic parameters RESULTS Hitting technique represented by kinetic chain is stable at our group and strokes of one player have very common characteristics. The interesting differences appeared among tested tennis players but we could find some basic phases which have to be done in same or similar way. We obtained following average results for velocities in contact time (racket and ball): front racket=20,2 m/s, lower racket=10,2 m/s, right wrist=6,6 m/s, right elbow=4,9 m/s, right shoulder=2,3 m/s All this values of playing hand confirm the theory about increasing velocity and acceleration during the stroke. The other hand is also useful and achieves even higher velocities: left wrist=7,2 m/s, left elbow=5,3 m/s and left shoulder=3,1 m/s Excellent kinetic chain has to be connected with very stable body position. This represents very low velocity of forehead (1,3 m/s). The lower part of body must be also very quiet and average velocity of left and right hip, left and right knee, left and right ankle-bone is 1,4 m/s All pre-hitting phase has to be very accelerated but smooth and top level players are able to do some movements corrections in time 0.1 s before contact phase (velocity decrease) with the aim of better timing. Precise and fast footwork during preparing phase is visible at all tennis players but better stabilisation work in contact time brings lower velocities. Very interesting are high acceleration peaks in time about 0,05s before hitting the ball but quite big differences exist in deceleration after this moment. The reason for doing this is accuracy of prepared shot CONCLUSIONS Correct kinetic chain represent optimal tennis technique. Based on our achieved results, we can confirm that 3D biomechanical analysis is an excellent mean for diagnostics of tennis strokes which leads to improvement of personal styles. 

References: 


A METHOD TO CAPTURE AND MODEL THE GEOMORPHOLOGY OF SNOW SURFACES FOR USE IN BIOMECHANICAL INVESTIGATIONS IN SNOW SPORTS

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Introduction:
This paper presents a method with which the geomorphology of a snow surface can be measured and modelled in such a way that allows the derivation of local gradients at any location on the captured slope. This methodological description is part of a technique analysis project in which kinematic and kinetic characteristics of alpine skiers were derived from multiple camera views.

Method:
The geomorphology of a 40 m long, 8 m wide and 18.6° inclined investigation area was captured by terrestrial surveillance with a theodolite. Since the snow surface was quite uniform, the distance between the captured points (Pc) was chosen to be approximately 1.5 m. These measured points on the surface (Pc) were triangulated by the method of Delaunay [1] to a preliminary, triangulated surface ('Striangulated'). Since the first derivative of such a surface is discontinuous, we computed a cubic interpolation which was based on and passed through the measured surface points (Pc). For the interpolated surface ('Sinterpolated'), derivatives are continuous [2] and allow the derivation of local gradients area-wide. The interpolated surface was determined with an evenly spaced grid interval of 30 cm. The local gradient at any point Ps on the interpolated surface was derived from the orientation of the plane spanned by the three closest grid points to Ps.

An alternative to 'Sinterpolated' would be the computation of a least-squares plane ('Sleast-square') through the measured points, however it is expected that considerable detail would be lost despite the slope's uniform nature.

Results:
Both 'Sinterpolated' and 'Sleast-square' were determined for the 40 x 8 m area and compared. The mean difference (rms) between the interpolated surface and the least-squares plane was 5.7 cm but was as large as 27 cm. The relatively smooth snow surface had local variability of about 7.6 cm above and below the mean surface level.

We chose to use 'Sinterpolated' for our subsequent analysis as we wished to derive the local gravitational gradient and decompose it into the component that accelerates the skier along the trajectory. Using the interpolated surface points, kinetic analysis was carried out for 2 slalom turns which were part of a longer course.

Discussion:
Determining local characteristics of a snow surface is challenging but can provide detailed information concerning forces acting on the skier during turns across the surface. Surface gradients can be used to better understand the kinetics of ski turning.

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KNEE JOINT KINEMATICS AND MODERN ALPINE SKI RACING TECHNIQUE

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INTRODUCTION: In 1999, Berg et al. [1] reported a range of motion in the knee joint angle of 98 ±11 deg for the outside leg and an average angular velocity of 69 deg/sec in slalom. They observed two periods of knee extension over the turn cycle. Equipment and technique have evolved considerably since the 1990's. In 2005, Kugovnik et al. [2] described the development of technique from the double-motion technique - similar to that observed by Berg et al. - to a single-motion technique which they were able to relate to improved performance.

The purpose of this paper is to describe the knee angle kinematics of a highly-skilled group of skiers using modern equipment and technique.

METHODS: The kinematics of 6 male members of the Norwegian national team were analyzed through 2 turns during a slalom race simulation. The gates were set at a 10 m distance with a 3 m offset on a slope inclination of 18.6 deg. Hip, knee and ankle joint center 3-D positions were determined from 4 panning cameras and calibration control points distributed near the course [3]. The knee angle of the outside leg was calculated using the dot product between the thigh and shank segment vectors. Knee angle data were time-normalized as a percentage of turn cycle. Descriptive statistics and ensemble averages were calculated using all 12 of the analyzed turns.

RESULTS & DISCUSSION: In examining the knee angle ensemble average, a cyclic pattern of knee extension and flexion is apparent, resembling the single-motion technique described by Kugovnik et al. [2]. In the turn initiation phase, knee angles increased from an average (+SD) of 93 ±10 deg at turn-start to reach an initial peak angle of 124 ±10 deg by 35.7 ±6.1% of the turn cycle. Knee angular velocities in this phase varied substantially with an average of 108 ±49 deg/sec. Throughout the main loading phase of the turn, knee angles decreased slowly in an eccentric or quasi-isometric movement for the knee extensors. In some turns, a secondary knee extension was observed in the latter part of this phase, similar to the double-motion technique. During turn completion, knee flexion predominated with an average angular velocity of -120 ±36 deg/sec. By turn-end, the skiers had reached an average angle of 88 ±9 deg.

CONCLUSIONS: When compared to the Berg et al. data [1], the results of this study show a somewhat increased knee joint range of motion as well as increased angular velocities. On average, the pattern of motion resembled the single-motion technique [2], although there were exceptions.

References.

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COMPARISON OF THE GROUND REACTION FORCE BETWEEN GAIT WITH DIFFERENT UNIFORMS AND MILITARY MARCH PERFORMED BY OFFICERS

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One of the main goals of the current research on military march is to minimize injuries. Boots and the additional weight used by the police officers, due to their uniforms, can lead to an increase of the overload at the joints and modify the normal gait pattern. This study derived from a problem brought out by the Municipal guard guards who during their daily work suffer consequences from the use of all the equipment (uniform, weapon, tonfa, ballistic vest, garrison belt and boots) which adds 6 to 9 kg to body weight. The present study aimed to compare ground reaction force during military march and gait with different uniforms and overloads, analyzing in the vertical axis the peak force in touch down and toe-off phases and the minimum force during the single support phase. The sample was composed by 35 officers of the Municipal Guard being in average 34.3 years old. For the data acquisition an AMTI Platform was used connected to a PC/AT, with acquisition’s software and signals’ processing executed at Windows platform. The subjects walked by the force platform at their natural speed for the three first conditions wearing: physical education uniform, military uniform and boots, complete uniform. In the fourth condition they performed the military march, in the rhythm demanded for taking part in a parade and wearing complete uniform. In order to compare the differences between the trials it was used the statistics ANOVA with Post-hoc of Tukey with significance level of 0.05. The results showed significant differences in peak force at touch down between military march and the other gait trials and in minimum force at single support between military march and complete uniform trial and between this last one and physical education uniform trial, with the complete uniform trial showing a greater value. No differences were found between the trials in peak force at toe-off phase. In relation to the differences in single support we suppose that with the use of tennis and without an additional load the gait is natural what generates a good acceleration during the weight transfer of the contrary leg, what also happens in the military march but with an additional muscular force demanded by the greater rhythm. The difference in peak force at touch down is dependent on the greater velocity imposed by the military march and also due to the knee angle, that must be kept straight during a longer time than in the other trials, what does not allow the natural damping phase. We can conclude that the military march in relation to the other trials has a greater possibility of causing injuries because of the greater peak force at touch down. The other trials that represent the daily movements performed by the officers do not show any significant difference in the gait pattern, only the trial with complete uniform leads to a stride with a greater demand from the leg muscles due to a lower decrease from the vertical force during single support.

COMPARISON OF MUSCULAR ACTIVITY AND GROUND REACTION FORCE BETWEEN LAND BASED AND AQUATIC PLYOMETRIC TRAINING: A PRELIMINARY STUDY

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The benefits of jump-specific plyometric exercises have been studied in athletes and non-athletes. This training method has been associated with factors such as increased power output and maximum rate of force development as well as increased muscle fiber size, characteristics likely attributed to the stretch reflex, high eccentric loading, and explosive nature of plyometric exercises. In the last years some authors have described the use of aquatic jumping training as aquatic plyometric training. This training should reduce the impact forces and increase the resistance to the movement. The results suggest that in comparison to the land-based training, the aquatic plyometric training could provide comparable training gains while providing a therapeutic modality for reducing muscle soreness and pain. On water the stress is considerably reduced because of its buoyancy that thus reduces stretch reflex, exercise velocity and the eccentric load over athletes’ joints which seems to generate a different stimulus, with different characteristics from the land-based plyometric training. The aim of this study was to describe and analyze the ground reaction force and the muscular activity of the muscles: rectus femoris, biceps femoris, biceps femoris, tibialis anterior and gastrocnemius during the landing on two different ground conditions, land or swimming pool, after jumping from two different heights (54,7 cm and 73,2 cm). Three Physical Education students took part in this study and were asked to perform three jumps for each condition and height, landing in the force platform and jumping out as quickly and forceful as possible. For the acquisition of the registers a platform and a electromyography of 8 channels (EMG System of Brazil), water resistant and of 12 bits resolution were used, with acquisition’s software and signals’ processing executed at Windows platform. Surface electrodes of bipolar type were used on active EMG interface with amplification of 20 times and were located as the protocol suggested by Delagi (1981). The analyzed values were RMS for each muscle during the contact with the force platform and the peak force during contact after landing from the different conditions and heights. In order to compare the differences between the trials it was used the statistics ANOVA with Post-hoc of Tukey with significance level of 0.05. The results showed significant differences in muscular activity of rectus femoris, biceps femoris and gastrocnemius and also in peak force for the two conditions. Specifically the differences between the two heights, in both conditions, were only found in rectus femoris activity and in peak force. In general the muscular activity was greater in landing in swimming pool while the contrary was found for peak force. Both findings seem to support the studies that propose the use of aquatic plyometric training, but due to the small sample size, the results may not be considered as strong evidence.

ADVANCES IN ELITE FEMALE TRIPLE JUMPING: TIME MANAGEMENT AND VELOCITY PROFILES

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The progression of female triple jumping (TJ) took place rapidly within the last few years. Since 2000 international championships tenner crosscut TJ results were >14.5m. Achieved distances in TJ depend upon ideal kinetic energy production and conversion into height and distance through approach speed in every take off (TOI) (e.g. Hay 1992). Aim of the study is to describe behaviour and influence of selected approach characteristics of time management (TMI) and horizontal velocity (v (m/s)) profiles in elite female TJ. Numerous competition-velocity profiles were compiled among several elite female TJ during outdoor-seasons between 2002 and 2007 (Niessen et al. 2004): Velocity was registered by a laser distance device (LDM 300CL), placed in approach direction and focussed on lower back of the athlete. Speed curves were edit and filtered by 67p1 moving average of distance & speed (Sport 3.9, LoveDrei). Additional 2D-kinematic video-analysis of side movement was performed (Niessen et al. 2003). Descriptive and group-specific parametric statistics were applied.

Elite female TJ (n=52): performance: 14.3±0.4m achieved maximum velocities (vmax) of 9.0±0.2m/s around 0.6s or 5.5m prior to board. No statistically relevant relationship was noticed between vmax and effective distance (Deff: official plus toe-to-board distance).
FIELD MEASUREMENT OF EMG PATTERNS IN POLE VAULT: A PILOT STUDY

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The pole vault is a complex spectacular discipline [1,2] involving several types of athlete's skills and a great number of muscle groups whose activation pattern is characteristic during the different stages of the vault. Elite athletes can reach highest results after a proper refinement of their vaulting technique and parallel optimization of their physical performance levels. The activation pattern of a skilled athlete and its timing at the different instants of the pole vaulting event can be seen as an optimized motion pattern to be studied for physical interpretation and training purposes. The high number of muscles involved all over the body requires possibly a portable acquisition device with several channels: the final athlete's back impact on the mat also involves the use of a compact minimally invasive system to avoid disturbs or injuries to the athlete.

The surface EMG activity of 16 muscles (arms [4], shoulders (2), chest (2), quadriceps (2), back (5), and abdomen (1)) was recorded by means of a PDA PockeEMG (BTS-Italy) at a sampling frequency of 1Khz synchronously to video recording from 2 commercial cameras. Three subjects performed a set of indoor vaults aiming to their personal best. Video images were analysed by Dartfish® SW and synchronized to EMG signals. EMG signals were integrated, filtered and plotted against time with corresponding video frames to reveal the coordination patterns of the vaults. The EMG results of this pilot study are the first set of data collected. In the following acquisitions muscle signals will be recorded synchronously with strain data from the pole (2) and the planting box and with 3D motion capture from inertial sensors of the limbs.

References:

DEVELOPMENTAL FACTORS TO THE THROWING AND HITTING PERFORMANCES IN JAPANESE MALE teenager BASEBALL PLAYERS

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The aimed of this study was to clarify the developmental factors to the throwing and hitting performance in teenager baseball players. Forty-three male baseball players aged from 12 to 17 years old were requested in this study. These subjects were classified by three groups for every two years (G1: 12-13 years, n=17, G2: 14-15 years, n=15, G3: 16-17 years, n=11). The body height (Bh), body weight (Bw) and fat free mass (FFM) as a body size parameters were measured in all the subjects. The maximal ball velocity of overarm pitched in a exposure time of 1/2000s. The phase of hitting motion analyzed from stride foot contact to ball impact in all the subjects. Hitting ball velocity (Hv) was increased with age groups. Significantly higher value was showed in G3 (33.2±2.3 m/s) compared to other two groups(G1: 26.8±2.3 m/s, G2: 30.0±1.8 m/s). Significant partial correlation coefficient was obtained between Hv and Bh (rxy.z= 0.610, p<0.01). And also, Hv was closely related with FFM (rxy.z= 0.536, p<0.01) in all the subjects.

TO H & S and time management is necessary to individually adjust training and finally TO performance.

References:
COMPARATIVE ANALYSIS OF VERTICAL GROUND REACTION FORCES IN TAP DANCING

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Introduction: Sports floors in general and dance floors in particular are constructed to reduce the impact of heavy loads on the lower extremities in order to prevent injuries (Bowling, 1989; Macintyre & Joy, 2000; Werter, 1985). At this point in time, despite the large variety of different floor constructions, there is a lack of detailed recommendations on how to construct sprung dance floors that decrease the strength of the impact in tap dancing. Vertical ground reaction forces can indicate information on joint loading in general, however it is very difficult to provide accurate force plate data from sprung floors in tap dancing. Therefore, the aim of this study was to investigate if plantar pressure soles (pedar-X, Novel, Munich) can be accurately applied to measure vertical ground reaction forces in tapping on sprung floors.

Methods: 9 tap dancers (19.4 ± 4.2 yrs) performed two different step sequences (flaps and shuffle hop steps). The ground reaction forces were measured simultaneously with pedar-X insoles (100Hz) and two AMTI force plates (1000Hz). The step cadence was given by music (106 bpm). For comparative analysis the average of the peak forces out of 10 steps from each system was calculated for both the left and the right foot per person. Paired t-test and Pearson’s correlation were used for statistical analysis.

Results: The force-time course for both steps (left and right) coincide well for the two systems in the lower and middle range, however, regarding the peak forces, a good correlation can be observed. Looking at the mean differences between the two systems, the pedar peak forces of the two systems were 16.1% (±5.0%) for the flaps and 13.8% (±4.8%) for the shuffle hop steps.

Discussion and conclusion: Due to the technical conditions of the pedar and the AMTI systems, the measured differences in force data was expected. This corresponds with previously reported results (e.g. Barnett et al., 2000). Although the two systems differ significantly regarding the peak forces, a good correlation can be observed. Looking at the mean differences between the two systems, the pedar may not be suitable to measure the absolute forces accurately, however, it supports its use to measure the discrepancy in vertical ground reaction forces of tapping on different sprung floors.

References.

HIGH PRECISION INERTIAL MEASUREMENT FOR TRACKING THE TRAJECTORIES OF SKI JUMPERS; SMART BOOT PROJECT

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Measurements of ski jumpers’ trajectory are almost exclusively based on the traditional motion analysis techniques using one or more high speed cameras. Motion analysis studies provide very useful data from ski jumping performance and they have certainly improved the understanding of the factors affecting final result in ski jumping (for review, see Schwameder 2008). However, great number of cameras needed to record the entire ski jumping performance makes the measuring set-up very difficult to accomplish and often limits the area of interest to certain part of the performance only. Synchronization of the cameras and especially calibration of the image space of long distance can not always be done reliably. For example a good pan and tilt high speed camera set-up allows the distance of ~ 40 meters of the flight phase to be recorded accurately (Virmavirta et. al. 2005). Digitizing of ski jumpers in the motion analysis process is very time consuming and the feedback from the analysis is usually available so late that this method can not be considered very helpful in the coaching of the athletes. Therefore a new method for tracking the trajectories of ski jumpers was developed in this smart boot project.

The accuracy of the different measurement devices attached to the jumper (e.g. accelerometers) has been fairly poor as compared to the above mentioned motion analysis techniques and they have had, at least some psychological effects on jumping. However, in this project the development of the high technology devices has provided the package of the measurement system so that ski jumpers do not perceive at all the existence of the measuring system installed in their jumping boots. Cooperation with the ski jumping boot factory Jalas, Finland made it possible that this in-baked system consists of its own computer with memory, accelerometers and gyroscopes. The high accuracy of the accelerometers is based on the special modelling of the sensors and the positions, orientations, and parameters of the sensor box were determined by placing the box in three orthogonal positions on the special calibration table with maximum rotating speed of 6000 rpm. The data collection of the system is automatically started when ski jumpers secure their ski bindings before the jump. Since the trajectory of ski jumping boots coincides exactly with the inrun tracks of the jumping hill, the GPS real time kinematic (RTK) measurement of the inrun profile provides a good reference for the measured data.

Preliminary results showed that smart boot measures the information from the ski jumping performance very accurately and independently without disturbing the performance of ski jumpers. Ski jumpers’ position can be measured with the accuracy of the RTK measurement, i.e., in the level of centimetres.

References.

THE CHANGES OF BALL VELOCITY AND MOTION WITH WINDMILL PITCH TRAINING FOR SOFTBALL

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Windmill pitching performance such as ball velocity and accuracy are important factors in the softball game. There were no reports of windmill pitch training for softball. The purpose of this study was to clarify the role of training the windmill pitching performance in Japanese male.
The subjects were 6 males (age: 25.5±1.0 yrs, height: 173.7±1.3cm, body weight: 85.1±1.9 kg). The training program consisted of 18 training days to two or three days in a week with two months. Subjects were trained windmill pitch for 50 pitching. Pitching motion on before and after training recorded by two high-speed cameras, and analyzed by computer with 3-D analysis software. The phase on pitching motion analyzed from leg takeoff to ball release, and pitching motion phase analyzed start to top (ST) and top to release (TR) in all the subjects. The maximal ball velocity was measured in the distances of 13.1m both before and after training. The all subjects were performed to 3 fastballs pitch with maximal effort. The velocities of elbow and wrist joints on pitching motion were analyzed on before and after training. And also, mean accelerations of the pitched ball and pitching motion time were calculated in ST and TR respectively.

The maximum ball velocity in after training (21.0±0.9 m/sec) was significantly higher than that of before training (18.9±1.2 m/sec). And also, significant difference on elbow joint velocity was observed between before and after training.

In TR, mean accelerations of the pitched ball in after training (82.5±7.8 m2/sec) was clearly changed compared to the before training (62.0±9.1 m2/sec). In addition, the motion time of after training (0.190±0.012 sec) was significantly shorter than that of before training (0.245±0.026 sec). However, these parameters in ST were not significant difference.

From these results, it was considered that the velocity of ball and motion time were dependent on pitching training times. There for more long terms training was necessary to improvement of windmill throwing performance.

References.

THE EFFECTS OF EXTERNAL LOADING ON THE HEIGHT AND MAXIMAL VELOCITY IN-WATER AND DRY-LAND VERTICAL JUMPS BY WATER POLO GOAL KEEPERS: PRELIMINARY RESULTS
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Platanou (2005) described that the performance of the water polo athletes in the water vertical jump correlates poorly with the height assessed in the dry-land vertical jump. However, for goal keepers this can be an important variable because these athletes need to jump high greats and train with heavier loads than the others players. Thus, many coaches have applied external loading during jump training, performed in dry-land and in water. This paper described preliminary results of the effects of external loading on the height and maximal velocity attained by water polo goal keepers in vertical jumps performed in land and in water. Three goal keepers (1 female; 2 male) from the national team volunteered to take part in this study. In dry-land the maximal height was assessed by the use of a jump test platform that automatically calculated this variable from the time spent in the air and was placed over the force platform. The acceleration of the body was calculated using vertical force and body mass. Vertical velocity was subsequently determined by integrating the acceleration. The jumps were performed from a squat position with the heels on the platform and the thighs in a horizontal position. Lower limb counter-movement and swinging of the arms were not allowed; the participants grasped the collar of their shirts with their hands. In water the subjects performed the jump in the middle of the goal bars, without support, and with flexed arms, raised out of the water. They were filmed by two digital cameras (60 Hz) after receiving a reflective mark at the forehead. The difference between the heights of the mark at the initial position of the jump and the highest point achieved was calculated after using an automatic tracking system of this mark and the maximal velocity was obtained from a derivative of this mark. The participants jumped with no load (0%), or an external load corresponding to 5%, 10% or 15% of their relevant body weight. The loads were distributed on the trunk in accordance with previous standardization (Driss et al., 2001). They performed three vertical jumps at each load with at least 90s between jumps in random order. The results showed a high correlation between water and dry-land conditions for the four different loads (r=0.64), with the values between the subjects varying from r=0.86 (female) to r=0.73, r=0.67 for males. However, the correlation values between the maximum velocity developed by the athletes in both conditions varied a lot between the subjects, showing a correlation for the female (r=0.58) and no correlation for the males (r=0.22, r=0.11). We know that the movements in water are dependent from active drag and buoyancy forces, both are influenced by body density, body shape and drag is related to the squared velocity. All these parameters together have influence on the velocity and the height achieved, but it seems that the technique used can somehow interfere in the performance.

BIOMECHANICS OF GAIT ANALYSIS IN OBSESE AND NON OBSESE DOWN SYNDROME YOUNG ADULTS - KINEMATIC ANALYSIS
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Down syndrome (DS) is one of the most common chromosomal disorders and it is estimated that it affects one in 550 born babies. The most common characteristics that this population has are a variety of musculoskeletal and neuromuscular disorders such as hypotonia, ligament laxity, insufficient muscular stability and strength that influence the quality of gait¹. Overweight and obesity are other common characteristics that can influence their gait pattern² but only a few studies seem to have considered this factor as one that influences quality of DS population. The purpose of this study was to analyze gait characteristics of adults with Down syndrome and understand how obesity can influence their gait pattern. Four groups of 4 participants of both genders were formed and matched by the Body Mass Index (BMI) and age. Down Syndrome group (DS) mean age 27.8 ± 5.7 and BMI of 22.1 ± 2.5; Obese Down Syndrome group (ODS) mean age 34 ± 1.4 and BMI of 32.5 ± 2.6, Normal Control group (NC) mean age 24 ± 2 ± 2.2 and BMI of 23.4 ± 1.6; Obese Control group (OC) mean age 29 ± 2 ± 3.1 and BMI of 34.5 ± 1. Twenty-two spherical passive reflective markers were secure over standard anatomical landmarks and Kinematic data were obtained from two 50Hz digital video cameras. All participants walked with self-selected speeds for 5 times on 5-meter walkway and the 3 best trials of each participant were analyzed. APAS (Ariel Performance Analyzing System) software was used to analyze the kinematical data. Time spent in stance phase (percentage) was: ODS 70.6±14; DS 62.8±15; OC 62.5±2; NC 62.1±6 and the time spent in swing phase (percentage) was: ODS 29.4±4; DS 37.2±8; OC 37.5±3; NC 37.9±2. The mean cadence (strides per minute) was: ODS 144.1±7.8; DS 145.7±9.4; OC 149.5±1.7; NC 148.2±1.2. The mean stride length (m) was: ODS 0.71 ±0.2; DS 0.89±0.1; OC 1.25±0.2; NC 1.26±0.1. The vertical displacement of the Centre of Gravity (m) was: ODS 0.029±0.006; DS 0.037±0.009; OC 0.057±0.017; NC 0.04±0.006. The calcaneus elevation (m) was: ODS 0.099±0.021; DS 0.125±0.02; OC 0.194±0.023; NC 0.215±0.019. In persons with DS, where the syndrome itself may stigmatize the person, obesity can further limit the capacity to participate in social, recreational, and athletic activities that are so important for physical and emotional development. The main results of this study suggest that people with Down Syndrome reveals abnormalities in their gait patterns that are even
more constrained by increasing BMI, assuming harmful motor consequences. It is of fundamental importance a greater awareness so that DS population avoids obesity in order to improve their quality of life.

References.

SOLEUS MOTOR UNIT FIRING BEHAVIOR DURING RAMP AND CONSTANT FORCE CONDITIONS
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Muscle force can be increased by recruiting inactive motor units or by increasing the firing rate of active units. The strategy to control muscle force varies according to activation level and contraction type. In small hand muscles with constant force levels there are fluctuations in force and also in motor unit firing rate (Lippold et al. 1957, Stephens and Taylor 1974, Taylor et al. 2003). The purpose of the study was to investigate whether these fluctuations would be observed also in Soleus motor unit firing behavior during varying and constant force contractions.

Six subjects performed isometric plantar flexions while seated in an ankle ergometer. Motor unit activity was recorded with wire electrodes and decomposed using Daisy-software (Olsen et al. 2001). The tasks consisted of ramp (RFI) and constant force (CFI) contractions of 10 and 20% MVC.

The mean firing rate of 12 motor units during CFI was 7.03pps and 8.74 pps at 10% and 20% of MVC, respectively. For the RFI the corresponding mean FR were higher with 7.22 (P<0.001) and 9.46 (P=0.02) pps. In addition, more MUs were active and there were more fluctuations during ramp contractions when compared to the same target force level in CFI. There were no differences in RMS values calculated from the antagonist (TA) and synergist (MG) surface EMG between contraction modes.

Several studies have found a derecruitment and decrease in firing rate during the initial stage of CF contractions (e.g. De Luca et al. 1996), which was supported by the present findings. As there was no difference in antagonist/synergist muscle activity, it can be concluded that differences in firing rates between the two contraction types are due to the use of different neural strategies employed by the CNS specific to the Soleus, a muscle that plays an important role in movement and balance control. This is further supported by the higher number of MUs recruited during a RFI contraction relative to a CFI and the differences in firing rate variability of the same motor units in the two tasks.

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COMPARISON OF NEUROMUSCULAR ACTIVATION TO MAINTAIN POSTURAL STABILITY DURING DOUBLE LEG AND SINGLE LEG STANCE BETWEEN GENDERS
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Introduction: Postural control can be defined as the ability to maintain equilibrium in a quiet-standing position. This control is kept by the sensor-motor system, which integrates visual, vestibular, and somato-sensory information. The resultant oscillation is normally performed in a smooth and controlled way. The purpose of this study is to assess neuromuscular activation differences between male and female of the tibialis anterior (TA) and soleus (SOL) and center of pressure (COP) oscillation during quiet-standing positions, and to assess whether these fluctuations would be observed also in Soleus motor unit firing behavior during varying and constant force contractions.

The mean firing rate of 12 motor units during CFI was 7.03pps and 8.74 pps at 10% and 20% of MVC, respectively. For the RFI the corresponding mean FR were higher with 7.22 (P<0.001) and 9.46 (P=0.02) pps. In addition, more MUs were active and there were more fluctuations during ramp contractions when compared to the same target force level in CFI. There were no differences in RMS values calculated from the antagonist (TA) and synergist (MG) surface EMG between contraction modes.

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BILATERAL DEFICIT IN MUSCULAR POWER AND EMG DURING MULTI-JOINT ISOKINETIC LEG EXTENSION MOVEMENTS UNDER DIFFERENT CONSTANT SPEEDS
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Purpose

13TH ANNUAL CONGRESS OF THE EUROPEAN COLLEGE OF SPORT SCIENCE
Bilateral deficit (BLD) is known as a decrease in maximum contraction muscle force during both limbs acting simultaneously (bilateral contractions) compared with the sum of the forces produced during each limb separately (unilateral contractions). The purpose of this study was to examine the characteristics of BLD in muscular power and muscle activation during multi-joint isokinetic leg extension movements.

**Methods**

BLD was measured using leg extension power (LEGPOWER, Takei co., Ltd., Japan) under following two protocols: 1) 46 males (20.7±1.9 years) at the velocity of 0.2 and 1.0 m/s. 2) 9 males (20.7±1.3 years) at the velocity of 0.2, 0.6 and 1.0 m/s along with EMG recordings. EMG recorded from 6 muscles such as GM, RF, VL, BF, BF1, LG. EMG data were integrated (iEMG) after full wave rectified. In these two experiments, bilateral index (BLI) was calculated by mean power and iEMG to define for BLD in a following equation. BLI%=[100×(bilateral/unilateral)-100 (Haward and Enoka, 1991)]. When BLI showed a negative value, it reflects a BLD.

**Results**

In protocol 1, BLI of mean power were 65293;9.2±6.7% in 0.2m/s, 65293;19.5±9.3% in 1.0m/s. BLI was significantly greater in 1.0m/s than 0.2m/s;65293;56.8±6.3% in 0.2m/s;65293;14.6±7.5% in 0.6m/s;65293;10.5±7.4% in 1.0m/s;1478±236% were smaller than unilateral contractions (0.2m/s;530±88W, 0.6m/s;1246±197W, 1.0m/s;1826±232W) at each velocities (p<0.001). BLI were 65293;3.9±2.2% in 0.2m/s,65293;10.5±6.1% in 0.6m/s,65293;19.1±8.0% in 1.0m/s. There is significantly different between 0.2m/s and 1.0m/s;65293;1.0±6.3% in 1.0m/s;19.1±8.0% in 1.0m/s. There is significantly different between 0.2m/s and 1.0m/s;65293;46.8±6.3% in 0.2m/s;65293;15.0±6.1% in 0.6m/s;65293;19.1±8.0% in 1.0m/s. when significantly different between 0.2m/s and 1.0m/s;65293;14.6±7.5% in 0.6m/s;65293;10.5±7.4% in 1.0m/s;1478±236% were smaller than unilateral contractions (0.2m/s;530±88W, 0.6m/s;1246±197W, 1.0m/s;1826±232W) at each velocities (p<0.001).

**Conclusions**

The main findings of this study were 1) BLD was existed during multi-joint isokinetic contractions, and BLD depend on velocity of movement. 2) Muscle activations were smaller in bilateral contractions than unilateral contractions.

**LOWER LIMB SYMMETRY DURING RHYTHMIC LATERAL STEPPING**

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Lower limb symmetry is usually assumed for simplicity of data collection and analysis, however few studies have actually reported this symmetry using quantitative biomechanical data, where both limbs were evaluated (Sadeghi, et al., 2000). The purpose of this study was to investigate the lower limb symmetry during rhythmic lateral stepping. Twelve participants (18.7±0.3 yrs, 66.3±9.0 kg, 167.5±7.8 cm) performed series of lateral steps with the leading foot contacting a forceplate (Kistler 9881, 250 Hz). One cycle of movement included one step to the right (RS) followed by one step to the left (LS) (leading foot right). Trials were performed with the RF leading as well with the LF leading (randomized order of the leading foot). All trials were recorded with a camera (Panasonic HK-600) for kinematic analysis of the step length (Lstep). Trials were performed in preferred stepping frequency (PSF) and in two frequencies set by an external rhythmic stimulus (as lower (LFS:82 beats/minute) and higher (HFS:144 beats/minute) than the PFS, respectively (Rousanoglou & Boudalos, 2006). The kinetic parameters determined were the duration of the cycle of movement (tcycle), duration of contact (tccontact), the vertical impulse (Fzimpulse). All parameters were determined for the leading foot, for a series of 14 cycles of movement. The individual mean value, standard deviation (SD) and coefficient of variation (CV%) during the 14 cycles were calculated. Finally the group means (average of individual values) were estimated for each parameter and inserted for statistical analysis. Student paired t-tests were applied for the differences between LF and RF, separately in each stepping frequency (ps<0.05). The significant kinetic differences were found for mean tcycle in LPS (RF:3.979±0.008s, LF:3.972±0.009s, p=0.009), SD and CV% of Fzimpulse in PSF (RF:20.4±7.5s, LF:22.5±7s, p=0.042 and RF:2.9±0.3%, LF:3.4±0.7%, p=0.026, respectively) and mean tcycle in HPS (RF:62.8±12N.s, LF:60.4±7.2N.s, p=0.005). No significant difference was found for Lstep (ps>0.05). These results show that although there was a consistent spatial symmetry, as shown by the same Lstep in both limbs, in all three stepping frequencies, kinetic performance was not always symmetrical. Moreover, stepping frequency appears to alter the kinetic symmetry. Thus for a global apprehension of lower limb symmetry, a combination of parameters that reflect the cause (force), timing of force, the effect (step length) as well as the frequency of the movement should probably be used.


**Poster presentations (PP)**

**PP-HF04 Health and Fitness 4**

**THE DISEASES OF THE MUSCULOSKELETAL SYSTEM AND CONSCRIPTS’ PHYSICAL READINESS RELATED TO THIS IN THE UNIT OF THE ESTONIAN ARMY**

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All soldiers in the Estonian Defence Forces must take the Army Physical Fitness Test (APFT) regardless of their age. The APFT is a three-event (push-ups, sit-ups, 2-mile run) physical performance test used to assess muscular endurance and cardio respiratory (CR) fitness. Individuals’ disabilities and health related problems are detected during medical examination carried out before entering into service. The aim of the current paper is to elicit the relationship between the findings of the medical examination of conscripts before entering into service and the results of their first and second physical test at their Military Post in 2007. 613 male conscripts, aged 18 to 22 participated in the survey. Soldiers are divided on the basis of their health condition into two groups: healthy, and healthy with restrictions. The medical records of the freshmen and their APFT results in the beginning (the first test) and at the end (the second test) of the basic training course, as well as their physical progress, were analysed. Diseases of the musculoskeletal system and its connective tissues are considered to be a rather common health problem (49% of all diseases) among freshmen. The occurrence of musculoskeletal problems among conscripts was highest among the following: other acquired deformities of limbs 35%, scoliosis 17%, dorsalgia 12%, kyphosis and lordosis 4%, spinal osteochondrosis 3%, other juvenile osteochondrosis 3%. The correlation analysis revealed some significant relations. There was a connection between the health group of the soldiers and the results of their physical tests. It appeared that 50% of the healthy soldiers did not participate in the APFT.
not perform positively in their first APFT in the beginning of the soldier’ basic course whereas this indicator for the conscripts within the category healthy with restrictions was 65%. 5% of the healthy soldiers and 20% of the soldiers within the group healthy with restrictions did not pass the second APFT. The physical test development dynamics of the soldier group healthy with restriction has weekly correlated with the average physical test development dynamics of the last five years (r= 0.18 , p<0.05). The soldiers’ group healthy does not deviate significantly from normal average dynamics (r=0.87, p<0.05).

BONE-MUSCLE BALANCE AND BONE DIMENSION IN ATHLETES AND NON-ATHLETES OF BOTH GENDERS

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Previous works suggest that lean mass is an important determinant of bone mineral in both genders. Nevertheless there is lack of research respecting the balance between bone and lean mass and the influence of lean mass on bone dimensions. Purpose: To compare bone mineral content (BMC), bone area (BA), BMC and BA for lean mass (LM), and BMC and BA for body height, in athletes and non-athletes of both genders. Methods: Subjects were 262 athletics, 122 female (18 ±5.4 yrs; 21.8 ±2.2 kg/m²), and 140 males (18 ±5.9 yrs; 22.9 ±2.3 kg/m²), and 527 non-athletics, 290 female (17.7 ±5.9 yrs; 23.0 ±4.4 kg/m²), and 237 males (17.9 ±4.8 yrs; 23.0 ±4.2 kg/m²), with an age range from 10 to 33 years. BMC, BA and LM of total body were evaluated by dual x-ray absorptiometry. Standing height was measured on a stadiometer. Analysis of covariance (ANCOVA) was used to analyze the main and interaction effects of condition (athlete vs. non-athlete) and gender (male vs. female) on BMC, BA, BMC/LM, BA/LM, BMC/body height and BA/body height. Analysis of BMC and BA were adjusted for body weight and height, BMC/LM and BA/LM were adjusted for body height, and BMC/body height and BA/body height were adjusted for body weight. Results: It was observed a condition main effect with athletes presenting higher values than non-athletes on BMC (1.019 ±±17.1 vs. 1.233 ±9.3 ±2.2 g, p<0.001), BA (1.205 ±8.67 vs. 1.960 ±4.9 ±2cm, p<0.001), BMC/body height (15.9 ±0.1 vs. 14.1 ±0.7 cm/cm, p<0.001) and BA/body height (11.5 ±0.03 vs. 11.9 ±0.02 cm/cm, p<0.001). A gender main effect was also observed with males having higher values than females on BMC (2.561 ±15 vs. 2.390 ±16 g, p<0.001), BA (2.026 ±5 vs. 1.986 ±6 ±2cm, p<0.001), BMC/body height (15.5 ±0.1 vs. 14.5 ±0.1 cm/cm, p<0.001), and BA/body height (12.2 ±0.03 vs. 12.1 ±0.03 cm/cm, p<0.001), and females demonstrating higher values than males on BMC/LM (6.0 ±0.7 vs. 5.1 ±0.7 ±g/kg, p<0.001) and BA/LM (5.0 ±0. ±6 vs. 4.2 ±3.±6 ±cm²/kg, p<0.001). A significant or almost significant interaction effect was found on BA (p=0.004), and BA/body height (p=0.094), with athletic females revealing a proportionally higher bone width than other groups. Conclusion: Despite highest values of BMC, BA and LM in athletes than in non-athletes, and in males compared to females, muscle-bone balance, namely, BMC/LM and BA/LM ratios were similar between athletes and non-athletes and higher in males than in females. Regarding bone width, females benefited more than males from sports commitment. This study provides evidence for an important contribution of lean mass (a surrogate of muscle mass) and sport engagement on BMC and bone width, and particularly in women compared to men.

BODY IDEAL OF BRAZILIAN AND PORTUGUESE FEMALE RECREATIONAL BODYBUILDERS

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Physical appearance is very important for human development (Cash, 1990), because the body is the kernel of all human actions (Loy, 1991). Garganta (2000) highlight that our actual society idealizes ectomorph morphologies for women. Some studies have showed that women very often experience body dissatisfaction with a strict desire for leanness (Harrison, 2000). American women show up negatively in relation to body dissatisfaction and desire for extremely thinness, followed by the European and Asiatic women (Pedretti, 2008). The emergence of a more muscular woman ideal in 80’s, permit the practice of weight training and bodybuilding more acceptable for women very often experience body dissatisfaction with a strict desire for leanness (Harrison, 2000). American women show up negatively in relation to a more mesomorph or less endomorph body ideal, as well as other anthropometric variables, are discussed.

References.

PERCEPTION OF CLIMACTERIC SYMPTOMS OF BRAZILIAN WOMEN OF A MUNICIPAL PHYSICAL ACTIVITY PROGRAM

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Background: The climacteric is a process of physical and emotional changes for the woman, which receives the influence of many factors, such as personal and familiar history, environment, culture, customs and personal peculiarities, among others. Objective: To assess the menopausal symptoms of women members from a municipal program of physical activity. Methods: This study included 30 climac-
Mild and only 3.3% reported severe. Conclusion: Despite of the mild intensity of the physical activities offered in this municipal program, there was a benefit in climacteric symptoms, highlighting the social importance of exercise, which promotes social integration, improves quality of life and increases the welfare physical and mental. Efforts should be directed to develop researches involving the perception of climacteric symptoms in women and the influence of various factors on this perception and to promote a construction of public policies that highlight the importance of physical activity in promoting health through preventive measures and educational practice.

ASSESSMENT OF WOMEN'S SELECTED FUNCTIONAL PARAMETERS IN BMI CATEGORIES
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Obesity is one of the most important factors of the risk of disasters especially in circulatory system and the reason of metabolic disease (Gibbons at all 1983, Morrow at all 1995, Ignasiak, Domaradzki 2003). Sedentary lifestyle and excessive food consumption characteristic for rich societies results in the growth of fat tissue. The aim of the work was the assessment of women's' selected functional parameters in BMI categories. The urban women were examined in our studies. They were divided into two groups on the basis of BMI level. The first group (n=40) consists of women with BMI in normal category (the mean BMI=22.4±4). The second group (n=32) consists of women with BMI in obesity category (the mean BMI=33.9±9). Hemodynamic parameters, functional parameters of the respiratory system and parameters of body posture were measured. Results show that differences between women with normal and higher BMI in body weight, BMI but also body height and normative BMI were statistically significance. Obese women have higher blood pressure, but parameters don't exceed the limit of the norm. Additionally women with lower BMI have better values of heart work index (HWI) as well as vital capacity (VC) and forced vital capacity (FVC).

Cervical spine lordosis and thoracic spine kyphosis were similar in both groups of women. The only body posture parameter discriminating women with normal and abnormal BMI is lumbar spine lordosis and the difference is statistically significant. We suppose that it can be related to more spine load by abdominal fat tissue. As the conclusion we can say the higher BMI the worse vital parameters of the organism.

MEASUREMENT OF OXYGEN CONSUMPTION OF INDOOR WALKING WITH A DOUBLE TREADLES TREADMILL VS TRADITIONAL TREADMILL
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Introduction:
Treadmill walking have been largely used for calories burning. In the last years several news devices have been introduced to give alternatives to the more traditional treadmill. Recently, a new equipment (TreadClimber®) for indoor walking has been produced. It consists in a doubled deck treadmill in which there is a dual action motion of the treadles due to the alternate supporting phase during walking. So far there is no evidence that this kind of exercise can determinate a different energy expenditure than traditional treadmill walking.

Aims
The aim of this study was to measure oxygen consumption (VO2) during walking on this new equipment and to compare the values with walking on a traditional treadmill, at the same speed and grade.

Methods
12 subjects, 6 males and 6 females (30.2 ± 5.7 yrs, 173.7 ± 9.4 cm, 72.2 ± 10.8 kg), after familiarization on both the devices, in 4 separate days walked for 6 minutes 8 times on a TreadClimber® (ITC916, Nautilus®, USA) and 6 times on a professional treadmill (Run 900 Exctile, Technogym Spa, Italy) at different speeds and grades. For both the devices 3 and 5 km-h-1 were used. For treadmill 8, 10 and 12 % of slope were used. For TreadClimber, in which a minimum and a maximum setting is possible to operate on the slope, the real slope was measured without the use on handlebars were studied. During the sessions VO2 (QuarkB2, Cosmed srl, Italy) was measured. Statistical analysis was performed with t-test to check the significance of regression coefficients.

Results
No statistical differences were found between the measured VO2 values on the two devices when walking was performed with and without holding on the handlebars, at 3 km-h-1. Similarly, no difference was found between the two devices at 5 km-h-1 without holding on the handlebars. A statistically very significant difference was found between walking at 5 km-h-1 on traditional treadmill and walking on TreadClimber using handlebars: In this case, energy expenditure on TreadClimber was lower than that on traditional treadmill.

Conclusion
The results of this study showed that walking on the new device determine the same VO2 than walking on a traditional treadmill if handlebars are not used to hold. Because of the stumbles that can occurred during walking on TreadClimber, holding on the handlebars reduces significantly the energy expenditure at the higher speeds.

COMPARATIVE STUDY OF THE QUALITY OF LIFE PERCEPTION AND CLINICAL CONDITIONS IN THE SUBJECTS WITH TYPE II DIABETES MELLITUS, PRACTICING AND NON-PRACTICING PHYSICAL EXERCISE
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The present study about the comparison of perception of quality of life and clinical conditions on type II diabetics subjects that practice and do not practice physical exercises, had the objective to compare the possible differences on the perception between the two groups.
and thus to evaluate the existence or not of the differences about these aspects. The subjects answers were of 24 patients [16 - 66.7% are women and 8 - 33.3% are men and the average age was 60 ± 10 years] from the Diabetes Educative Center of the Nurse School - University of São Paulo (USP) - Brasill, where 13 were practicing physical exercise and 11 did not practice. To compare the quality of life perception, life habits and clinical conditions, the WHOQOL-Bref Instrument and an informative questionnaire were used. The T-test was employed to analyze the difference between two groups. In relation to the life habits and clinical conditions, the practicing physical exercise subjects presented values of glycemia, arterial pressure and weight below of the non-practicing physical exercise. For the domains (physical, psychological, environment and social of the WHOQOL-Bref, through of the frequency percentages given on the answers we can verify that the practicing physical exercise had better result in almost all domains. A no significant difference was perceived only in the physical domain. Despite of difference on the physical domain, is possible to observe that the quality of life is dependent of the physical exercise and others factors. Thus, we can concluded that type II diabetics subjects involved on physical activity program get a better clinical condition and perceptions of quality of life than the sedentary ones.

SEX DIFFERENCES IN VO2peak IN NINE-YEAR OLD RURAL NORWEGIAN CHILDREN

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Introduction

Several studies have shown sex differences in children’ cardio respiratory fitness, defined as maximum oxygen uptake (VO2peak). However, there are few studies with accurate and high-quality measures of direct VO2peak on representative populations. Therefore, we wanted to investigate VO2peak sex differences in 256 (124 boys and 132 girls) fourth graders in two Norwegian rural towns.

Methods

Body weight was measured at the nearest 0.1 kg using a calibrated electronic scale with the children wearing light indoor clothing. Body height was measured with the children standing in an upright position. VO2peak was measured directly where the children ran on a treadmill until fatigue.

Results and conclusions

Boys had significantly higher VO2peak (p<0.001) than girls regardless of how it was expressed.

It is unlikely that the difference in VO2peak can be explained by lack of effort from the girls, because, subjectively the girls and boys put in equal effort. This was supported by no significant difference in RERpeak ([Boys, 1.05±0.04 vs girls, 1.06±0.05]) and that girls had a significantly higher HRpeak than boys [205.5±7.5 vs 203.1±6.8, respectively]. Other studies using VO2peak direct measurements have found that boys have a significantly higher VO2peak compared to girls. These studies have suggested that the difference in VO2peak relative to body mass can largely be attributed to variations in body composition, i.e., the larger percentage of body fat in girls. In the present study, half of the subjects performed DXA measurements. Girls had a significantly higher fat percentage (p<0.001) than boys, 25.8±7.9 vs 19.4±7.0, respectively. This supports that body composition is central when explaining gender differences in VO2peak. However, the fact that girls have a smaller stroke volume could also contribute to a lower VO2peak for girls. Stroke volume was not tested directly in the present study, but can be calculated from the absolute VO2peak in milliliters divided by the HRpeak. This indirect measurement of stroke volume is defined as O2pulse. In the present study, the boys have a significantly higher O2pulse than the girls (p<0.01), 8.7±1.1 vs 7±1.1, respectively. In addition, several studies using valid and reliable objective methods to measure children’s physical activity levels have shown that girls have significantly lower levels of habitual physical activity, both in respect to total physical activity and more vigorous activity. Therefore, an implication of the findings in this study and others is that one should encourage physical activity for girls, mainly on their own terms.

CHARACTERIZATION OF A SHORT ANAEROBIC PEAK USING AN INTERMITTENT AQUATIC EXERCISE PROTOCOL AND HEALTH RISK DETERMINATION

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According to ACSM (1998) strenuous physical exertion may trigger ischemic cardiac events, particularly among persons not accustomed to regular physical activity. Nevertheless, performers evolves in hydro classes are induced to raise his effort until very high intensities. This kind of efforts are apparently little studied and scarcely characterized. The aim of the present study was to characterize an intermittent short intensity exercise and detect possible health risk factors associated with it. Nine healthy women [39.4 +/- 9.3 years] experienced in hydrogymnast practice participate on the study. Exercise protocol consisted on 3min of warm up [level 11 in Borg's 6 to 20 Rate of Perceived Exertion (RPE) Scale], followed by 5min of aerobic exercise of low-mean intensity (13 to 15 in Borg's RPE scale) and by an intermittent exercise composed by 3x30s leg-kick, with 30s passive recovery. Rest HR values (POLAR Vantage NV) were obtained both on land and in water and during exercise. BP was evaluated at rest and after exercise by experienced health professionals using a sphygmomanometer and a stethoscope. Mean BP (MBP) was also calculated using systolic (SBP) and diastolic blood pressure (DBP) [(MBP=1/3(SBP-DBP)+DBP] and used as a health risk factor. [La-] was determined at rest and after exercise (LactatePRO). Due to the lower number of subjects studied, both non-parametric Wilcoxon test and parametric Paired Samples T-Test were applied to data. Level of significance was established on 5%. Differences obtained through both statistical procedures were the same. HR rest values were significantly lower on water (70.8±5.85 bpm) comparatively to (74.6±6.50 bpm) land. Peak and mean HR values of the intermittent anaerobic exercise were 177.2±10.16 and 167.5±10.25 bpm, respectively. After exercise systolic arterial blood pressure was significantly higher (mean difference of 27.5±6.90 mmHg) and diastolic arterial blood pressure was significantly lower (mean difference of 15.6±8.82 mmHg) than in rest. The same MBP was observed in rest (79.3±6.13 mmHg) and after exercise (78.1±9.81 mmHg), showing a lower cardiovascular risk associated to short intermittent anaerobic exercises. [La-] values were significantly higher after exercise (110.7±2.65 mmol.L-1) comparatively to rest (10.9±0.10 mmol.L-1) and showed the high level of participation of the anaerobic metabolic pathway. BP and [La-] results combined lead to the conclusion that anaerobic intermittent exercise could be safely used in hydrogymnastic classes with healthy subjects.

References

HEALTH INDICATORS OF THE ADULTS SEVILLIAN POPULATION

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Objective: To assess the habits in relation with physical activity of the adult sevillian population and also the autoperception of their health status. Methods. 1002 adults (n= 470 males, n= 531 women, older than 18 years old)in Seville were asked with a 69 questions survey about health and wellbeing indicators and also topics in relation with a healthy lifestyle. Results. 50.6% of the subjects were done any physical activity. Among them the 56.7% were males and the 45.6% women, lowering this percentage (38.5%) in adults older than 64 years old. At least the 33.47% of the women could walk for more than 10 minutes. Alasought the 36% of the males and the 27.7% of the women thought they have a good health, among the elderly the 29.3% thought their health it was bad. In this sense, just the adults between 18-24 and 25-44 feel their health as good. Conclusion. The showed results describe the characteristics of the adult population in Seville in terms of the physical features and psychological health, taking into account differences in age and sex. It was seen how half of the population was practicing any activity and mostly among the women the activity it was to walk. With regard to the health indicators the sevillian adults have a good concept of their health however the perception is bad in adults older than 64 years old. Keywords: Physical activity and sports, health, lifestyle.

GROWTH, BODY COMPOSITION AND MOTOR PERFORMANCE IN BRAZILIAN ADOLESCENTS OF DIFFERENT SOCIOECONOMIC LEVELS

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INTRODUCTION. The health-related physical fitness components are important factors in the context of public health. Several studies have demonstrated that high physical exercise and low sedentary behaviors are associated with beneficial health outcomes in children and adolescents. In addition, socioeconomic level is associated with a broad range of outcomes and it may also play an important role on the health components of fitness in adolescents. OBJECTIVE. To explore the association between growth, body composition, performance in motor tests and socioeconomic level in Brazilian adolescents. METHODS. The sample comprised 512 adolescents (45.5% boys) aged 11 and 12 years living in Cambé, PR, Brazil. Socioeconomic level was investigated through a standardized questionnaire, which classified individuals into either high (HSEL) or low (LSLE) socioeconomic level. Height, body mass, and tricipital and subescapular skinfold thickness were measured. In addition, the following motor tests were performed: sit-and-reach, standing long jump, modified pull-up, modified sit-up, 50 meter run, and nine or 12 minutes run/walk test. For a comparative analysis between groups in the quantitative variable the t test was applied. The level of significance adopted for all the analyses was p<0.05. RESULTS. HSEL girls presented higher values of height, body mass and sum of tricipital and subescapular skinfolds than girls in HSEL. No association between socioeconomic level and performance in the motor tests was observed in girls. Nonetheless, boys of HSEL performed better in the sit-and-reach, standing long jump, modified sit-up, and 50 meter-run tests. Finally, the analyses of both anthropometric and motor variables suggested that girls from LSEL are more maturated than girls in HSEL. Such a result was not evident among boys. CONCLUSION. Although socioeconomic level is associated with a wide range of health outcomes, it associated only moderately with the health-related components of physical fitness investigated in this sample of Brazilian adolescents. Further studies shall address possible interactions between socioeconomic level and maturational status on the level of physical fitness of children and adolescents.

CHANGES IN BODY COMPOSITION OF UNIVERSITY STUDENTS DURING FOUR YEARS OF FOLLOW-UP

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INTRODUCTION
Overweight and obesity are one of the major health problems in developed countries. The beginning of a university degree has been identified as a "critical period" that could determine whether an individual will develop a healthy lifestyle, without overweight and following the recommendations of physical activity. Besides, greater body fat has been related to lower physical fitness in young individuals (1). Therefore, the present study aimed to evaluate the changes in body composition and jump performance in a group of young men and women during their entire university studies.

METHODS
Eight men and 10 women, students from the first course of a Sports Sciences degree in Spain, started as volunteers the present study. All subjects were physically active on a recreational basis, but none was engaged in any structured physical activity during the study. Results. 50.6% of the subjects were done any physical activity. Among them the 56.7% were males and the 45.6% women, lowering this percentage (38.5%) in adults older than 64 years old. At least the 33.47% of the women could walk for more than 10 minutes. Alasought the 36% of the males and the 27.7% of the women thought they have a good health, among the elderly the 29.3% thought their health it was bad. In this sense, just the adults between 18-24 and 25-44 feel their health as good. Conclusion. The showed results describe the characteristics of the adult population in Seville in terms of the physical features and psychological health, taking into account differences in age and sex. It was seen how half of the population was practicing any activity and mostly among the women the activity it was to walk. With regard to the health indicators the sevillian adults have a good concept of their health however the perception is bad in adults older than 64 years old. Keywords: Physical activity and sports, health, lifestyle.
References.

MUSCLE STRENGTH DECREASE WITH AGE IN INSTITUTIONALIZED ELDERLY

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Aging is accompanied with loss of muscle mass and strength, a phenomenon called sarcopenia. Observational studies indicate that approximately 1% of muscle mass is lost per year after 40 years of life (Janssen et al. 2000) and 12-14% of muscle strength is lost per decade after 50 years of life (Asmussen and Heeboll-Nielsen, 1962). Appropriate strength training may stop or at least slow down these processes (Frontera et al. 1988). The purpose of our study was to determine the relationship between age and measured parameters in Slovenian elderly people living in homes for elderly people.

Forty-nine men (age 77.9±6.9 yrs, mass 75.4±12 kg, and height 170±4.4 cm) and 103 women (age 80.1±7.7 yrs, mass 71.2±13 kg, and height 161±4.6 cm) participated in this research. All participants were from six Slovenian homes for elderly people. We measured torque during maximal isometric voluntary plantar and dorsal flexion (90 deg in ankle and knee respectively), left and right knee extension (90 deg position), forward, backward, left and right side body lean, all in standing position. Pearson’s correlation coefficient was used to determine the relationship between age and measured parameters.

The results showed that all the measured parameters in women were significantly correlated with age. In men, only the strength of knee extensors of both legs and forward body lean were significantly correlating with age. The correlations between torque in plantar and dorsal flexion and age were close to statistical significance (plantar flexion, p=0.084; dorsal flexion, p=0.071). Women’s results were in agreement with others (Lynch et al. 1999). However, in men the expected trend was observed only in two parameters.

One of possible reasons for non-systematical strength decline in elderly men could be their different activity levels regarding age. In this case we could expect systematical strength decline only in muscles that are included or excluded from most of daily activities. If we speculate that muscles responsible for forward body lean are excluded from most of daily activities and legs are involved in many daily activities the results became close to expectations.

References.

LIKELIHOOD OF METABOLIC DISORDERS AND PHARMACOLOGIC THERAPY USE ACCORDING TO BMI LEVEL, IN OLIVEIRA DE FRADAS MEDICAL CENTRE

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Introduction: Obesity is associated with other metabolic disorders, increasing the risk of mortality and disability (Pi-Sunyer, 2004; Peeters et al., 2004). The aim of this study was to estimate the likelihood of Oliveira de Frades Medical centre (OFMC) users, in different levels of Body Mass Index (BMI), having other metabolic disorders and using pharmacologic therapy.

Methods: We observed the anthropometric, biochemical and homodynamic variables for the diagnosis of metabolic disorders (obesity, dyslipidemia, hypertension and hyperglycaemia) in 200 OFMC users (75 men and 125 women, with mean ages of 48±13 and 46±14 years, respectively, ranging 18 to 69 in both genders), in Portugal. We also used a data sheet to register medication in use for metabolic disorders. All subjects gave their informed consent to participate in this study. We used odds ratio (OR) to estimate the risk of overweight (OW) and obese (OB) subjects having metabolic disorders and using pharmacologic therapy as compared with normal weight (NW) subjects, according to WHO BMI classification (WHO, 1998). The level of significance was set at P<0.05.

Results: Obesity and overweight was present in 28.0 and 40.5% of the subjects, respectively. OB subjects showed higher odds of having other metabolic disorders as compared with NW (hypertension: OR 5.3, confidence interval [CI] 2.2, 12.5), dyslipidemia: OR 2.3, CI [1.1, 4.9] and hyperglycaemia: OR 3.3, CI [1.4, 7.9] and OW (hypertension: OR 2.2, CI [1.2, 4.7]). OB subjects also showed higher odds of using pharmacologic therapy as compared with NW (blood pressure lowering medicine: OR 3.8, CI [1.2, 12.9], glycaemia control medicine: OR 6.4, CI [1.3, 30.7], Cardiac medicine: OR 4.2, CI [1.1, 16.2] and OW (glycaemia control medicine: OR 5.6, CI [1.5, 21.6]). OW subjects only showed higher odds of having hyperglycaemia (OR 2.7, CI [1.2, 6.1]) as compared with NW. The odds of using pharmacologic therapy weren’t significantly higher in OW as compared with NW.

Conclusion: These results show that the OW and OB OFMC users are more likely to have metabolic disorders and use of pharmacologic therapy than NW. Considering the high prevalence of OW and Ob and high prevalence of pharmacologic therapy use identified in our sample, as well as the known potential metabolic benefits associated with weight loss, in our understanding a weight loss program should be considered as a cost effective measure to impact these subjects health.

References.

METABOLIC SYNDROME AND RISK OF CARDIOVASCULAR DISEASES AS DETERMINED BY RISK FACTORS IN OLIVEIRA DE FRADAS MEDICAL CENTRE USERS

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Introduction: Cardiovascular diseases (CVD) are the leading cause of death in the world (Yach, 2004). Several factors have been identified as part of it’s complex cause (Grundy, 1999). The aim of this study was: (1) to identify the prevalence of CVD risk factors and of metabolic processes (Frontera et al. 1988). The purpose of our study was to determine the relationship between age and measured parameters.
syndrome (MS) in Oliveira de Frades Medical centre (OFMC) users, (III) to identify the risk level for Coronary Heart Disease (CHD) of OFMC users, (IV) to observe the differences in the level of risk between OFMC users with and without MS.

Methods: We observed the anthropometric, biochemical, homodynamic, behavioural and familial variables that constitutes risk for CVD, including those for the diagnosis of MS (obesity, dyslipidemia, hypertension and insulin resistance) in 189 OFMC users (69 men and 120 women, with mean ages of 48±13 and 46±14 years, respectively, ranging 18 to 69 in both genders), in Portugal. We used the definition of MS from the World Health Organization (WHO) (Grundy, 2004). We also estimated the level of risk for CHD according to American Heart Association/ American College of Cardiology (Grundy, 1999). Descriptive statistics were used and Mann-Whitney test to compare results between groups was performed. The level of significance was set at P<0.05.

Results: The prevalence of obesity (28,0%), hypertension (31,5%), dyslipidemia (49,0%), Hyperglycemia (30,5%), diabetes (7,5%), tobacco use (8,5%) and family history of CVD (43,0%) was identified. 20% of subjects were diagnosed with MS. 81,9% of the subjects were considered low risk, 14,8% were average risk and 2,7% were high risk of CHD. Considering subjects groups with and without MS, respectively, 87,9% and 59,4 were low risk, 9,5% and 34,4 were moderate risk, 1,7% and 6,3 % were High risk. Average risk was only found in the group of subjects with MS (8,9%). There were significant differences between subjects with and without MS concerning the level of risk (P=0.000).

Conclusion: These results show that there is high prevalence of metabolic risk factors such as obesity, hypertension and dyslipidemia. Considering the sample origin it could be expected a higher prevalence of MS. The majority of subjects are considered low risk. The diagnosis of MS may be a simple and useful tool in identifying higher risk subjects.

References.

PREVALENCE OF CHILDHOOD OVERWEIGHT AND OBESITY IN CHILDREN FROM RIO MAIOR, PORTUGAL

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Introduction. Childhood obesity has been increasing in many countries worldwide, being considered by the World Health Organization - WHO (1998) as a global epidemic. Its aetiology is complex, and influenced by the dynamics between biological and environmental factors.

Aim. The aim of this study is: (1) to document the prevalence of overweight and obesity among children from the kindergartens (KG) of the Rio Maior County; (2) to quantify the prevalence of sports participation among children from the KG of the Rio Maior County; (3) to assess the association between children's Body Mass Index (BMI) and sports participation; the association between children's Body Mass Index (BMI) status and sports participation; (4) to document the intergenerational effects on BMI.

Methods. We assessed 253 children (128 girls and 125 boys), ages from 3 to 5 years old, from the KG of the Rio Maior county's public and semi-public school network. Height and weight were taken (ISAK, 2006), and questionnaires to parents were used for biosocial data. We also estimated the level of risk for CHD according to American Heart Association/ American College of Cardiology. Circulation, vol. 100: 1481-92.

Results. The prevalence of overweight and obesity was 13.8% and 7.1%, respectively. Almost twenty five percent (24.6%) of the children participated in some sort of sport activities. No associations were found between children's BMI status and sports participation, or parents' characteristics. Low correlations were found between parents' and children's BMI (r=0.17 to 0.49, p=0.001 to 0.033). Statistical differences were found in the prevalence of childhood overweight and obesity, when considering the group of fathers with basic education versus the group of fathers with higher education (p = 0.036). Prevalence of overweight and obesity also differed between girls who did and did not participate in sports (p = 0.031).

Conclusion: Considering in our sample the prevalence of childhood overweight and obesity is similar to those found in other European countries, and the percentage of sports participation is similar to the national estimate for the adult population. Girls were more involved in sports than boys, although with higher prevalence of overweight and obesity. Fathers' educational level seems to influence the prevalence of childhood overweight and obesity prevalence.

References.

BODY IMAGE AND ITS RELATIONSHIP WITH ANTOPROMETRICS AND PSICOMETRICS MEASUREMENTS IN OLDER WOMEN

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Introduction. Aging is associated to several alterations that can have among other consequences a distortion of body image (BI). Purpose: (1) Identify the ideal body image (IBI) characteristics desired by the volunteers, (2) establish the dissatisfaction grade (DIG) and the distortion in relation to the real body image (RBI), and (3) Examine the relationship between the DIG with RBI as well as with anthropometric (AV) and psychometric (PV) variables, in older women. Methods. 47 physically active women (66±3 4 years, VO2 max 20,3 ml kg-1 min-1), with preserved cognitive function, were submitted to a maximal cardiopulmonary exercise test after rest physician evaluation. The measured AV were body mass index (BMI), waist circumference (WC) and the waist to hip ratio (WHR). In addition, body fat percentage was evaluated by dual energy x-ray absorptiometry. The evaluated PV were cognitive performance (CP), levels of depression (LD), quality of life (QL) and body image. The used instruments to evaluate PV were the Mini Mental State Examination (MMSE), the Beck depression inventory.
CONTRIBUTIVE HEALTH STUDY OF BSC PHYSICAL EDUCATION AND SPORT MANAGER STUDENTS BY KINANTROPOMETRIC MEASUREMENTS

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Introduction
A kinantropometric-exercise physiological study has been going on at the University of Pécs, Institute of Physical Education and Sport Science since 2001 only excluding the academic years of 2004 and 2005. From 2006 compared to the traditional Physical Education (PE) MSc teacher training course a new but still sport related course was introduced Sport Manager (SM). No both PE and SM is a 3 years BSc major. The number of students included in the comparative study is not the 100% of the students (PE 1st ay. m=41, dec age=19,77+/1-1,09, f=16, dec age=19,09+/1-0,62, SM 1st ay. m=13, dec age=19,6+/1-1,07, f=6, dec age=19,47+/1-0,91) reading PE or SM though students participating in both 1st and 2nd years study exceeds 50% of the total. In kinantropometric measurements among many factors we monitor students’ somatotype and body composition. Exercise physiological data is not shown in this paper.

Method
Kinantropometric study includes determining somatotype by Heath-Carter using endo-mezo-ectomorphic data and also by Conrad using Plastic Index and Metric Index. Body composition is estimated by skinfolds, girths and widths giving data also on Body Mass Index (BMI), Waist-to-Hip Ratio (WHR).

Results
There is a sex specific difference between male and female students as at the beginning of their courses as in the changing pattern throughout the academic years. PE male students shift from mesomorph to endo-mezomorph (1st ay. 1,28+/1-0,76/13,42+/1-1,06/17,79+/1-1,31/2,98+/1-1,77) and WHR measures as well. Females on the other hand go through a feminine maturation, change body shape and gain fat even on triceps (skinfold mm PE 5,19+/1-0,99/14,17+/1-1,04/1-1,99-/0,85), SM students show similarly (1st ay. 1,33+/1-0,58/13,8+/1-0,95/12,81+/1-0,76, 2nd ay. 3,89+/1-0,99/3,83+/1-0,91/2,07+/1-0,51). The shift can be detected also in BMI (PE 23,05+/1-1,84/22,4+/1-2,05, SM 22,59+/1-1,59/23,18+/1-1,77) and WHR measures as well. Males on the other hand go through a feminine maturation, change body shape and gain fat even on triceps (skinfold mm PE 5,19+/1-0,99/14,17+/1-1,04/1-1,99-/0,85), SM students show similarly (1st ay. 1,33+/1-0,58/13,8+/1-0,95/12,81+/1-0,76, 2nd ay. 3,89+/1-0,99/3,83+/1-0,91/2,07+/1-0,51). The shift can be detected also in BMI (PE 23,05+/1-1,84/22,4+/1-2,05, SM 22,59+/1-1,59/23,18+/1-1,77) and WHR measures as well. Males on the other hand go through a feminine maturation, change body shape and gain fat even on triceps (skinfold mm PE 5,19+/1-0,99/14,17+/1-1,04/1-1,99-/0,85), SM students show similarly (1st ay. 1,33+/1-0,58/13,8+/1-0,95/12,81+/1-0,76, 2nd ay. 3,89+/1-0,99/3,83+/1-0,91/2,07+/1-0,51). The shift can be detected also in BMI (PE 23,05+/1-1,84/22,4+/1-2,05, SM 22,59+/1-1,59/23,18+/1-1,77) and WHR measures as well.

Conclusion
Both male and female students either reading PE or SM change body build, they shift towards endomorph though there is a different rate between sexes. Regarding BMI the majority of students are in the normal, healthy range, among SM students there are some in the overweight area. Observing WHR only a few male students both PE and SM are in the moderate risk field the rest of the males and all the females are in the low risk range.

THE EFFECTS OF DIFFERENT AEROBIC AND STRENGTH EXERCISE SEQUENCES OVER NET ENERGY EXPENDITURE IN A CONCURRENT TRAINING SESSION

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The regular practice of physical activities has been showed as the most important strategy to maintain the physical fitness. More than a high caloric intake, the inactivity is the determinant factor of weight gain in the course of life. People who exercise regularly increase your energy expenditure and consequently maintain body composition in satisfactory standards. The energy cost in a training session can reduce body fat mass and increase neuromuscular function. The purpose of our study was assessed the difference on energy expenditure in a concurrent training session and recovery when the sequences of strength and aerobic training are changed (sequence strength-aerobic and aerobic-strength). Eight active females (121.2±1.28 years old, 60.75±3.92 Kg, BMI 21.77±2.05 kg m-2) completed two protocols. Both consisted at 2 sets of 8 strength exercises performed to volitional fatigue at previously determined 20 RM and 30 minutes of cycle ergometer at 60-70% of maximal heart rate evaluated at progressive treadmill test, and 1 hour of recovery. Each one protocol was designed to have similar duration: aerobic-strength and strength-aerobic exercise protocol, completed in a randomized mode. The rest metabolism, energy expenditure in exercise session and recovery were measured before, during and after each protocol, respectively, using an indirect calorimetry portable system (Aerospot KB1-C) to estimate energy consumption (O2). The net energy expenditure was estimated using a constant value of 5.05 kcal per litre of oxygen consumed during strength exercise. For aerobic exercise and EPOC, caloric cost was estimated by oxygen consumption and metabolic equivalent of respiratory exchange ratio (RER). In all 3 situations (strength and aerobic exercise, and recovery) net energy expenditure was estimated besides rest conditions. The statistical analysis were realized by Paired T Test. The results showed that the total net energy expenditure per session was significantly greater (p<0.001) during strength-aerobic (146.8±14.9 kcal) than aerobic-strength exercise protocol (111.8±11.5 kcal). Related to exercise time the strength-aerobic exercise sequence showed a major metabolic impact than aerobic-strength sequence (p<0.001). 2.5±0.3 and 1.7±0.7 kcal min-1, respectively.

Based on results we concluded that strength-aerobic sequence showed a greater metabolic impact than aerobic-strength sequence. So, when the goal of training session was a higher energy expenditure, the first one would be the most indicated. Comparing the caloric expenditure only in aerobic exercise between different sequences, there is a higher cost caloric in the strength-aerobic than...
the aerobic-strength sequence. Thus, one of the hypotheses that explain the results of present study would be the transfer of EPOC caused after execution of strength exercise, to the aerobic exercise of strength-aerobic sequence.

ASSOCIATION BETWEEN CARDIO RESPIRATORY FITNESS, COMMUTING TO SCHOOL, TV AND COMPUTER TIME IN A HIGH SCHOOL POPULATION ACCORDING TO GENDER

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Purpose:
The aim of this study was to analyse the association of Cardiorespiratory Fitness (CRF), with Physical Activity Index, Time Spent Watching TV and Using Computer and Transportation to School according to Gender.

Methods:
Participants of this study included 856 children and adolescents, 470 girls (54.9%), aged 11-20 years (X=15.17±1.53 years-old, weight=60.45 ± 12.78 kg, height=1.66 ± 0.094m, BMI=21.85 ± 3.69 kg.m-2). 17% of the girls and 19.2% of the boys were overweight, and 4.5% of the girls and 7.5% of the boys were obese. CRF was evaluated using the Fitnessegram battery test – Shuttle Run (1) with qualified staff, to assure the standardization, validity, and reliability of the measurements. Physical Activity Index (PAI), Active Commuting to School (ACS) and Time Spent Watching TV (TV) and using Computer was obtained by questionnaire. Stepwise method was used to find the best Model in Regression Analysis. The number of laps from Shuttle Run was used as dependent variable, adjusted from Skinfolds (subscapular, tricipital and calf) and Tanner Stage.

Results
In girls, PAI was associated with CRF (β=-0.342; 95% CI: 0.789; 1.373); p=0.000). In boys PAI and ACS was positively associated with CRF (β=0.186; 95% CI: 0.453; 1.373); p=0.000) and (β=0.158; 95% CI: 0.390; 1.065); p=0.002) and negatively associated with TV (β=-0.138; 95% CI: -0.351; -0.009; p=0.000).

Conclusions
Although our study is cross-sectional, the results showed that, after adjustment for Skinfolds and Tanner Maturation, PAI, TV and ACS were associated with CRF in boys. However, in girls the association was found only with PAI. These findings suggest that increasing physical activity levels rather than reducing TV time or using ACS can contribute to improve CRF levels in girls whereas in boys all variables, excluding time spent using computer, can predict CRF.

References

PHYSICAL ACTIVITY OF PRESCHOOL CHILDREN DURING SCHOOL TIME

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Introduction: Due to the increasing occurrence of obesity and a low level of physical activity (PA) reported in preschool children, there is a need to refocus attention on the importance of PA in this age group. Low levels of PA during childhood may compromise current and future health and well-being of our society. Seasonality is believed to have influence on the amount of engagement in PAs, although geographical differences are likely (Timmons et al. 2007). Moreover, a child's PA level may also be related to the opportunities and policies of the preschool they attend. For example, a significant predictor for increased PA during a school day is the presence of an involved primary educator (Pate et al. 2004). The school represents a suitable setting to promote PA to benefit next to health related factors also physical, cognitive and social developmental factors. During the school day physical education class and school play time offers children regular opportunities to engage in PA (Ridgers, 2006).

Objectives: The goal of this study is to chart school PA of preschool children. Within this study specific focus is on the relationship between PA, seasonality and opportunities to be physically active at school.

Methods: Two rural and two urban preschools participated in the study. 81 (53.3%) out of 152 parents provided informed consent for participation in the study. 32 preschoolers in rural area preschools (16 boys and 16 girls) and 48 preschoolers in urban area preschools (23 boys and 25 girls) participated in the study. The data is registered in autumn, winter and spring, each during two full school days. Step counts are registered at the beginning and at the end of each school day. Objective measurement of children's PA using pedometry is likely to provide more accurate data on habitual daily PA. The Yamax Digiwalker pedometer type SW-200 was used to register step counts.

Results and conclusions: Preliminary results on children attending preschool (autumn 2007) show average step counts of 7645 +/- 2538. Although children from rural schools (7952 +/- 2594) were slightly more active than their peers in rural schools (7231 +/- 2587) during preschool hours there were no significant differences between both groups (t=1.54; n.s.). Although children spent most their daylight hours (and so their most probable time to be physically active) at school, the school accounts for only half of the amount of recommended PA in preschool children.

References:

THE IMPORTANCE OF OBESITY IN MORPHOFUNCTIONAL DEVELOPMENT OF CHILDREN IN PREPUBERTY PERIOD

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The obesity is called the epidemic of the 21st century. Main causes of this disease are environmental factors and about 25 to 40 percent of obesity cases result from genetic factors. In recent years we could observe an increase of the number of overweight and obese people, regardless of their age. It is disturbing that numerous children have abnormal weight-height index. Biological and health consequences will appear in the future ontogenesis stages, they can also affect the length of life.
Poland is a country, in which dynamic changes in the number of children with overweight and obesity occur. The aim of the work is to determine the percentage of the overweight children in prepuberty period and to estimate the consequences of this phenomenon for the value and the rate of the morphofunctional changes.

The groups of boys (n=782) and girls (n=830) aged 10-12 were examined. The overweight children were separated according to Cole's standards (2000). There were some somatic and functional parameters measured, such as: body height and weight, three skinfolds (triceps, subscapular, abdominal), body composition and several respiratory system parameters (VC, FVC, FEV1, PEF, MVV). Physical fitness test was used to estimate the speed, coordination, power, strength and flexibility. Body Mass Index was also calculated. The basic statistics were used to describe all of the measured parameters (mean, standard deviation, variability coefficient, I-Student test).

The percentage of the overweight boys was between 15.8%-19.5%, but it was decreasing in the older groups of children. The percentage of the overweight girls was between 13.1%-17.6%. The lowest number of overweight girls was in the group aged 11 and the highest number of overweight girls similar to the groups of boys was in the group aged 10. Among both groups of sexes more overweight children according to Cole's norms were in the boys' groups.

There were statistically significant differences in body height and fatness between the groups of children with normal body weight and the ones with overweight. Such differences (e.g. in fat mass, body fat percentage, the sum of skinfolds) were the consequence of division criteria, but it confirmed the propriety of that partition. Higher morphological measurements of children with overweight suggested that they could be more advanced in somatic development. But motor development was quite opposite. Children with normal weight received better results in most of the motor tests. Sometimes, it is more clear after including basic somatic traits in the comparison. Basic body measurement values (height and weight should be taken into consideration in the comparison of the functional respiratory traits too. There were no significant differences between children with normal and abnormal body weight after relativisation of the functional features of the respiratory system.

THE EFFECTS OF CAFFEINE AND WATER INTAKE ON BODY FLUID LOSS THROUGH URINE PRODUCTION AND SWEAT LOSS DURING 2000-M UNDERWATER WALKING

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The aim of this study was to investigate the effects of caffeine and water intake on the body fluid loss during 2000-m walking in the pool. Eight healthy men large: 20.6±0.5 years, height: 173.6±4.2 cm, weight: 70.3±4.7 kg were designated as three experimental conditions: water ingestion (WA: a total of 400 ml water), caffeine ingestion with water (CAF: a total of 250 mg caffeine in 400 ml water), and no fluid ingestion (NO). The fluid was ingested before the start of exercise and during exercise with a rest interval at 1000 m. The pool had 25 m in length and 1.0 m in depth. The subjects walked 2,000 m at a speed of 3 km/h in the pool at a water temperature 30.3±0.3°C, a room temperature 29.5±2.7°C, and a relative humidity 83.5±2.7%. We measured the urine volume and osmorality, sweat loss, heart rate, tympanic temperature, and blood pressure pre-exercise, during exercise with a rest interval at 500 m, 1000 m, and 1500 m, and after exercise. Urine volume after exercise increased in the CAF (253.7±211.3 ml) as compared with the NO (129.9±152.9 ml). There was no difference in the sweat loss among three conditions (NO 321.5±127.5 g, WA 281.3±119.3 g, and CAF 381.3±133.5 g). The total body fluid loss as evaluated with the urine volume plus sweat loss in the CAF (635.0±216.2 g) was significantly increased and that in the NO (432.3±170.8 g) tended to increase that in the NO (442.4±143.4 g) after exercise (p<0.05). Post-exercise tympanic temperature in the NO and CAF was significantly higher than the pre-exercise value. Post-exercise urine osmorality in the CAF and WA was significantly lower than that in the NO (p<0.05). The systolic blood pressure significantly increased during exercise (in the NO at 500 m, in the WA at 1000 m, and in the CAF at 500m and 1500m) compared with the pre-value (p< 0.05). There was no difference in the heart rate and diastolic blood pressure among three conditions. We concluded that water ingestion with caffeine significantly increased total body fluid loss through urine production and sweat loss during 2000-m underwater walking.

THE EFFECTS OF COMBINED EXERCISE TRAINING ON MIDDLE AGED WOMEN WITH METABOLIC SYNDROME

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The purpose of this study was to examine the effects of combined exercise training on physical fitness, risk factors of metabolic syndrome, and immunoglobulin in middle aged women with metabolic syndrome. We recruited 5 middle aged women with metabolic syndrome and 5 healthy middle aged women. Exercise session was performed 3 times per week for 12 weeks. The aerobic exercise training was composed of walking at 60~80% HRR, and the resistance exercise training consisted of 15 repetitions of sit-up, bench press, lat-pull down, shoulder press, leg press, and leg extension at 60~80% of IRM (repetition maximum). Twelve weeks of combined exercise training produced significant improved on power, agility, cardiorespiratory function, waist circumference, and diastolic blood pressure in healthy group (p<0.05). However, in metabolic syndrome group, only waist circumference was significantly decreased after the training (p<0.05). These results indicate that the combined exercise training was able to produce enhancement of physical fitness, metabolic syndrome factors, and immunoglobulin in healthy middle aged women.

DOES DAY TIME AFFECT PHYSICAL EXERCISE EFFECTS?

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A growing body of literature has confirmed that aerobic acute exercise determines a transient decrease in the normal resting blood pressure and may last up to several hours (MacDonald, 2002); so, physical exercise practice is used both as primary and secondary prevention to hypertension. Even if it is simple to begin training, it is much more difficult to maintain its practice for physiological and psychological determinants that may obscure positive effective of exercise on blood pressure. The aim of this study was to observe heart rate, blood pressure and perceived exertion (PE) response at the same aerobic exercise, performed at different times of day. Forty-six healthy sedentary men, aged 26±2 [years], were recruited. They were randomly assigned to a different day time training: A (9:00-12:00), B (13:00-17:00), C (17:00-21:00). They cycled 50 min at aerobic intensity of which 10 min of warm up at 50% VO2 max, 35 min at 55-60% VO2 max and 5 min of cool down at 50% VO2 max. Heart rate was monitored during each part of the experiment. PE was monitored at baseline and at 10th, 20th, 25th, 30th, 40th and 50th min of exercise, using CR-10 Borg Scale, blood pressure measurement occurred at baseline and at 10th, 25th, 40th and 50th min of exercise and during successive 30 min of siting rest at 5th, 10th, 15th and 30th min. ANOVA analyses
were carried out using SPSS 15 software. Body composition and baseline blood pressure were not statistically different. Group A showed a greater PE than B and C in each measurement. The heart rate after the first minute of exercise was lower in group A than C (p=0.012). Group C started with a greater diastolic blood pressure (DBP) (p=0.000) and mean arterial blood pressure (p=0.000) than A and B. While during exercise, C DBP decreased, A and B DBP increased, during recovery, C DBP decreased more than A and B. These findings show that morning exercise affects negatively PE because it requests a higher strength or more time to reach heart rate target intensity for the lowest heart rate response to exercise. Even if in the evening people start with higher DBP, linked to its circadian rhythm, during exercise and during sitting rest recovery, C DBP variation was better than group A and B. The findings of Jones et al. (2006) showed that there were no differences in the 24-hour variation in blood pressure reactivity to daily activity between normotensive and hypertensive groups suggesting that the best evening reduction of blood pressure to exercise is present independently of blood pressure status. Our results suggest that training effects are optimized when exercise is performed in the early evening.

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**PHYSICAL ACTIVITY PROGRAM IN THE WORKPLACE AND QUALITY OF LIFE**

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*Introduction:* In the past decades small and big companies have adopted some kind of health promotion programs to improve employees’ productivity, wellness and quality of life (QL). Objective: The aim of this study is to investigate the QL of workers enrolled in a physical activity program of an important Brazilian company. Methods: A total of 246 individuals participated of this cross-sectional study (May-July, 2006). All volunteers were enrolled in a physical activity program offered by the company. The QL was evaluated by the questionnaire WHOQOL-Bref, which comprehends four domains of QL: physical, psychological, social relationship and environment. The maximum score permitted in each domain is 20 points that represents better satisfaction with QL. The independent variables considered in the study were: sex, Body Mass Index BMI (kg/m²), <25.0, >25.0 to 29.9 and >30.0 and program adherence, evaluated by the number of Training Sessions per Week (TSW; days/week; <2 and >2). The Kruskall-Wallis and Mann-Whitney statistical procedures were used to compare the scores of the WHOQOL-Bref according to the independent variables. Results are present as mean and standard-deviation or as percentage when appropriated. The level of statistical significance adopted was 5% (software SPSS 13.0 for Windows). Results: It was observed that the sample was predominantly composed by men (77.2%). A total of 69% of the participants was more than 40 years old (age = 42.6 ± 9.0 years) and 43% was classified as having overweight according to the World Health Organization (BMI = 26.5 ± 3.8 kg/m²). The mean TSW was 2.5 ± 1.9 days/week. In relation to the QL, the mean scores of the WHOQOL-Bref of the sample were: physical=16.0 (±2.0); psychological=15.7 (±1.8); social relationship=15.5 (±2.8) and environment=15.0 (±1.8). Men systematically presented higher scores with statistical significance for physical, psychological and environment domains. It was not observed statistical and clinical significant differences between the groups, for all WHOQOL-Bref domains, when it was considered the program adherence (TSW). BMI was inversely associated with QL. Obese people presented lowers scores in all domains of QL (p<0.05) suggesting that body fat may be associated with QL deterioration. Conclusions: Despite the differences observed according to independent variables considered, the group in general is satisfied with their QL considering the variation of the WHOQOL-Bref domains scores. Our results point to the necessity of new researches about this subject, principally cohort studies, to better comprehend the relationship between QL and its determinants and the effectiveness of health promotion programs for enhancing wellness, productivity and QL.

**BODY COMPOSITION AND PHYSICAL FITNESS OF ADOLESCENTS WITH DIFFERENT SOCIAL AND ECONOMIC LEVEL**

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Objective: The aim of this study was analyze the body composition and physical fitness of 76 adolescents (10-15 years), considering the biological maturation and the social and economical level. Material and Method: The body composition was estimated through the measurements of skinfolds thickness, body perimeters, bone diameters, height and total body mass and relative body mass, fat mass, residual mass, bone mass, muscle mass and BMI. Physical fitness test applied: Flamingo balance, Tapping test, Sit and reach, Standing broad jump, Hand grip test, Abdominal test, Bent arm hang, Velocity and endurance shuttle run. The presence or absence of menarche was investigated by Tanner method and the social and economical level was done by the discrimination of school (public or private). The comparison was done by the t-Student test (p=0.05). Results: No significantly differences were found to breasts development between the groups for body diameters and the femur shows a tendency to higher value to the private school. The matured adolescents of public school presented greater (p=0.006) and during sitting rest recovery, C DBP variation was better than group A and B. The findings of Jones et al. (2006) showed that there were no differences in the 24-hour variation in blood pressure reactivity to daily activity between normotensive and hypertensive groups suggesting that the best evening reduction of blood pressure to exercise is present independently of blood pressure status. Our results suggest that training effects are optimized when exercise is performed in the early evening.

References.
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**STORIL**

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INTRODUCTION

Two different lifestyles of Slovenian high school students, which can be differentiated by their sporting activity, were studied on a sample of 681 high school students of both genders with an average age of 18.06 years (±1.41 year). Some indicators of young people's lifestyle relating to eating, drinking, smoking, daily routines, socialising and sports activity were used to demonstrate their habits. Some other factors gender, urbanisation of the environment and the education of parents which could also influence the lifestyles of young people were also studied.

A questionnaire was prepared for the purpose of the study; afterwards, discriminant analyses, a t-test for independent samples, Pearson's coefficient as well as some other suitable correlation coefficients were calculated to analyse the collected data.

The findings confirm the hypothesis that participation in sport has a significant impact on the formation of two quite opposing lifestyles in terms of unhealthy habits. The sports lifestyle is, besides regular sports activity (at least three times 45 minutes per week in addition to PE lessons), also characterised by regular eating habits and the infrequent intake of intoxicating substances. Although the consumption of these substances is largely related to partying, the study found that students with a sports lifestyle socialise and spend their weekend nights similarly to their peers, but not in such an unhealthy way. In contrast, the so-called «cigarettes&coffee» lifestyle is an antithesis to the sports lifestyle when health risk factors are considered. Such a lifestyle is characterised by sporadic sports activity (only a few times a year, besides PE lessons), regular smoking (57% of the population of this group smoke every day) and coffee drinking (43% drink it every day), irregular eating, frequent drinking and staying out late at night. Such a lifestyle brings consequences even in short-term as these students more often take medications against general sickness, stomach cramps and other pains.

Young girls are more likely to live an unhealthy lifestyle than boys. Among other factors influencing the lifestyles of young people, the education of one's mother is very important. This factor is also in correlation with one erroneous systematic governmental measure in Slovenia cutting back on the amount of PE lessons in vocational high schools. In response to the findings of the present research, several measures are suggested to encourage young people to have a healthier lifestyle.

HEART AND BREATHING FREQUENCY RECOVERY AND THEIR RELATIONSHIP WITH THE LACTATE CONCENTRATION AFTER AN INCREMENTAL TEST IN HEALTHY PEOPLE


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Introduction and objectives. Cardiovascular disease constitutes the first cause of death and hospitalisation in Spain. 1. This study attempted to analyze the evolution of various recovery indicators such as heart rate, ventilation and concentration of lactate within the first 20 minutes after an incremental exercise test design, using an equation that measures the recovery percentage-wise with regard to the individual functional capacity.

Methods. Thirty-two young athletes performed a high-intensity incremental cycle ergometer test until exhaustion (5 watts 12 s-1). The test was preceded by 15 minutes of rest, lying face up, during which established the baseline of oxygen uptake (VO2) and carbon dioxide (VCO2). The cardiorespiratory variables were measured with a portable metabolic system (Jaeger Oxycon Pro) and the heart rate was taken with a Polar 810 (Polar Electro, Finlandia).

Variables were recorded from the warm-up to the test end and 20 minutes after exercise. The subjects completed 2 min cycling at low intensity (50 watts), after 18 minutes of passive recovery.

A two way repeated measures analysis of variance (ANOVA) was used.

Results. After five minutes recovery, ventilation was at 85.1 (± 4.6) % of its maximum reserve, while the heart had regained 65.7 (± 6.1) % of the cardiac reserve and the concentration of lactate reached 13.4 % (±12, 9) % of the lactic reserve. After 20 minutes, subjects showed a ventilatory recovery close to 100 %, while heart rate values and especially concentration of lactate were removed from the values of the line of rest. The value obtained in the ANOVA for repeated measures in the testing of the Traza of Pillai (TP), indicates a strong association between the factors 'type of recovery' and 'time', with a value of TP (16,174) = 1492 with p <0,001.

Conclusion. The results showed that there is dissociation between the recovery of factors ventilatory compared with lactate and cardiac, which still increased after 20 minutes of recovery. Therefore, the study of post-exercise recovery rates, at a ventilatory, cardiac or metabolic level, could be applied to patients with ventilatory restrictions, and as a potential cardiac risk marker 3, 4. In addition, it could serve to check the evolution of the different parameters of recovery in a cardiopulmonary rehabilitation program.

References.

ACUTE NEUROMUSCULAR RESPONSES IN HEALTHY MEN AFTER WHOLE BODY VIBRATION EXPOSURE IN A SEATED POSITION

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INTRODUCTION

Some occupational groups such as various machinery drivers are exposed to whole body vibration (WBV) at their work. While WBV training has been shown to have positive effects [1], long-term WBV exposure is known to cause health hazards such as back pain [2]. The purpose of this study was to examine if single (30 min), low frequency (5-10 Hz) WBV exposure would cause neuromuscular fatigue. Transmissibility of vibration in the human body was measured with accelerometers.

METHODS

20 healthy young men, who hadn’t been exposed to WBV or hand-arm vibration at previous jobs, were divided into vibration and control groups. Both groups sat 30 minutes in a custom made vibration bench, the vibration group with random vibration (5-10 Hz) using an average excitation level of 1 m/s²1 r.m.s. and the control group without the vibration. WBV was measured using 3 tri-axial accelerometers; one seat pad by Svantek, Poland situated at the seat interface and the other two (Crossbow, USA) attached to pelvis and forehead.
of the subject. Frequency weighted acceleration r.m.s-values were calculated using weighting factors indicated by ISO 2631-1:1997 standard. Maximal isometric voluntary plantar flexion force (MVC) and aEMG of soleus muscle were measured in a seated condition. H-reflex recruitment curve and maximal M-wave were measured in a passive standing condition. Measurements were repeated to both groups after the 30 min sitting.

RESULTS
MVC decreased [-3.0 ± 4.7%] (p<0.05) in the vibration group and [-4.7 ± 14.2%] (n.s) in the control group while no significant changes were observed in aEMG. Maximal M-wave amplitude increased [4.9 ± 5.8%] (p<0.05) in the vibration group and decreased [-2.9 ± 7.8%] (n.s) in the control group. No significant changes were observed in Hmax/Wmax ratio in either group. The lowest acceleration was observed from the seat pad 1.11 ± 0.17 m/s(2) which was significantly lower (p<0.01) than from pelvis 1.52 ± 0.25 m/s(2) and (p<0.05) from forehead 1.21 ± 0.20 m/s(2).

DISCUSSION

Some small changes in the neuromuscular system were observed after the vibration. Measurements were taken from plantar flexor muscles while the vibration exposure was done in a seated position. Whether the influences had been more substantial if the exposure had been done in a standing position is not clear at present. The observed changes in the neuromuscular system were of such small magnitude that we conclude that the vibration exposure used did not lead to systematic neuromuscular fatigue. Acceleration values measured confirm the resonance behaviour of the human body in the low frequency range [3].

References.

SOCIOGEOGRAPHIC VARIATION OF OBJECTIVE PHYSICAL ACTIVITY MEASURES AMONG PORTUGUESE MALE ADOLESCENTS
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Extensive evidence supports the benefits of physical activity on health outcomes. Adolescence is often viewed as an important period of acquisition and maintenance of health behaviours. It is also assumed that physical activity habits do not occur in a social vacuum. This study examines the sociogeographic variation in a sample of male adolescents.

The sample is composed of 132 subjects ranging from 13 to 16 years of age. Somatic characteristics included weight, stature, sum of six skinfolds and waist circumference. Physical activity was assessed using an accelerometer (Actigraph, model 7164) during five consecutive days assuming a minimum amount of 10 hours of valid data per day [criterion for inclusion]. After presenting descriptive statistics, the hypothesis of sociogeographic variation [urban versus rural] was tested using ANCOVA [chronological age as covariate] on physical activity variables. A significance level of 5% was assumed.

In summary, urban boys seemed to account more physical activity per day, specially during the weekend and due to vigorous portion of physical activity variables. A significance level of 5% was assumed.

Urban and rural boys seemed to have similar mean values on body size [weight and stature], adiposity and waist circumference. Comparisons between groups showed urban adolescents as significantly more active during the weekend days [urban: 477 counts/min, rural: 393 counts/min, F=5.450, p<0.05]. While analysing the moderate, vigorous and very vigorous portion of physical activity, the urban group also tend to be more active in the five consecutive days [urban: 83 minutes/day, rural: 79 minutes/day], although differences were only significant for the weekend [urban: 67 minutes/day, rural: 53 minutes/day, F=5.086, p<0.05].

In summary, urban boys seemed to account more physical activity per day, specially during the weekends and due to vigorous portion of physical activity. Research about the specific context of physical activity and its vigorous portion is lacking. It would also be of interest to replicate the present study in girls.

SUMATOTYPING IN MALE AND FEMALE WORLD GYMNAESTRADA PARTICIPANTS
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Aim: This study is a part of the Gymnaestrada Health Project (GHP), conducted at the 13th World Gymnaestrada (Austria, 2007). The aim of this study was to assess the somatotypes (S) of male and female participants of different age groups.

Methods: Participants were recruited during the one week event. Out of 25000 gymnasts 295 males and 820 females volunteered in this study. Anthropometry was conducted following the ISAK guidelines. S was calculated using the Carter&Heath method (Carter&Heath, 1990). Participants were stratified in following age groups: <20, 20-29, 30-39, 40-49, 50-59, 60-69 and >70 yrs. Significance was set at the 5% level.

Results: There were no significant differences between the mean ages of the female and male groups. In the youngest age group, female mean S was central [3.6-4.1-2.7] while male mean S was balanced mesomorph [2.3-4.8-3.0]. In all age groups >20 yrs female mean S were mesomorphic-endomorph [4.1-4.3-2.4, 4.7-4.6-2.0, 5.1-5.3-1.6, 5.2-5.4-1.4, 5.4-5.7-1.2, 5.0-5.6-1.2] for groups of increasing age resp.) while male mean S were endomorphic-mesomorph [2.8-5.8-2.0, 3.2-6.0-1.7, 3.8-6.0-1.5, 3.7-6.5-1.3, 4.0-6.4-1.2, 4.1-6.9-0.9 for groups of increasing age resp.). Significant differences between the genders were observed for endomorphy (endo) and mesomorphy (meso) in all age groups and for ectomorphy in the 20-29 yrs age group. The standard deviations of endomorphy are significantly lower in males than in females.

Discussion: In the cross-sectional age groups the mean S of GHP participants develop from central to the north-west of the somatoplots in the corresponding age groups. Sexual dimorphism is observed in all age groups for endo and meso. The variability in endo is low in males of all age groups. In the youngest age group the mean S is similar to this of elite Belgian female (Beunen, 1981; cit.in Carter&Heath, 1990) and elite Venezuela male gymnasts (Pérez, 1981; cit.in Carter&Heath, 1990). Compared to reference data of adult S from different studies (Carter&Heath, 1990), GHP males and females show somewhat lower endo values in male age groups and high mean meso values for all age groups. The differences range from 0.5 to 1.3 units and increase with age for meso. Clinically, high meso levels may suggest that GHP participants are better protected against age related health risks such as sarcopenia.

Conclusions: The mean S of young GHP participants is comparable with elite gymnasts. The high degree of meso observed in adult GHP participants may be of clinical importance in the subjects of +65 yrs of age. Analyses of the strength test and the IPAQ data are needed to further substantiate our findings.

References.
EFFECTS OF AN EXERCISE PROGRAM ON CARDIOVASCULAR FUNCTION, BODY COMPOSITION AND PHYSICAL ABILITY IN A MIDDLE-AGE GROUP AND ELDERLY GROUP

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BACKGROUND and PURPOSE
The arterial stiffness and body fat increases with aging. In contrast, physical ability declines. In general, habitual exercise prevents the decline of physical ability with aging. We thought that the exercise program prevented the aging of the middle-aged and elderly people without a habit of exercising. We investigated whether group exercise program influences cardiovascular function, body composition and physical ability.

METHODS
70 middle aged and elderly Japanese men and women living in the same town participated in this study. They have not been habitually exercised. We divided subjects into two groups, a middle-aged group (n=20, 65.9±5.0years) and an elder group (n=50, 76.7±5.4years).

RESULTS
A group exercise program for three months significantly decreased body weight and the body fat percentage in the middle-aged group. The muscle mass of lower limbs increased significantly. PWV and blood pressure decreased significantly in the middle-aged group. In particular a physical test showed a significant improvement in aerobic capacity. In the elder group, there were no changes in body weight. Body fat percentage increased significantly. PWV and blood pressure showed no changes either. A physical test showed a significant improvement in lower limb muscle strength in the elder group.

DISCUSSION
In the present data, the executed exercise program provided weight loss, the improvement of cardiovascular function and physical function in the middle-age group. Therefore, we concluded that the exercise program provided enough exertion to improve these functions. On the other hand, contrary to our hypothesis, the results acquired from the elder group through our exercise program indicate that there was no decrease in weight loss, and no improvement in cardiovascular function. The only improvement shown was in lower limb muscle strength, which we conclude from an improved neuron-muscular system. The lack of positive result of the exercise program in the elder group displays a low exercise intensity or short exercise period was conducted. But it is hard to increase exercise intensity any further because of the participant’s increased age. We suppose that adaptation of the exercise program for the elder group takes time. In conclusion, we suggest the importance of becoming accustomed to exercise before middle age.

PHYSICAL EXERCISE, OXIDATIVE STRESS AND DNA DAMAGE: EFFECTS OF A 4-MONTH TRAINING PROGRAM IN TYPE 2 DIABETIC PATIENTS

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Altered redox balance has been suggested as a contributory factor for initiation and progression of diabetes and its complications. An unbalance between prooxidant-antioxidant forces can cause increased lipid peroxidation and DNA damage which have been shown to have an inverse relationship with the metabolic control of diabetic disease. It is supposed that a moderate physical training can lead to adaptive phenomena, decreasing DNA damage by up-regulating antioxidant defences as well as DNA repair mechanism. However, there is a lack of studies evaluating the effect of physical training on oxidative stress in diabetic patients.

In order to investigate this relationship, we evaluated DNA damage in lymphocytes, by means of COMET assay as well as plasmatic 8-hydroxydeoxyguanosine (8-OHdG) levels, and several biochemical markers of antioxidant status, before and after 4 months of moderate physical training.

The sample consisted of 12 healthy sedentary males (62.1±4.3 yrs) as control group, and 12 sedentary males (61.7±3.7 yrs) affected by type 2 diabetes (at least 5 years of disease duration, in therapy with metformin alone or in combination with repaglinide or glyclazide).

Blood samples were collected before and at the end of a 4-month training program consisting of three sessions/week of 30’ of moderate aerobic activity and 30’ of calisthenic gym.

Alkaline (pH>13) COMET assay was performed following the Tice-Vasquez procedure on purified lymphocytes both untreated and treated for 30’ with H2O2 (100µg/ml) that cause an oxidative damage, or Doxorubicin (0.5 µM), a clastogenic drug. Plasma 8-OHdG levels were measured by immunoassay method (8-OHdG ELISA kit, JAICA, Japan). Determination of malonyaldehyde (MDA), oxypurines (hypoxanthine, xanthine, uric acid), ascorbic acid, oxidized glutathione (GSSG) and glutathione reduced form (GSH) content in plasma was performed by HPLC analysis.

Preliminary analysis indicates that after training %DNA in the comet tails result lower, both in untreated and in H2O2 treated samples in both groups. Before training, DNA damage of samples treated with H2O2 was higher in diabetic patients (DP) than in control subjects, while no differences between groups in the untreated samples were detected. After training, 8-OHdG values showed a tendency toward increase in DP, possibly indicating an improvement in DNA-damage repair efficiency and release of 8-OHdG.

As far as biochemical data are concerned, we observed, after training, a significant reduction of DNA levels in DP only, whereas a significant improvement in the oxidant-antioxidant balance was detected in both groups.

Our data suggest that moderate physical training reduces the susceptibility to DNA damage and/or improves the DNA-repair mechanism efficiency. Biochemical data seem to confirm the hypothesis that training can cause adaptive responses in terms of endogenous antioxidant. Further research is needed to investigate the underlying molecular mechanisms.
INFLUENCE OF PHYSICAL ACTIVITY IN MORPHOLOGIC VARIATION OF PROXIMAL FEMUR AMONG PRE-PUBERTAL BOYS

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Research analyzing the influence of physical activity (PA) on skeletal has been focused on bone material properties such as bone mass and few studies were conducted on bone morphologic properties. Purpose: To analyze the influence of PA on morphologic variation of proximal femur in pre-pubertal boys, probably the most active group in non athletic population. Methods: Participants were 68 boys (age: 8.6±0.4 yrs, bone age: 8.9±1.1 yrs, height: 1.33±0.06 m; BMI: 18.0±2.9 Kg/m²). Analysis of the proximal femur was performed in DXA 2D images with a morphometric approach using 18 anatomical and Type III landmarks in order to quantify shape differences among participants. PA was assessed with the Actigraph accelerometer (Model WAM 7164) over seven days. The outcome variable was the number of minutes per day the child engaged in moderate and vigorous PA. A cut point of 1952 counts/min was used to represent moderate and vigorous PA. Results: Exploratory relative warp (RW) analysis performed with TPSReh 1.45 (Rohlf 2007), showed that the first RW (RW1) represented the major axis of shape variation, which explained 65.5% (SV=0.72627) of the total variance of proximal femur. This deformation along the RW1 axis was mainly described by differences in relative positioning of Ward’s area. Two main specimen clusters were found one in the negative extreme of RW1 and the other on the opposite part. Consequently a more detailed description on RW1 and its observed shape differences was conducted. In the negative extreme of the RW1 it was observed that Ward’s area was located at the middle of the upper limit of femoral neck width. In the positive extreme of the RW1, Ward’s area was positioned on the neck axis under the lower limit of femoral neck length. Regression analysis using shape variables as dependent and moderate plus vigorous PA as independent variable demonstrated that PA accounted for 4% of the variance explained (F=3.3 841, df=32, p<0.01). Conclusion: Proximal femur morphologic variation in pre-pubertal boys seemed to be mainly due to differences in the position of Ward’s area, the region of femoral neck with the lowest bone mineral density. Although statistically significant, PA only accounted for 4% of all shape variation of proximal femur. Funded by Portuguese Science and Technology Foundation and POCI 2010,  POCI/DES/58762/2004.

PERCENTILE VALUES FOR MUSCULAR STRENGTH FIELD TESTS IN CHILDREN AGED 6 TO 17 YEARS; INFLUENCE OF WEIGHT STATUS

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Aim: To provide percentiles values for nine different muscular strength tests (explosive strength Spanish children aged 6 to 17.9 years. We also examined the influence of weight status on the muscular strength level across age groups, with special focus on underweight and overweight-obese groups. Methods: A total random sample of 2778 (1513 boys and 1265 girls) healthy children and adolescents, participated in a cross-sectional study in Cádiz (Spain). Explosive strength was assessed by throw ball test (upper body), standing broad jump, and vertical jump tests (lower body). Upper body muscular endurance was assessed by push ups, bent arm hang, and pull ups tests, and abdominal muscular endurance by sit ups, curl ups 30 s, and curl ups. Height and weight were measured, and body mass index (BMI) was calculated. Participants were categorized according to the BMI international cut-off values as underweight, normalweight, overweight, and obesity. Results: Boys had significantly better scores than girls in all the studied tests, except in the three upper body muscular endurance tests in 6-7 years old group and in the push ups test in the 8-9 age group. Underweight and normalweight children and adolescents showed similar strength levels, except in the bent arm hang and pull ups test where underweight had significantly better scores. Both underweight and normalweight children and adolescents had significantly higher performance than their overweight and obese counterparts in lower body explosive strength tests and in push ups test in boys, and bent arm hang test in both, boys and girls. Overall, overweight had better strength levels than their obese counterparts. Conclusion: Percentiles values of nine muscular strength tests are provided. The presented percentiles values are of interest to identify the target population for primary prevention, and to estimate the proportion of adolescents with high or low muscular strength levels. The obese and overweight children had worse scores than their underweight and normalweight counterparts, while the underweight group had similar performance that the normalweight group. Funding: The study was funded by Centro Andaluz de Medicina del Deporte, Junta de Andalucía, Orden 4/02/105, BOJA nº 37 (Ref. JACT2005-01), the Spanish Ministry of Education (AP2003-2128, AP2004-2745), and the European Union, in the framework of the Public Health Programme (ALPHA project, Ref. 20060120).

RELATIONSHIP BETWEEN PARENTS’ ACTIVE LIFESTYLE, ATTITUDES AND PAST EXPERIENCES TOWARDS PHYSICAL EDUCATION AND THEIR CHILDREN’S ACTIVE LIFESTYLE

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Introduction: School-based intervention is the most recommended strategy to increase young people’s participation in PA. From an ecological perspective, given the fact that the majority of young people’s PA occurs outside school, there is a growing recognition of the importance of involving parents in this process. Objective: Aiming to support a future school intervention, the purpose of this study was to analyze the relationship between parents’ and children’s lifestyle, and the influence that parents’ attitudes towards PE, as well as their previous experiences have on the lifestyle of their children. Methods: A total of 385 fathers (age 47.5±7.1), 385 mothers (age 45.0±5.5) and their children (168 boys, 217 girls), from grades 7 to 12 (age 15.6±3.3), have participated in the study. Questionnaires were used for data collection. Parents were questioned on lifestyle, perception of health, previous experiences in PE classes, and how they have contributed to the practice of PA. Children were questioned on their participation in sports and leisure activities, goal orientation, perceptions of health and competence, and on attitudes towards school, PE and PA. A cluster analysis was used for data processing. Results: Regarding parents, 65% of fathers and 68% of mothers reported that they practice PA. The most commonly practiced activity was walking. More than half of the students claimed to practice physical activities (58% formally, 52% informally). An individual analysis
revealed that for boys (33.9%) and fathers (12.7%) football is one of the preferred activities. Mothers do not practice team sports. The majority of fathers (80.5%) and mothers (82.1%) have participated in PE classes. As for past PE experience, 40.3% of the fathers and 43.6% of the mothers responded to have had a positive experience.

According to the cluster analysis, the active students were characterized by parents who practiced sports two or more times a week and by the importance they attributed to PE classes as part of the compulsory curriculum. The inactive students had parents that were sedentary and felt that PE should be mandatory, but without evaluation.

Parents with negative experiences in PE during their school years do not differ from those with positive experiences. As for mothers, a good experience in past PE is associated with regular informal and formal sports participation and by the perception of an active lifestyle. Parents showed an accurate perception of their children PA levels, characterizing them correctly. Children also showed a correct perception of their parents lifestyle (p<0.03).

Conclusion: This study shows that the most active children are characterized by their parents’ active lifestyle and by the importance they give to PE. Positive PE experiences characterize the mothers that show an active lifestyle. This data suggests that positive PE experiences can stimulate and contribute to the development of a favourable attitude towards the future practice of PA.

RATE OF PERCEIVED EXERTION AND HEART RATE RESPONSES RELATED TO AGE IN ELDERLY WOMEN DURING COLLECTIVE FITNESS LESSON

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The aim of this study was to compare the perceptual and physiological responses of elderly subjects according to their age, during the same collective fitness lesson. In this way, twenty seven women were divided into 2 groups: 60-70 years (group 1, n = 14) and > 70 years (group 2, n = 13). Measurements were performed during 1-hour collective lesson of physical adapted activity for elderly people, subdivided in 7 parts: warm-up, aerobic exercise, exercise (throwing with a ball, ex 1), coordination and ability exercise (rowing with a ball, ex 2), force-resistance exercise (exercising on a pulley, ex 3), individual game (throw a ball, ex 4), collective game (with a ball, ex 5) and stretching-cool-down. Heart rate (HR) was continuously recorded at each bout of exercise. Theoretical HRmax (HRmaxTh = 208 - 0.7 × age) was used to obtain relative HR values (%HRmaxTh). After each exercise, the subjects were asked to rate their perceived exertion (RPE, scale 6-20) and, at the end of the session, subjects completed the self-efficacy for exercise scale (SEES).

As expected, mean HR, HRpeak (maximal HR value recorded during the exercise session) and HRmaxTh were significantly diminished in group 2 compared to group 1 (p < 0.05, < 0.001 and < 0.001, respectively). Moreover, %HRmaxTh tended to decrease in group 2 (67 ± 2.5 % in comparison with group 1 (71 ± 2.0 %)). Concerning the perceptual data, no difference was observed for mean RPE and SEES according to the age. However, in group 2, RPE and SEES values were strongly and positively correlated with HR (r = 0.91, p < 0.05 for RPE) and r = 0.74, p < 0.05 for SEES) HR relationship), whereas no correlation was found in group 1. Finally, exercise 5 was perceived as the easier exercise compared to exercises 1 (p < 0.01), 2 (p < 0.05), 3 and 4 (p < 0.001) in the first group and compared to exercise 4 (p < 0.01) in the second one.

The current results show that, advanced age did not alter perceptual responses to physical exercise. Quite the reverse, the older subjects involved in our study had a better perception of effort than the younger group. However, further investigations are needed to thoroughly understand this finding. Interestingly, collective game seems to be one of the main components to integrate in physical exercise collective lesson intended for elderly people. Indeed, without decreasing the physiological constraints, this kind of exercise modality was perceived as less difficult. This fact is important in order that elderly people easily engage in practice of physical activity on a regular basis.

THE EFFECT OF CYCLING EXHAUSTING EXERCISE ON POSTURAL STABILITY IN YOUNG AND OLD ACTIVE SUBJECTS

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Introduction: It is generally accepted that the risk of fall increases with fatigue. Strenuous exercise results in fatigue occurring at both central and peripheral levels (Enoka et al. 1992). Nardone et al. (1998) showed that body balance during quiet stance was affected by fatigue after walking or cycling. The increased body sway observed after fatigue was correlated with the exercise intensity, even if this effect is of moderate extent and vanishes within a few minutes. Importantly, the negative effect of exercise on postural stability is of similar magnitude on both young and adult active subjects.

This effect is of moderate extent and vanishes within a few minutes. Importantly, the negative effect of exercise on postural stability is of similar magnitude on both young and adult active subjects.

References
**COMPARISON BETWEEN PHYSICAL ACTIVITY LEVELS IN MEN AND WOMEN INSTITUCIONALIZED ELDERLY WITH MTI ACTIGRAPH**

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Introduction: Exact evaluation of the quantity and intensity of physical activity in daily life is considered very important due to the close relationship between physical activity level, functional decline and sedentary habits. Even moderate-to-vigorous intense physical activity (PA) is beneficial when done regularly for a total of 30 minutes or longer on most or all days. We used in this study accelerometers to measured minute-by-minute the movement, to assess PA volume and intensity performed by women and men older adults in different groups. The objective of this study was to analyze the pattern of PA performed by the Women and Men elderly in their daily routine. Methods: The sample was divided into two different groups [19.0±4.7 years old, BMI: 26.0±4.0, 166 subjects constitute the women group (WG) and 131 belong to the men group (MG). The Physical activity levels were directly measured for seven consecutive days using a MTI Actigraph accelerometer model 7164. The assessment of the level of physical activity performed by each individual has been carried out using the values suggested by Freedson et al. (1998). We point the moderate/vigorous PA intensities because we have a few values in vigorous intensity. The habitual physical activity performed by the groups has been monitored and registered during a complete week (activity performed in week days and weekend). The statistical procedures were the Descriptive Statistics (mean, standard deviation and frequency distribution) and a Student t-test was used to compare WG and MG on the physical activity (PA) performances. Results: The results provided are: (i) The mean PA lower at a week by hour (p<0,428), the mean PA lower at a weekend (p<0,893) and de mean PA lower at all week by hour (p<0,622) were slightly higher in the WG than MG. (ii) The mean PA moderate/vigorous at a week by hour (p<0,457), the mean PA moderate/vigorous at a weekend (p<0,053) and de mean PA moderate/vigorous at all week by hour (p<0,167) were slightly higher in the MG than WG. (iii) No statistics significance between groups was found in Lower PA and in moderate/vigorous PA. Conclusion: We conclude that the groups have an equal profile of performance in PA in lower or moderate/vigorous intensities. There was no statistic significance in every intensities.

**AGING ASSOCIATION TO THE EVALUATION OF THE PHYSICAL CAPACITY IN INSTITUTIONALIZED OLD PEOPLE OF BOTH GENDER**

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Introduction: Recognising the benefits of regular physical exercise among aged people, the importance of knowing the factors that influence the participation of that population in the physical activity relies on the possibility of improving the intervention accuracy, the kinds of offer and activities. This way and bearing in mind the importance that physical activity assumes in life quality and activity performances, it is crucial to determine the levels of physical capacity, which is taken as one of the objectives of the physical activity, either at physical and physiological levels: to increase the physical capacity through the development, strength, resistance, flexibility, coordination and balance, as a way to overpass accurately and effortlessly the challenges of the daily activities, as well as diminishing the probability of the development of some degenerative chronic diseases. The aim of this current study was to assess the levels of Physical Capacity of aged individuals from both sexes, living in care homes and establishing a comparison with ageing. Methods: The sample is composed by institutionalized aged people, from care homes with ages from 68 to 96 (82.85±7,06). The women group (WGI) was 18 subjects and the men group (MGI) was 18 subjects too. We evaluated Body Mass Index (BMI) and to assess the physical capacity parameters we used the battery of tests developed by Rikli and Jones (1999). The test items included: chair stand test (assess lower-body strength); arm curl test (measure upper-body strength); 6-minute walk test (assess aerobic endurance); chair sit-and-reach test (assess lower-body (primarily hamstring) flexibility); back scratch test (assess upper-body (shoulder) flexibility); and 8 feet up-and-go test (asses agility and dynamic balance). The used statistical procedures were the descriptive statistics (mean, standard deviation and frequency distribution), presentation of the higher and minimal values in relation to the variables dependent on sex. And the inferential statistics (non-parametric tests for independent samples and U Mann Whitney). Results: The following results have shown that in average statistics significance was found in BMI (p<0.004). In Rikly and Jones battery tests, no statistics significance was found in every test! Conclusion: The levels of physical capacity that the aged people from the sample show are very low nevertheless the male genre presents higher values in every tests, with the exception of those which assess the flexibility of the upper-body and lower-body.

**RELATIONSHIP BETWEEN HEALTH-RELATED PHYSICAL FITNESS AND OBJECTIVE PHYSICAL ACTIVITY IN PORTUGUESE FEMALE ADOLESCENTS**

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Discussion of physical fitness and its relationship with physical activity is more apparent in adults than in children and adolescents (Malina, 1996). A large portion of the variability in physical fitness is not accounted by physical activity (Malina, 2001). This suggests that, among pediatric subjects, other factors are involved and need to be considered, for example, growth, maturation, and other components of lifestyle such as television viewing (Katzmarzik et al., 1998). The current study examines the relationship between physical activity and physical fitness. The sample is composed of 221 female subjects (14±1.1 years) from Portuguese Midlands. Somatic characteristics included body weight, stature, sum of six skinfolds and umbilical circumference. Physical activity was estimated using an uniaxial accelerometer (Actigraph, model 7164) on five consecutive days assuming a criterion of 10h per day for inclusion. Health-related physical fitness was defined as one-mile run, sit-ups, sit-and-reach and 20-meter shuttle run. After presenting descriptive statistics, data analysis determined the correlation between indicators of health-related fitness and physical activity. Coefficients of correlation between physical activity (counts/min) and the four indicators of health-related physical fitness ranged from 0.17 to +0.58. Between moderate-to-vigorous physical activity and health-related fitness, the magnitudes of correlations ranged from 0.13 through +0.58. Physical activity was significantly and positively correlated with one-mile run and 20-m shuttle-run performance. No significant relationship was found between physical activity and sit-ups or sit-and-reach. In summary, the relationship between 3-day accelerometry data and physical fitness were no more than weak to moderate. The results highlight the complexity of assessing short-term physical activity as a predictor of fitness in adolescents. References.
Introduction: Vibration exercise is a new type of physical training to maintain and/or improve muscle strength and postural stability. However, research about this topic with elderly women has been scarce. Purpose: To investigate the effect of a whole body vibration training program on postural control and quality of life in women aged 60-82 years. Methods: Fifty three women were distributed into two groups, a whole body vibration exercise group (VEG: n=21; 48% of which with high physical function; age: 70.7±6.2 yrs; BMI:26.2±2.9 kg/m²), a combined aerobic plus resistance exercise group (CEG: n=19; 58% of which with high physical function; age: 68.1±5.9 yrs; BMI:26.2±2.7 kg/m²), and a control group (CG: n=13; 31% of which with high physical function; age: 70.7±6.6 yrs; BMI:26.7±3.0 kg/m²). Participants of vibration and combined exercises were randomly assigned to each group. The dissimilarity between these two intervention groups consisted of an additional static and dynamic balance exercises performed by VEG participants during 10 min on a vibration platform (Galileo 2000, with a frequency of 15-25 Hz, in two of the three sessions (1 hour training each session) that both groups accomplished per week during 2 months. The control group did not exercise. Postural control was measured by dynamic computerized posturography, namely, the Limits of Stability Test (reaction time, movement velocity, end point excursion and directional control, the modified Clinical Test Sensory Interaction Balance and Unilateral Stance Test (COG sway velocity). Quality life was assessed using the Short-Form Health Survey, specifically, physical and social functioning, physical and emotional role limitations, mental health, general health, vitality and pain. Results: Analysis of covariance (ANCOVA) was used to compare rate changes of quality of life and balance variables between groups. Due to differences at baseline, comparison of dependent variables between groups was adjusted for the initial values of the respective variable. ANCOVA showed group differences in the rate of change of physical functioning (VEG:10.15 vs. CG:-2.24%, p=0.001; CEG:1.8% vs. CG:-2.4%, p=0.015), unipedal COG sway velocity with open eyes (VEG:-29.14 vs. CG:40.1311, p=0.010; CEG:-4.21 vs. CG:40.1311, p=0.036), end point excursion forward (VEG:30.44 vs. CG:-12.34%, p=0.001; CEG:36.72 vs. CG:-12.34%, p=0.001), maximum excursion forward (VEG:18.35 vs. CG:-14.30%, p=0.002; CEG:21.59 vs. CG:-14.30%, p=0.001), and directional control (VEG:12.23 vs. CG:2.17%, p=0.001; CEG:7.13 vs. CG:2.17%, p=0.003). Conclusion: Adding 10 min of vibration exercise to a 60 min aerobic plus resistance training program during 2 months did not impact postural control and quality of life in women aged 60-82 yrs, since at the end of the intervention programme both exercise groups demonstrated improvements in physical functioning and postural control, particularly on limits of stability.

EFFECTS ON STRENGTH OF VIBRATORY EXERCISE COMPARED TO WALKING IN POSTMENOPAUSAL WOMEN

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Purpose: to compare the effect of 8 months of low-frequency vibration and a walk-based program in the muscle strength. Methods: twenty-seven postmenopausal women were randomly assigned into two groups: the whole body vibration group (WBV) (n=14) that performed 3 times a week a static exercise on a vibration platform (6 sets of 1-minute with 1 minute of rest, with a 12.6 Hz of frequency and a amplitude of 3 mm); and walking control group (WC) (n=13) performed 3 times a week a 60-minute walk activity. A health-related battery of tests was applied. Maximal unilateral concentric and eccentric isokinetic torque of the knee extensors was recorded by an isokinetic dynamometer. Results: after the 8 months, the time spent to walk 4-meters and to perform the chair and rise test of the Walking group improved 20% and 12% compared to the WBV group (p = 0.011, p = 0.005, respectively). In contrast, the type of exercise program did not show any significant comparative effect on isokinetic measurements. Conclusion: Both programs differed in the main achievements and could be complementary to prevent lower limbs muscle strength decrease as we age ([ISRCTN76235671])

LIFE'S SATISFACTION AND SELF PHYSICAL CONCEPT: THE EFFECTS OF SIX MONTHS OF PILATES-BASED EXERCISE IN WOMEN

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PURPOSE The purpose of this study was to determine the effects of Pilates-based mat exercise on life's satisfaction and self physical concept. METHODS Participants were 63 adult women (aged 25-55), 39 yrs (IQR:1.3 +/- 6.7 yrs) who voluntarily enrolled in a Pilates-based mat class for 24-week, 2 times per week on non-consecutive days, 60-minute per session (EG), and 24 yrs (IQR:3.3 +/- 7.7 yrs) served as controls (CG). After being informed on the risk and the benefits of the practice all participants gave their written informed consent to their participation on the study . The committee on Ethics of the University of Évora approved the study. Life’s satisfaction (LS) was measured using Satisfaction with Life Scale and the self physical concept was assessed by the Self Physical Concept Scale. The first questionnaire consisted of five statements with a Likert's scale answer from strongly disagree to strongly agree. The Self Physical Concept Scale questionnaire consists on nine statements, which measures the Self Physical Concept (SPC), the Perception of the Impression that causes in the Others (PIO), the Perception of Physical Appearance (PPA) and the Perception on Function (PF).
Each participant answered the questionnaires in a unique session, and the order application was the same at baseline, after 12 and 24 wk. The repeated measures ANOVA, Bonferroni post hoc test and Syntax were run in SPSS version 15.0 (SPSS Inc. Chicago, IL). For all tests the significant level was set at p<0.05.

RESULTS The results showed statistically significant differences on Life’s Satisfaction (F(2)= 3,790, p=0.025), between week 2 and week 12 (p=0.001) and between baseline and week 24 (p=0.035). In what concerns SPC the results indicated statistically significant differences (F(2)=10,744, p=0.000). These differences were observed between week 2 and week 24 (p=0.000) and between baseline and week 24 (p=0.001). Furthermore, the results indicated statistically significant effect for the three dimensions on the self physical concept: PIO, F(2)=4,007, p=0.021, between week 12 and week 24 (p=0.014) and between baseline and week 24 (p=0.008); PPA, F(2)= 5,296, p= 0.006, between week 12 and week 24 (p= 0.001) and between baseline and week 24 (p=0.037); PF, F(2)=4,473, p=0.013, which were between week 12 and week 24 (p=0.001) and between baseline and week 24 (p=0.004). There were no statistically significant differences between EG and CG, at baseline.

CONCLUSIONS This study demonstrated that adult women exposure to Pilates-based mat exercise during 12 weeks, for two 60-minutes sessions per week was not enough to stimulate statistically significant increases in LS and SPC. However, after 24 weeks the adult women increased the LS, SPC, PIO, PPA and PF. In conclusion, after 24 weeks of Pilates-based exercise, significant improvements attributable to practice effects were found in LS, SPC, PIO, PPA and PFG.
ELECTROMYOGRAPHIC EVALUATION OF SHOULDER EXTERNAL ROTATORS AND TRAPEZIUS MUSCLES IN DIFFERENT EXERCISES

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Purpose: Specific exercises for strength development of external rotator muscles are necessary to guarantee shoulder balance in athletes. The main goal of this study was to quantify the EMG activity of shoulder external rotators muscles and scapula stabilizers (trapezius muscle) in seven exercises commonly used to strengthen these muscles.

Methods: 20 healthy males (age=22±3.6 years) performed seven exercises in random order: (A) prone horizontal abduction with full external rotation (ER) at 90° of abduction, (B) prone horizontal abduction with thumb forward at 90° of abduction, (C) prone horizontal abduction with full ER at 100° of abduction, (D) side lying ER at 90° of abduction with elbow at 90°, (E) side lying ER with elbow at 90°, (F) standing ER in scapula plane, (G) standing ER with elbow at 90° with a towel roll placed between the trunk and elbow. Each subject performed 8 repetitions in each exercise with a 4Kg dumbbell. Surface EMG was recorded from the posterior deltoid, infraspinatus, teres minor, upper, middle and lower trapezius. The EMG signals were amplitude normalized using as reference the maximum EMG value found in the MVC. Mean EMG value was calculated separately during each repetition and during each phase (concentric and eccentric). For the phase delimitation a movement sensor was used. The Shoulder Synergy was calculated by the formula (ER synergy + Trapezius synergy/2). The ER Synergy was calculated through the average of the EMG values from the infraspinatus, teres minor and posterior deltoid. The Trapezius Synergy was calculated by averaging the EMG value from the three portions of the muscle. A Rotator Cuff Synergy was also calculated using the average from the infraspinatus and the teres minor.

Results: The mean values of different individual muscles and synergies in each exercise were determined. Shoulder Synergy: A=44,96±9,77%; B=39,34±9,23%; C=44,67±8,79%; D=43,83±10,37%; E=28,59±7,28%; F=20,20±4,23%; G=14,45±4,60%. ER Synergy: A=44,08±12,97%; B=40,39±10,63%; C=40,88±9,39%; D=41,61±12,65%; E=31,48±10,27%; F=23,00±7,64%; G=16,32±7,02%. Rotator Cuff Synergy: A=42,91±17,62%; B=34,83±12,91%; C=36,89±12,76%; D=40,56±14,47%; E=37,17±13,70%; F=30,82±10,62%; G=22,73±9,79%. Trapezius Synergy: A=46,81±10,40%; B=38,84±12,46%; C=49,57±12,05%; D=46,43±12,58%; E=26,23±7,75%; F=17,88±4,17%; G=13,36±4,57%. ER Synergy: A=44,96±9,77%; B=39,34±9,23%; C=44,67±8,79%; D=43,83±10,37%; E=28,59±7,28%; F=20,20±4,23%; G=14,45±4,60%. ER Synergy: A=44,08±12,97%; B=40,39±10,63%; C=40,88±9,39%; D=41,61±12,65%; E=31,48±10,27%; F=23,00±7,64%; G=16,32±7,02%.

Conclusions: For the dumbbell mass we used (4Kg), the exercises performed in the prone position presented the highest levels of EMG activation in the ER synergy, Trapezius Synergy and Shoulder Synergy. To activate specifically the ER muscles from the rotator cuff group (infraspinatus and teres minor), with a reduced solicitation of the posterior deltoid muscle, the side lying exercise (E) represents a good option since it presented high activation level of the Rotator Cuff Synergy with low level activation for the posterior deltoid (20,60±8%).

EVALUATION OF HEALTH PROMOTION LIFESTYLE PROFILE AND PHYSICAL ACTIVITY PATTERNS AMONG TURKISH PHYSIOTHERAPISTS

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Purpose:
Physical therapy interventions implies not only health protection but also health promotion, a concept which includes everything that can promote health and working capacity of patient. Health-promotion lifestyle profile (HPLP) and physical activity (PA) patterns of therapists can be effect their therapy interventions. The purpose of this study was to describe HPLP of 33 Turkish female physiotherapist aged x = 31,38 ± 6,20, and to determine the relationship between their lifestyle behaviors and PA patterns.

Methods:
Data were collected using a questionnaire about HPLP developed by Walker et al [1]. It is composed of 48 items and 6 subscales and consists of questions about health promoting behaviors. Total scores reflects the healthy life-style behavior. To record PA patterns and to estimate energy expenditure of daily living was used SenseWear Armband (SWA)(BodyMedia Inc., Pittsburg, PA). Each participant wore SWA monitors on the upper arm of the dominant hand for an average 47 hours during two consecutive days. Following parameters obtained from SWA monitor:daily energy expenditure (kcal/d), daily number of steps, duration of lying down (min/d), duration of sleep (min/d), daily average METs, active energy expenditure (kcal/d), duration of physical activity (min/d). Data were analyzed using SPSS package program. Descriptive statistics and Pearson Product Correlations were used to determine relationship between HPLP and PA patterns.

Results:
The mean total HPLP score was 128.09 ±16.08, the mean scores of self-actualization, health responsibility, exercise, nutrition, interpersonal support and stress management as follows: 38.82±5.72, 24.43±5.21, 8.60±2.95, 17.83±2.67, 20.87±2.85, 17.52±3.23, respectively. Total energy expenditure was 2266.93±310.72 kcal/d, number of steps were 10089.17±3502.39, duration of lying down was 347.79±81.84 min/d, daily average MET value was 1,55±0.23, active energy expenditure was 519.93 ±253.60 kcal/d; duration of physical activity was 120,21±65,97 min/d. There were significant correlations between duration of sleep and self-actualization (r = 0.430), and nutrition (r = 0.456) p < 0.05.

Conclusions:
It was concluded that physiotherapists participated in the study were generally at medium level of health promoting behaviors, and the highest mean score was health responsibility and the lowest was exercise. For increasing and supporting health promoting behaviors of the physiotherapists, exercise promotion interventions and opportunities should be included in their daily working schedules.

References.

FAMILIAL AGGREGATION OF OBESITY INDICATORS AND HYPERTENSION: A POPULATION-BASED STUDY IN RURAL MADEIRA

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Introduction.
In children and adolescents, waist circumference (WC) has been identified as the best predictor of Metabolic Syndrome. This study was carried out to determine the association between WC of 10 to 18-year-old children and adolescents from a rural area in Madeira, and their parents' risk factors for cardiovascular disease such as WC and blood pressure (BP).

**Methods.** Participants in this study were 176 students (86 M, 65 couples, 153 mothers aged 42.3 ± 6.1 years and 69 fathers aged 45.3 ± 8.4 years. Subjects were measured for weight, height, WC and BP. Central obesity (CO) in the students was classified according to the thresholds by Katzmarzick et al. (2004), and WC >80cm and 94cm for their mothers and fathers, respectively (IDF, 2006). Hypertension was defined in children using the Task force definition (NHBP, 1998) and for their parents, according to the IDF (2006).

**Results.** Of the students examined, 2.3 % were obese (OB), 17.0% overweight (OW), 71.6% normal and 9.1% underweight, according to Cole (2000, 2007). Of all mothers 28.1% were OB (BMI>30), 31.4% OW (BMI>25<30) and 40.5% non-OB (BMI<25); 12.7% of fathers were OB (BMI>30), 49.2% OW (BMI>25<30) and 38.1% non-OB (BMI<25). Interestingly, only 23.8% of the fathers were classified as at risk for CO, in comparison to mothers with a prevalence of 52.3%. The prevalence of hypertension was 70.3% for fathers and 64.5% for mothers. Significant positive correlations were found for mother-offspring pairs, mother-daughter (r = 0.28, p = 0.009, n = 88) mother-son (r = 0.27, p=0.016, n = 82) but not for father-offspring (p > 0.05, n = 34). Daughters presented a higher risk for hypertension (OR 1.10; CI 95%, 0.42-2.92) and CO (OR 3.00, CI 95%, 1.01-8.88) comparing to sons. Compared with daughters whose mothers did not have hypertension, the odds ratios in daughters with a hypertensive mother were 1.10 (CI 95%, 0.42-2.92) and similarly for CO, odds ratios were 3.00 (CI 95%, 1.01-8.88). A lower risk was found in sons whose odds ratios were 0.68 (CI 95%, 0.26-1.82) for hypertension and 1.32 (CI 95%, 0.38-4.58) for CO. Converse results were found regarding BMI in which, boys presented higher odds ratios for being OW or OB (OR 2.33, CI 95%, 0.58-9.43) compared to daughters (OR 1.57, CI 95%, 0.48-5.09) when their mothers were OB or OW.

**Conclusions.** In Madeiran rural families with adolescents, there is a familial aggregation of waist circumference, with daughters resembling their mothers more than sons, but not fathers. This may be explained by the fact that fathers presented a much lower risk of central obesity and professions requiring manual labour. The obesity relationship between mother and daughter advocates for the mother as a key player in the obesity prevention.

**RELATIONSHIP BETWEEN PHYSICAL ACTIVITY, NUTRITION, AND EATING BEHAVIORS DURING WEIGHT MANAGEMENT IN OVERWEIGHT AND OBSESE WOMEN**

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**PURPOSE.** Physical activity (PA) may contribute to improved compliance with recommended eating behaviors, and indirectly improved weight control. The goal of this study was to analyze the relationship between changes in PA, nutrition and eating behavior variables during a weight management program for overweight and obese women.

**METHODS.** 253 women (age: 37.0±7.1 years; BMI: 31.6±4.3 kg/m2) who initiated a 12-month behavioral obesity treatment program during a weight management program for overweight and obese women. The Dutch Eating Behavior Questionnaire, the Emotional Eating Scale, and the Three Factor Eating Questionnaire were used to measure cognitive eating behavior. A Food Frequency Questionnaire was used for dietary intake, and for PA the 7-day Physical Activity Recall (moderate+vigorous), pedometry (walking), and the Obesity-specific Physical Activity Recall (Ob-PAR, lifestyle PA) were used.

**RESULTS.** During the program, participants significantly increased cognitive eating restraint (p<0.001), and decreased eating in response to depression symptoms (p=0.035) and external eating (p=0.030). Correlation analysis show significant associations between PA and nutrition: all exercise variables were associated with a decrease in fat consumption (p<0.033); walking was associated with increases in carbohydrate intake (p=0.022). Associations between PA and eating behaviors also matched this pattern of improvements: lifestyle and moderate-vigorous PA were associated with increases in eating restraint and decreases in all other variables (disinhibition, hunger, external, and emotional eating, p<0.029). Eating restraint (p<0.001), external eating (p=0.027) and eating in response to depression (p=0.033) distinguished active from insufficiently active participants.

**CONCLUSIONS.** In overweight women, these analyses provide support to the usefulness of increasing exercise and PA for improved eating control, especially through the reduction of overeating episodes. If confirmed, this interaction among weight-healthy behaviors has important implications for future programs. Further studies are needed to clarify the psychological mechanisms and/or measurement issues underlying these associations.

**GENDER DIFFERENCES IN HEART RATE INTENSITY DURING RECREATIONAL MOUNTAIN BIKING**

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**Introduction.** Mountain biking (MTB) is a popular alpine outdoor activity, performed by 5% of the population in the Alpine countries (1) with a male female ratio of 2.5:1. Competitive off road cycling heart rate intensity has been analysed (2), but most recreational MTB research has investigated accidents and trauma. Therefore the aim of this study was to analyse heart rate intensity of recreational mountain bikers.

**Method.** A total of 49 (20 female / 29 male) bikers performed two tests. The lab test was a maximum progressive exercise protocol to determine maximal heart rate. The field test was a 7km MTB route with variable climbs at a self determined pace. Results were analysed by gender and age (younger: defined as 20-30 years, elderly: 50-65 years). The relative heart rate (%HR) was defined as the absolute (peak) heart rate divided by the maximal heart rate.

**Results.** At the self determined pace the mean time for the fixed MTB route was 61±8.7min. Men of all ages were faster than women, in the 20-30 group the mean time (55±6.1min) was significantly shorter for men, while in the 50-65 group men were faster but there was no statistically significant difference. The younger groups were faster independent of gender. Mean heart rate was 158±17.3bpm. Older women had a significantly higher heart rate (160±15.8bpm, p<0.01), whereas no gender specific difference was found in younger bikers. The mean relative heart rate was 89.5 %, and all women reached higher values than the men. The difference in the younger age group was 2.4% and the difference in the older group was significant [3.4%, p<0.01].

**Discussion.**
A relative heart rate of 90% during one hour of recreational sport is rare. This observation could be due to a high motivation. Relative heart rates of 70-74% have been found in ski mountaineering (3) and 62-68% in nordic walking. No gender specific differences were found in the absolute heart rate of the 20-30 group, but the 50-65 year old women were significantly higher than the men. Higher absolute heart rates in women during endurance sport have been reported in the past, explained by a lower hemoglobin level and oxygen pulse (4,5). A possible explanation for the similar heart rates in the young subjects could be motivation, as young men may identify more with their performance. This study demonstrates a high heart rate intensity during recreational MTB, so MTB is an effective cardiovascular training method.

References.
1 Statistik Austria [2007]

Poster presentations (PP)
PP-ML03 Motor Learning 3

ALTERNATIVE REPRESENTATIONS OF THE WING-KRISTOFFERSON MODEL
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Many human activities share the purpose of coordinating movement with time. A specific problem within this more general scenario is the coordination and timing of repetitive movements and, particularly, the conservation of a given interval in repetitive tapping. Stevens (1886) developed a simple experimental design in tapping tasks called the synchronization-continuation paradigm. Wing and Kristofferson (1973) introduced a model which offers a decomposition of the inter-response intervals in this kind of tasks, founded on a cognitive component and on a motor component. In the original approach, based on experiments with short continuation phases, the intervals related to the cognitive and to the motor components are regarded as independent white noise sources. Gilden et al. (1995) used long continuation phases and some spectral techniques and suggested that the intervals related to the cognitive component are drawn from a long-memory process (i.e., a stationary process whose autocorrelation function decays slowly following a hyperbolic decay). We performed an experimental study involving tapping tasks with two target frequencies (1.250 Hz and 0.625 Hz) and analyzed the corresponding time series. We propose a new theoretical approach, in which the intervals related to the cognitive component are modelled as a fractionally integrated process and the intervals related to the motor component are treated as a white noise process, independent of each other. Under these assumptions, we obtain the autocorrelation function and the spectral density function of the model. The estimation results point to a fractional parameter d around 0.4 which shows the presence of long memory. There is empirical evidence that many real data exhibit an autocorrelation structure with long memory. Currently, there is a vast literature on this topic including estimation methods and stochastic models (e.g., Palma, 2007). More specifically, there are some statistical explanations for long-memory processes. We suggest two statistical representations of our model that generate long memory and provide some information about the underlying biological system. The first one is based on an error duration model (Parke, 1999) and the second one is based on a regime switching model (Liu, 2000). Once again, the estimation results point to a parameter d close to 0.4 which reflects persistent long memory.

References.

ACCELERATION PERCEPTION - A NEW SPIN
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Most previous research suggests that humans are not able to perceive target acceleration and utilise it in the guidance of acceleration (e.g. Craig et al. 2006). This is counter-intuitive in view of the prevalence of acceleration in the natural environment. The present experiment revisited this question, but included a) a physical 3D display rather than a virtual representation, b) participants with a great deal of experience of intercepting accelerating targets and c) a task giving greater freedom for participants to perform more ‘naturally’ than previous studies. Comparisons of catching movement efficiency are made between the experienced interceptors and participants without particular expertise in intercepting accelerating targets.

Experts and novice table tennis players were asked to catch table tennis balls that were projected with no spin (normal trajectory), backspin (flatter trajectory) or topspin (more curved trajectory) into the vicinity of the catcher. Ball delivery was in a random order with 12 trials for each spin condition. The ball was launched by a machine hidden behind a low curtain so that the kinematics of the ball launch were not visible to participants. The final 5m (or 6m) of the ball trajectory was visible to catchers. Four dependant variables were calculated reflecting the efficiency of the catching movements straightness of the total hand trajectory, and RMS acceleration, RMS jerk, and ‘linex’ (a measure of endpoint duration), of the hand trajectory in the final 500ms of the action.

Experts moved more efficiently than novices - their hand trajectories were straighter and showed less acceleration in the 500ms before the catch, F(1,16) = 8.54, p = .01 and F(1,16) = 5.49, p = .03 respectively. Movements became less efficient with greater trajectory curvature (p < .02 for all efficiency measures) but more so for novices than experts (group by spin interaction effects p = .01 for RMS acceleration and jerk, and p = .04 for linex).
The declining movement efficiency with increasing trajectory curvature for both groups suggests that first order information strongly influences catching behaviour. However, the ability of the experts to perform more efficiently then the novices, especially as trajectory curvature increased, suggests that this particular sub-population are able to perceive target acceleration and to incorporate it to some degree into the guidance of interceptive actions. We conclude that it is possible for humans to utilize target acceleration in the guidance of interception, and that relevant task experience influences the degree to which it can used. The discrepancy between current findings and the results of previous studies are discussed with particular consideration of the differences in tasks and populations investigated.

References

EFFECT OF CYCLING CADENCE ON KNEE AND ANKLE ANGULAR KINEMATICS AND GASTROCNEMIUS MUSCLE LENGTH
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Propulsion during cycling occurs between Top Dead Centre (TDC) and Bottom Dead Centre (BDC) with peak torque occurring between 90 and 105 degrees. The gastrocnemius muscle is partly responsible for transmitting forces generated from the hip and thigh muscles to the pedal and is therefore of particular interest during the second half of propulsion and prior to BDC. Sanderson et al. (2006) found a single period of lengthening during propulsion followed by sustained shortening, through BDC, of the muscle-tendon at all cadences ranging from 50rpm to 110rpm. Gregor et al. (1991), however, observed a second gastrocnemius lengthening during the final part of propulsion prior to BDC. These authors found the length change occurred when cycling at 90rpm but not at 60rpm where a similar muscle length profile to Sanderson et al. (2006) occurred. Therefore this study aims to clarify the effect of cadence on gastrocnemius muscle/tendon length.

Results showed that the gastrocnemius muscle operated at significantly shorter lengths, over the course of the crank cycle, as cadence increased. Significant differences were observed in the behaviour of the gastrocnemius muscle between 40-50% of the crank cycle. Gastrocnemius muscle lengthened 0.1% and 0.29% at cadences 90 and 100rpm. However, at 50, 65 and 75rpm the muscle shortened 0.51%, 0.34%, 0.11% respectively over the same portion of the cycle. Mean ankle angular displacement increased (plantar-flexion) significantly with cadence from 87 to 97 for 50rpm to 100rpm respectively. Mean knee angular displacement significantly decreased (flexion) with increasing cadence (p<0.05).

The results support the data of Gregor et al. (1991). The gastrocnemius muscle exhibits a double lengthening phase at higher cadences during the propulsive phase with lower cadences showing a single lengthening phase. At higher cadence the shorter lengths of the gastrocnemius were due to changes in both knee and ankle angular kinematics. Although the range of motion for both joints is similar to those reported by Sanderson et al. (2006), the ankle angle is different. These changes of the ankle angle at higher cadences may allow a better transmission of forces to the pedal through BDC.

References

EFFECTS OF INTERNAL, EXTERNAL AND PREFERENCE OF ATTENTIONAL FOCUS FEEDBACK ON LEARNING VOLLEYBALL TENNIS SERVE OF 12-13 YEARS OLD CHILDREN
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The purpose of this study was to examine the effects of internal focus feedback, external focus feedback and preference of attentional feedback on skill learning at age of 12-13 years.

Feedback related with body movements was given as internal focus, whereas feedback related with movement effects was given as external focus. As a task “tennis service” in volleyball was used for both acquisition and retention measurements. Elementary school children with very limited knowledge and experience about the tennis service skill (N=78) were randomly assigned to three groups which were internal focus feedback group (IFF), external focus feedback group (EFF) and preference groups (PF). Subjects in PF group received feedback on skill learning at age of 12-13 years.

The results support the data of Gregor et al. (1991). The gastrocnemius muscle exhibits a double lengthening phase at higher cadences during the propulsive phase with lower cadences showing a single lengthening phase. At higher cadence the shorter lengths of the gastrocnemius were due to changes in both knee and ankle angular kinematics. Although the range of motion for both joints is similar to those reported by Sanderson et al. (2006), the ankle angle is different. These changes of the ankle angle at higher cadences may allow a better transmission of forces to the pedal through BDC.

References

This study indicated that for young children with limited amount of knowledge about a skill, internal focus feedback is more appropriate compared to external focus feedback in terms of retention. Being able to choose among internal and external focus of attention also seems to make a difference in retention performance of novice children indicating that active participation on the learning variables is an important concept.
TECHNOLOGY OF TEACHING SPORTS TECHNIQUE OF GYMNASTICS EXERCISES

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Introduction: The increasing of complexity and difficulties of programs’ range for gymnastic competition introduced by International Federation of Gymnastics (FIG), is manifested by the new, more effective means, forms and methods of teaching. The process of teaching complex exercises along with a constantly rising level, quality and stability is getting more and more difficult. It is necessary to apply new techniques for a better analysis of the structure of sports exercises in order to identify the most significant elements of a particular movement. Information concerning the most characteristic and the most significant, from the point of view of teaching the movement, stages of a physical movement is necessary to prepare effective training programs. Identifying such stages, described in literature as key elements of sports technique, should be an initial step to prepare pedagogical technologies of training. Therefore, the aim of the paper was to describe an effective pedagogical training technology of the process of teaching gymnastics exercises.

Method: Pedagogical experiment and 60 HZ UVC GR-DVL, 9800 NTSC camera with APAS 2000 cinematographic analysis systems were used to describe the round-off tucked back somersault (n=30) and straight back somersault after flickflack and round-off (n=9).

Results: On the basis of the research it was concluded that pedagogical technology of teaching includes three components: the first one a biomechanical analysis of phase structure of movement, the second one didactic teaching structure, and the third one contemporary teaching technology including algorithms as well as programs of teaching acrobatic exercises.

Conclusions: The effective teaching of gymnastics exercises is possible due to introducing pedagogical technology of teaching key elements in sports technique.

Many authors have similar opinions. It is often claimed that effective teaching depends on the so-called key elements, i.e. the main movements of the body or its parts. These elements are said to be indispensable to do a particular activity.

The acquisition of key elements of technique provides a positive transfer to perform the whole exercise or its profile (e.g. tucked back somersault - double tucked back somersault).

CYCLING: HEAD STABILIZATION ON IRREGULAR TERRAIN

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An image stationary on the retina permits to perceive undisturbed visual information about events that happen in front of us (Howard, 1993). Animals with flexible necks and whose eyes are fixed, generally attempt to stabilize the head, with the intent to stabilize the gaze (Troje & Frost, 2000). A chicken walking keeps its head stationary in space while the legs move the body forward (Davies & Green, 1988), this head-bobbing is synchronized with the movement of the feet (Dagg, 1977). Cycling on irregular terrain disturbs head and eyes stabilization. We tried to verify if adults use head stabilization during cycling on an irregular terrain, according to their experience. Head vertical oscillations and standard deviation of angle variations on elbow, hip and knee, were observed of one expert on all terrain cycling and eight inexperienced adults. Each subject had to cycle twice along a waved and a plain terrain. Images were treated in a movement analysis system (APAS), with a 5Hz low pass filter, and 6 co-planar points. Data revealed that inexperienced subjects could be divided on 2 sub-groups (immature, intermediate), namely, on head oscillation (Kruskal-Wallis = 11.378, p<0.01), on waved condition. For the waved condition, expert subject had stabilized head significantly more than immature (n= 5) and intermediate (n=3) groups (Wann-Wilhney, p<0.05, and p<0.05, respectively); intermediate group also differed significantly from immature group (p<0.01). On the waved condition, expert subject revealed greater standard deviations (n.s.) on the angle of elbow and knee joints (±61.51°, ±75.51°, respectively, than intermediate (±53.59°, ±58.27°) and immature (±57.85°, ±59.89°) groups. Additionally, expert subject produced greater mean angle (n.s.) on ankle join (74.69°) than intermediate (64.89°) and immature (67.31°) subjects. Coefficient of variation confirmed these results, on intermediate (±53.59°, ±58.27°) and immature (±57.85°, ±59.89°) groups. Additionally, expert subject reveal greater standard deviations (n.s.) on the angle of elbow and knee joints (±61.51°, ±75.51°, respectively) than intermediate (±53.59°, ±58.27°) and immature (±57.85°, ±59.89°) groups. Additionally, expert subject reveal greater standard deviations (n.s.) on the angle of elbow and knee joints (±61.51°, ±75.51°, respectively) than intermediate (±53.59°, ±58.27°) and immature (±57.85°, ±59.89°) groups. Additionally, expert subject reveal greater standard deviations (n.s.) on the angle of elbow and knee joints (±61.51°, ±75.51°, respectively) than intermediate (±53.59°, ±58.27°) and immature (±57.85°, ±59.89°) groups. Additionally, expert subject reveal greater standard deviations (n.s.) on the angle of elbow and knee joints (±61.51°, ±75.51°, respectively) than intermediate (±53.59°, ±58.27°) and immature (±57.85°, ±59.89°) groups. Additionally, expert subject reveal greater standard deviations (n.s.) on the angle of elbow and knee joints (±61.51°, ±75.51°, respectively) than intermediate (±53.59°, ±58.27°) and immature (±57.85°, ±59.89°) groups. Additionally, expert subject reveal greater standard deviations (n.s.) on the angle of elbow and knee joints (±61.51°, ±75.51°, respectively) than intermediate (±53.59°, ±58.27°) and immature (±57.85°, ±59.89°) groups. Additionally, expert subject reveal greater standard deviations (n.s.) on the angle of elbow and knee joints (±61.51°, ±75.51°, respectively) than intermediate (±53.59°, ±58.27°) and immature (±57.85°, ±59.89°) groups. Additionally, expert subject reveal greater standard deviations (n.s.) on the angle of elbow and knee joints (±61.51°, ±75.51°, respectively) than intermediate (±53.59°, ±58.27°) and immature (±57.85°, ±59.89°) groups. Additionally, expert subject reveal greater standard deviations (n.s.) on the angle of elbow and knee joints (±61.51°, ±75.51°, respectively) than intermediate (±53.59°, ±58.27°) and immature (±57.85°, ±59.89°) groups. Additionally, expert subject reveal greater standard deviations (n.s.) on the angle of elbow and knee joints (±61.51°, ±75.51°, respectively) than intermediate (±53.59°, ±58.27°) and immature (±57.85°, ±59.89°) groups. Additionally, expert subject reveal greater standard deviations (n.s.) on the angle of elbow and knee joints (±61.51°, ±75.51°, respectively) than intermediate (±53.59°, ±58.27°) and immature (±57.85°, ±59.89°) groups. Additionally, expert subject reveal greater standard deviations (n.s.) on the angle of elbow and knee joints (±61.51°, ±75.51°, respectively) than intermediate (±53.59°, ±58.27°) and immature (±57.85°, ±59.89°) groups.

References.

VISUAL REACTION TIME DIFFERENCES BETWEEN SEXES: EFFECT OF SPORT PARTICIPATION & DRIVING

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The purpose of this study was to investigate whether sport participation and extensive driving has any effect on the differences between sexes in visual reaction time (VRT). It has been generally demonstrated that across all age groups females have slower reaction times (RT) than males and that practice seem to have not much effect on the difference. A recent historical meta-analysis paper by Silverman (2006) argues that the difference between sexes is getting closer at least in visual reaction time (outside the USA) possibly due to more women’s participation in fast-action sports and driving.

Three groups of (control, sport and driver) 40 subjects (20 males & 20 females) participated to the study. The sport participation group (SPRT) comprised of athletes from taekwondo who were training at least for 5 years, minimum 3 days per week annually. The driver (DRV) group included males (M) and females (F) that were working as representatives of a company and driving at least 20,000 km annually for the last 4 years. University M and F students who neither drive nor regularly exercise were in control (CON) group. Participants were measured 3 times for simple VRT and choice visual RT for dominant and non dominant hands. Group and sex differences were examined with MANOVA.

The result indicated statistically significant interaction between sex and group for dominant hand (Wilks’ Lambda= 66, F(222,8)=6.27, p<0.05) and non dominant hand (Wilks’ Lambda= 60 F(222,8)=7.98, p<0.05) in favor of M and for most of the comparisons. For example
analyses for the dominant hand indicated that on VRT, the highest RT score was observed for F in CON group (M=40, SD=04) whereas the lowest RT score belongs to F in DRV group (M=29, SD=02). While the score of M participants (M=35, SD=02) in CON group was lower than that of F participants (M=40, SD=04), both SPRT and DRV group have faster times than F (M exercise=30, SD=03 & M driver=29, SD=02) than M (M exercise=32, SD=03 & M driver=31, SD=02). The sex difference in mean RT scores among groups was the highest in CON group. The mean scores of F SPRT (M=30, SD=03) and F DRV (M=29, SD=02) groups were similar and it is so for M SPRT (M=32, SD=03) and M DRV (M=31, SD=02) groups. The differences on RT scores between F participants who are in CON group and in SPRT and DRV groups are higher than the differences between M participants who are in CON, SPRT and DRV groups.

This study indicated that long term sport participation requiring visual information and driving extensively shorten visual reaction of the participants compared to their counterparts who were not active in sport & driving. Visual reaction time differences between sexes seem to be affected by sport and driving experiences.

References.


THE ANALYSIS OF THE ADJUSTMENT OF THROWING ANGLE IN JAVELIN THROW

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Introduction

The throwing angle is important for better performance in javelin throw in Track & Field. The best throwing angle is 37 degrees for 85m+ throwers, 36 degrees for 65m to 84m throwers, 35 degrees for 60m to 64m throwers, 34 degrees for 50m to 59m throwers, and 33 degrees for 40m to 49m throwers. In this study, throwing angle, motion and what angle subjects want to achieve when throwing javelin were examined in both standing and with an approaching throw.

Methods

Subjects were 7 javelin throwers (aged 19.29 years±1.796, best performance 54.93m±9.146, career of javelin throw 49.43month±27.098, body height 171.13cm±6.807, body weight 69.59kg±11.622), 2 female and 5 male throwers. The experiment was carried out from the standing throw, which enables measuring the throwing angle, initial velocity and angle of attack immediately, right after throwing. Sub-jects got their throwing angle after throwing from this gate. For the first time, they threw the javelin normally. In the second and third time, they were to declare their target throwing-angle beforehand, e.g. more high or more low. Their target throwing-angles were recorded by a video camera before throwing. Every throwing motion was filmed with high-speed video camera, film rate 250 / sec. by NAC, and analyzed with motion analysis software, Dynas-2D by Shin-Okoso Shokai Co., Ltd. As for the standing throw, followings were calculated; the angle between each [A1] throwing arm (wrist shoulder), [A2]torso, [A3]javelin, [A4] the axis (the center and top of sternum to left talus (right hand thrower) and horizontal plane, and [A5]the angle between [A1] and [A2] by [P1]the standing throw position, [P2]left foot contact on the ground (right hand thrower), [P3]power position and [P4]release.

As for the approach throw in addition to the standing throw, by [P5] taking off the left foot from the ground before throwing position and [P6]ight foot contact (right hand thrower) along with the phase in standing throw were calculated.

Results and Discussion

A clear relationship was not observed among the subjects target throwing-angle and actual angle. There was also no clear relation with body angle of [A1] to [A5] in each phase [P1] to [P6]. The angle of body was controlled in total, generally, e.g., if [A2] was large at [P1], it was small at [P2], large at [P3] and small at [P4]. The subjects 3rd throwing was based on feedbacks from their 2nd throwing, e.g. at [P2] if [A1] was large in the 2nd throwing, it was small in the 3rd throwing. It was suggested when man drives own body with their intention, motion converges in ones past acquired motion. If we want to change our motion, we need exercise with overblown movement in the throwing motion.

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TEMPORAL CONSISTENCY OF QUADRUPEDAL GAIT IN ADULT HUMAN SUBJECT

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INTRODUCTION

Rhythmic interlimb coordination tasks with motor actions among multiple effectors are not so often investigated. In present case study paradigm of quadrupedal gait (crawling) was used to see temporal relationships between limbs.

METHODS

One adult subject performed the crawling task paced by metronome (1 Hz) on a 10-m gait mat, made of conductive rubber, which had a 6-V potential from one end to the other. Pewter electrodes were placed on the participants shoes and on his gloved hands. The electrodes were connected via National Instrument A/D card to computer. When the subject contacted the rubber mat, an electric circuit was closed and a measure of voltage was provided. The voltage measures were scaled through the mat. Temporal data was gathered from 100 Hz sampling frequency. The direction of travel was forward and body orientation was constrained to prone but coordination pattern was not specified. Front-hind and lateral symmetries were determined.

RESULTS

Similarly to the findings of Sparrow (1989), lateral sequence of limbs touchdowns in crawling was adopted (left foot, left hand, right foot, right hand). According to Hildebrand convention (Whitall et al., 1997), the key parameter for symmetrical gaits is the relationship between forelimb and hindlimb on the same side, phasing between limbs was determined by calculating the midpoints of hand stance relatively to the time of the duration of the left foot contact. Temporal midpoints of the left foot hand in average in 61.06 % of the of the duration of the left foot contact [SD 13.89], while temporal midpoint of the right hand fall in average on 55.62 % of the duration of the right foot contact [SD 13.89].

References.

THE ENHANCEMENT OF NOISE-TO-SIGNAL RATIO IN MUSCLE ACTIVITY THROUGH AN ELASTIC CORD TECHNIQUE
TRAINING DEVICE DURING TREADMILL RUNNING

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Stabilization through destabilization is a leading aspect of contemporary technique training concepts, e.g. the differential learning approach by Schöllhorn 2006. Such concepts are based on self-organization, which refer to noise, or movement variability, as an inevitable part for a stable movement outcome. According to Bernstein (1967) movement outcome results from forces directly generated by muscle contraction and reactive phenomena (RP: gravitation, inertia, stored forces). Changes in these RP require different neuromuscular impulses for a stable movement outcome. To acquire an appropriate neural network to compensate or even use RP, the variability of such forces should be increased in training, but not exceed the solution space. This could be realized with elastic cords simulating external muscles to increase the DOF and thus provoke higher variability in neuromuscular impulses. The objective of our study was to compare running with and without elastic cords in muscle activity and in noise-to-signal ratio between strides.

Six males ran 2 x 30 min intervals at 2.9 m/s on a treadmill separated by a 30 min rest period. After 5 min of free running, elastic cords were fastened at iliosacral joint and both heels for 20 min of either the first or the second 30 min-interval. The cord length was standardized at 40 % of the leg length (producing ~48 N at 100 % leg length). EMG was recorded for rectus fem (RF), tibialis ant (TA), lat gastrocnemius (LG). Stride duration (ST) and IEMG for each stride was analyzed. Variance-to-signal ratio (VS-R, Merletti 2004) between strides in 2-min-blocks was calculated to assess noise-to-signal ratio.

Comparing cord to free running a 2 X 7 ANOVA (running condition X time blocks) indicated strong effects in average IEMG and VS-R for all three muscles. Average IEMG was 30.7 to 87.5 % higher in cord running (Et2a=.61,75, p<.07), whereas ST changed by 1.0 % (Et2a=.20; p>.30). An increase of 11.3 to 22.0 % in cord running is also observed in VS-R (TA: et2a=.47, p<.13; RF; et2a=.45, p<.14; LG; et2a=.22, p<.30). Though ST-ratio increased by 73.6 %, the VS-R in free running is only 1 % of the VS-R of the muscle activity. This is a reflection of the higher variability in EMG-values than the macroscopic ST parameter. In contrast to RF, TA and LG showed a strong interaction between treatment condition and the seven analyzed time blocks (et2a=.33, p<.11 and et2a=.58, p<.01) revealing an adaptation to the cords over time.

The observed increase in IEMG and noise-to-signal ratio could be the consequence of the inability to manage the forces generated by the cords due to the subjects’ inexperience. On the other hand, an increase in EMG variability could also reflect the ability to accurately use those forces. In that case, the movement outcome would be more stable, which was not confirmed by the variability in ST and the increase in average IEMG. The decreasing variability over time in TA and LG during cord running.

DOES SKILL ACQUIRED BY OBSERVATIONAL LEARNING TRANSFER?

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There are many occasions for athletes to learn technique from observing activities of experts. This phenomena has been known as observational learning. There have been many studies to show observational learning occurs. But a question arises whether how much external skill could be transferred to the acquired skill itself. In fact, it has also been known that acquired skill could transfer to improve related skills. Weigelt et al. (2000) reported that the improvement of ball-juggling could also improve ball approach skill. However, whether improved skill by observational learning could transfer has not been well studied. In this study, we examined whether a skill acquired by observational learning transfer. Subjects were 21 female college softball players. As a pre-test, soccer ball juggling and ball-targeting were performed. Ball-juggling only permit subjects to use their insteps and average of ten trials were recorded (no time limit in each trial). Ball-targeting rolls a soccer ball by inside kick closer to a 20-m away target. Five trials were performed and an average distance between ball and target were recorded. Twenty three subjects were divided into three groups considering the average abilities of both tests showing significant differences among groups. The first group (P group) practiced ball juggling ten minutes a day for four weeks [16 days]. The second group (O group) observed them. The third group (C group) did not do any practice. After four weeks ball-juggling and ball-targeting were tested again. Ball-juggling were significantly improved in the P group (p = 0.002) and O group (p = 0.03). But, C did not improve significantly. The difference of improvement between P group and O group was significant (p = 0.01). Results from ball-targeting did not show any significant differences before and after ball-juggling practice in all groups. However, the improvement level (differences between pre- and post- practice values) of ball-juggling and ball-targeting showed positive correlation in P group but did not reach the significant level (r = 0.58, p = 0.172). O group showed statistically no correlation between two improvement levels (r = -0.43, p = 0.395).

The present results show that observational occurred in soccer ball juggling. However, the acquired juggling skill did not transfer to ball-targeting. Although the present result did not reach the significant level, the improvement level of ball-juggling and ball-targeting showed positive correlation and the correlation coefficient was high. In O group, this did not show high correlation coefficient. This may indicate transference is weak in observational acquired skills with actual practice. This might be because subjects learned only a part of the entire movement by observation.

IS THERE A SECULAR TEND TREND IN MOVEMENT SKILLS IN PRESCHOOL CHILDREN?

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Introduction: Among professionals working with children in preschools, schools and sports clubs it is assumed that children have deteriorated in their movement skills over the last decades. However, there are few data supporting this hypothesis, especially in preschool children.

Methods: For this study, we analyzed the data of 700 preschool children from the Prevention through Activity in Kindergarten Trial [PAKT] with regard to motor skills and anthropometric measurements. The children completed a standing long jump (SLJ), balancing backwards (BBB and target throwing task [TT] and an obstacle course [IOC]). Furthermore, the children’s height and weight were assessed. The results of our sample were compared to those of previous studies using identical methodology. SLJ measurements were compared to samples from Vogt (1978; VS) and Kunz (1990; KS). OC results were compared to the KS. BB and TT were compared to a sample recruited for the LOGIK study (1985).
Introduction

Physical Training causes important metabolic changes, regarding protein turnover in skeletal muscle, enhancing protein degradation and free fatty acids oxidation. In growing individuals, these effects should be even more pronounced, due their higher protein needs. Branched-chain aminoacids are metabolized in muscle, replenishing leucine and increasing muscle glycogen content. The aim of this study is to verify if Branched-chain supplementation can reduce protein degradation and increase muscle glycogen deposits in young trained rats.

Methods

80 male Wistar young (age 21-days) rats were divided into 5 groups (BCAA trained, BCAA sedentary, Control Diet Trained, Control Diet Sedentary) and were trained using a swimming protocol of 6 weeks, 1 hour a day, 5 days a week, with a 5 % load attached to their tails. They consumed an AIN-93G diet supplemented or not with BCAA (45 mg/kg body weight/day of each BCAA). One day before the final experiment they rested and were divided into two more groups: 16-h fasting group or fed group. They were euthanized, blood and tissues were collected and kept in liquid N2. Muscle glycogen (MG), Plasma Tyrosin Levels (Trt), Epidydimal Fat (EF) and growth curve were measured.

Results

Sedentary rats featured an increase in body weight regardless of their diet. MG was higher in Trained Control group compared to Sedentary Control rats. Plasma Trt levels were higher in Sed Contr group compared to Sed BCAA. EF was reduced in both trained groups compared to sedentary ones.

Discussion/Conclusion

BCAA supplementation reduced protein degradation in sedentary growing rats but not in trained ones. Other expected BCAA effects like higher muscle glycogen deposition, equal growth curve and lower EF deposits were not achieved in our experimental conditions except by physical training regardless of diet. We concluded that BCAA can minimize protein degradation in growing sedentary animals but cannot improve metabolic some metabolic drives when considering exercise and growth simultaneously.

References


LONGITUDINAL STUDY OF DIETARY INTAKE AND BODY COMPOSITION IN ADOLESCENT FEMALE BALLET DANCERS

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Introduction

Classical dance may begin at an early age and its practise requires the development of physical abilities: strength, flexibility and power. A group of ballet dancers (BD) were enrolled in a 3 year longitudinal study to determine dietary intake and body composition. The decision to continue or discontinue dancing is often made during adolescence. Those adolescents that decide to continue dancing must ensure that they do not compromise their health with poor nutrition. The aim of this study was to clarify in early age female BD the risk of poor nutrition and its relation to body composition.

Methods

Twenty three BD initiated the study (age=11.5±0.8 yr; weight=33.6±5.0 kg; height=142.7±7.4 cm; BMI=16.5±1.5 kg/m2) and 13 BD (age=14±1.8 yr; weight=46.2±4.7 kg; height=157.6±6.9cm; BMI=18.6±0.9 kg/m2) completed the 3 years study. Dietary intake was estimated with a five day nutrition survey in four occasions, one per year. Anthropometric measurements (skinfolds, bone diameters and perimeters) were taken every six months. During the same days they completed a 24h activity questionnaire to provide energy expenditure estimation (EER).

Results

Energy intake (EI) and EER found in the 1st measurements EI=2193±414 Kcal/d, 67±17Kcal/Kg; EER=2083±196 Kcal/d showed an energy balance, three years later (4 th diet analysis) a reduction in EI (Kcal/Kg) [p<.01], an increase [p<.01] in EER (EI=1834±233Kcal/d, 42±14
Kcal/Kg EER=2215±171) and a negative energy balance were found. All the skinfold measurements (triceps, subscapular, ileac crest, abdominal, thigh and gastrocnemius) presented a negative correlation (p<.01) to total EI (Kcal/Kg). Energy distribution from snacks had a positive relation (p<.001) to total EI, and the %EI consumed at breakfast presented a negative relation (p<.01) to body weight. Moreover, carbohydrate and fat intake (g/d) presented negative correlation (p<.05) to body weight. We found an excess of protein consumption expressed as relative to weight means values between 2.2 and 2.8 g/Kg/d. We found marginal micronutrient intakes (according to DRI's) for folic acid, vitamins E and D, calcium, magnesium and zinc. The percentage of marginal diets in one or more micronutrient increased in the last year of the study, and another micronutrient (iron) was also marginal in the last year.

Discussion/Conclusion
Adolescence is a critical period in female BD. The fourteen year old age group showed an increase in marginal micronutrient diets, since DRI for most nutrients are higher with respect to the previous age range. We suspect that an under-recording of nutritional data, when they get older or when they gain fat, could explain the negative relation with skinfold measurements. It is essential that dance academies and schools emphasize healthy nutritional practices prior to adolescence.

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THE MUSCLE CARNOSINE AND TAURINE CONTENT OF ELDERLY NON-OBESE KOREAN MALES WITH IMPAIRED GLUCOSE TOLERANCE

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Carnosine (Beta-Alanylhistidine, Carn) is highly effective in buffering H+ over the physiological range and is probably the only such-active compound in skeletal muscle where the concentration can be changed by diet and/or exercise. Carn synthesis is limited by the availability of Beta-Alanine synthesised in the liver from Uricol and transported to muscle fibres, but is enhanced by the inclusion of Beta-Ala (or a Beta-Ala source such as Carn) in the diet. Whilst the transport of Beta-Ala into muscle is still not fully understood there is evidence that this may be linked to the action of insulin. Taurine (Tau), a beta-sulfonic amino acid which shares the same transporter as Beta-Ala in the diet. 602

THE ROLE OF NUTRITION AND KINESIOLOGY IN THE TREATMENT OF OBESITY

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INTRODUCTION

SINGLE SODIUM PYRUVATE INGESTION MODIFIES OXYGEN CONSUMPTION DURING EXERCISE

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Introduction
Pyruvate is a byproduct of carbohydrate metabolism. During low intensity exercise it’s converted to acetylCoA and oxidized in mitochondria. When the metabolic rate of the muscle increases during the work at higher intensity (e.g. above the lactate threshold), the glycolytic rate increases. Higher pyruvate concentration decreases NADH/NAD+ ratio via the lactate dehydrogenase equilibrium. The cytosolic NADH reoxygenation allows to continue glycolysis reactions and thus ATP resynthesis (1, 2).

The aim of the present study was to estimate the effect of single sodium pyruvate ingestion on the exercise metabolism at the intensity above lactate threshold.

Materials and methods
Six healthy volunteers participated in the study. In a randomized double-blind placebo-controlled crossover study, we tested the effect of single oral sodium pyruvate intake on exercise metabolism. Subjects ingested sodium pyruvate (0.1g or 0.05g / kg b.w.) prior to 6 minutes exercise at 90% VO2max.

Results
Our data indicated that higher dose of sodium pyruvate (0.1g / kg b.w.) ingested 30 min prior to exercise tend to decrease oxygen consumption (p=0.1) during workout at 90% VO2max. This effect was not observed when sodium pyruvate was ingested at lower dose (0.05g / kg b.w.), or at higher dose (0.1g / kg b.w.) ingested 15 min prior to exercise. Blood lactate concentration after the exercise was not affected by pyruvate intake.

Conclusion
We conclude that single sodium pyruvate ingestion at dose 0.1g / kg b.w., 30 min prior to exercise results in a lower oxygen demand during workout at 90% VO2max. This effect occurred without an increase in lactate concentration. It seems that the energy production is more efficient due to pyruvate ingestion.

Reference.

13th Annual Congress of the European College of Sport Science
Obesity is a serious disease and the prevalence of overweight and obesity is increasing worldwide at an alarming rate in both developing and developed countries. There are many factors that contribute to causing obesity including genetics, gender, endocrine diseases, the environment and behavior (overeating, alcohol consumption, lack of physical activity). Environmental and behavioral changes brought about by economic development, modernization, and urbanization, have been linked to the rise in global obesity. Obesity is increasing in children and adults, and complete health consequences may become fully apparent in the near future. Persons with obesity are at risk of developing one or more serious medical conditions, which can cause poor health and even premature death. Obesity is associated with more than 30 medical conditions and the most common of these are: type 2 diabetes, coronary heart disease, high blood pressure, osteoarthritis. Treatment options for obesity are very diverse: moderate deficit diet, physical activity, lifestyle changes, pharmacotherapy and even surgery. The purpose of this study was to investigate how a specific nutritional program and a certain kinesiologic treatment influenced and improved the health state of 20 adult women during a 12-week program.

Keywords: obesity, fat, low-calorie diet, kinesiology, BMI.

METHODOLOGY

The sample under research included 20 adult women, with ages varying between 28 and 54. All subjects were diagnosed with severe obesity (third degree) and some of them also suffered of other conditions such as: dislipidemia, hypercholesterolemia, constipation, type 2 diabetes, asthma, irritable bowel syndrome or hyperuricemia.

Methods: biographical research, descriptive research, observations, diet therapy, determination of Quetelet index (BMI), biochemical tests, effort capacity tests, applied kinesiology procedures.

RESULTS AND CONCLUSIONS

It was observed that all subjects lost weight depending on their ages and on their health states. The younger and the healthier subjects lost more than the older ones. The nutritional program was based on 5 properly balanced meals per day and they lost about 0.5 kg per week. The body mass index was decreased in all subjects and the degree of obesity was improved. The applied kinesiology procedures were efficient but, at the same time, limited by the presence of the other pathologies associated with obesity. It was also noticed that all subjects improved their neuro-psychological tonus and this directly and positively influenced their social and private life.

REFERENCES


NUTRIENT INTAKE AND ESTIMATED ENERGY EXPENDITURE IN WOMEN WITH BULIMIA NERVOSA

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INTRODUCTION: Bulimia Nervosa (BN) is an illness that is most commonly found in females beginning usually during adolescence. The main characteristics of BN are the frequent occurrence of binge-eating episodes, and the over-concern with body weight and shape. Purging behaviours usually follow a binge eating episode, while restricted eating or excessive exercising also used, intended to prevent the otherwise inevitable consequence of weight gain. Resting energy expenditure (REE) has been found to be lower in normal weight bulimics compared to controls and it has been speculated that metabolic abnormalities might underlie bulimia.

PURPOSE: This study determined the dietary intake and energy expenditure of active females with BN and active healthy subjects.

METHODS: 14 female with BN and an equal number of healthy comparable mass controls (C) participated in this study (BMI: BN=21.50±1.62; C=21.25±1.92 kg/m2). Percent body fat was estimated using skinfolds. The energy intake was assessed using an 8-day weighed food record which was analyzed using the nutrition analysis package Nutrianalysis (Mougias 2002). Daily energy expenditure was calculated from 7-day activity records.

RESULTS: Both groups had similar body fat percentage (BN=21.85 ± 5.88; C=20.36 ± 6.69%). Mean energy intake was not different between groups (BN=2263.3 ± 326.8; C=2030.8 ± 302.14 kcal/day) with higher however proportion of fat intake (BN= 46.24 ± 3.63; C= 45.58 ± 5.24%) and lower proportion of carbohydrates (BN=39.57 ± 4.54; C=40.67 ± 6.24%) for both groups according to the recommended normal daily allowance for active individuals. Regarding to micronutrients, BN had statistically higher values in polyunsaturated fatty acids, vitamin E, iron , Na, K, Mg, compared to C, but comparing both groups with the recommended dietary allowances (RDA), the values fall below the chosen RDA cut off in vitamin A (BN & C), B2 (BN), B6 (BN & C), iron (BN & C), K (BN & C), Ca (BN & C), Mg (C), Zinc (BN & C) and ribbers (BN & C). BN had higher daily energy expenditure (EE) (BN=2681.82 ± 347.51; C= 2412.56 ± 226.64 kcal/day). Both groups had negative energy balance (BN= -418.49 ± 428.33; C= -381.74 ± 399.65 kcal/day).

CONCLUSION: Total energy consumption did not differ between BN and C. The higher intake of several micronutrients in BN and lower intake of macronutrients in C might have explained from the higher energy intake, or due to the fact that BN consumed healthier items. The observation that although female with BN have the same energy intake compared to C are more active, can possibly be explained by the reduced resting energy expenditure that is reported for women with BN.

NUTRITIONAL SUPPLEMENT USE BY HIGH-LEVEL PORTUGUESE ATHLETES

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This study aimed to characterize nutritional supplement (NS) use among a group of highly-trained athletes. Subjects were asked to respond to a self-report questionnaire in order to characterize the type, frequency and amount of consumption, reasons of use, sources of information and advice, the associations between supplementation habits and years of competition, type and volume of training, competition level, gender, schooling and occupation, were also examined. Twenty five athletes (12 women and 13 men), with a median age of 25.2±5.1 (18-37 years), attending to nutritional counselling in the Portuguese Athletics Federation (PAF), volunteered to participate in this study. The study was performed in a training period, i.e., between December 2007 and January 2008. The prevalence of NSs consumption was 92% during a median of 3.5 years. Between NSs users, 69.6% were employed and 8.7% were full-time athletes. Over half (60.8%) were in high-school or college. Athletes have been regularly training and competing since their official affiliation on the PAF (on average, 12.1±4.2 years). Some were Portuguese international representatives, with a maximum of 50 international events. The most frequently cited reasons for taking NSs were ‘accelerate recovery’ (87.0%), ‘have more energy/reduce fatigue’ (69.6%), ‘improve sports performance’ (65.2%) and ‘increase strength’ (52.2%). For male athletes, ‘stay healthy’ was also an important motive (58.3%). Those not taking any type of supplement (8%) referred ‘ignorance’ and ‘lack of supplement habit’ as the main reasons. For male athletes, ‘stay healthy’ was also an important motive (58.3%). Those not taking any type of supplement (8%) referred ‘ignorance’ and ‘lack of supplement habit’ as the main reasons.

PREFERENCE OF SUPPLEMENT USE

Those taking supplements (92%) responded to a self-report questionnaire in order to characterize the type, frequency and amount of consumption, reasons of use, sources of information and advice, the associations between supplementation habits and years of competition, type and volume of training, competition level, gender, schooling and occupation, were also examined. Twenty five athletes (12 women and 13 men), with a median age of 25.2±5.1 (18-37 years), attending to nutritional counselling in the Portuguese Athletics Federation (PAF), volunteered to participate in this study. The study was performed in a training period, i.e., between December 2007 and January 2008. The prevalence of NSs consumption was 92% during a median of 3.5 years. Between NSs users, 69.6% were employed and 8.7% were full-time athletes. Over half (60.8%) were in high-school or college. Athletes have been regularly training and competing since their official affiliation on the PAF (on average, 12.1±4.2 years). Some were Portuguese international representatives, with a maximum of 50 international events. The most frequently cited reasons for taking NSs were ‘accelerate recovery’ (87.0%), ‘have more energy/reduce fatigue’ (69.6%), ‘improve sports performance’ (65.2%) and ‘increase strength’ (52.2%). For male athletes, ‘stay healthy’ was also an important motive (58.3%). Those not taking any type of supplement (8%) referred ‘ignorance’ and ‘lack of supplementation habit’ as the main reasons. For male athletes, ‘stay healthy’ was also an important motive (58.3%). Those not taking any type of supplement (8%) referred ‘ignorance’ and ‘lack of supplement habit’ as the main reasons.
more likely get information from other athletes (36.4%). Regarding the type of supplement, the most used were multivitamins (73.9%), magnesium (69.6%), sport drinks (60.9%) and proteins (52.2%). There were some gender-based differences, with male athletes reporting a more prevalent use than female athletes for multivitamins (75.0% in men and 72.7% in women) and magnesium (75.0% in men and 63.6% in women), while the opposite was seen for sport drinks (63.6% in women and 58.3% in men), proteins (54.5% in women and 50.0% in men), and creatine (63.6% in women and 33.3% in men). Thirteen percent of the athletes taking supplements were sponsored by a commercial brand in the area of supplementation and 43.5% of them benefit from a reduction in the price. So, given the easy and privileged access that athletes have to NSs and their almost generalized use, in many cases by self prescription, it has become increasingly important that clearer and more accurate information about their effect on physical performance is available for high-level athletes.

PREVALENCE OF THE DIETARY SUPPLEMENTS INTAKE IN BRAZILIAN ROAD RUNNERS
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INTRODUCTION
The practice of road races has exhibited an exponential growth in the last decade(1) and the consumption of dietary supplements is significant in practitioners of physical activities in Brazil(2). The aim of this study was to identify the reasons of the consumption of dietary supplements in road runners.

METHODOLOGY
817 volunteers were interviewed in four different road races from the Brazilian’s schedule in 2004. The races were: Maratona de Revezamento Pão de Açúcar(=201); Volta Internacional da Pampulha(=204) and São Silvestre (=206). The tabulation of the data was made with the words used by interviewees. The statistic analysis was through the SPSS 13.0 software. This study was approved by the Ethic Committee in our University.

RESULTS
In road runners sampled 28.33% reported having used some type of dietary supplement, and the men was 81.74% of this total, the average age of consumers was of 37.5 ± 10.77 years old, with average time of practice between 3 and 5 years, training weekly 3-4 days. It was observed that the consumption of supplement is strongly correlated (R2 = 0.93) to the running distance a week, and good correlation (R2 = 0.74) with years of practice of the sport, the longer the time a runner has practiced the sport, the higher is the training volume and the supplement intake. The most consumed dietary supplements by road runners were: carbohydrates 52.17%, vitamins 28.70% and proteins 13.48%. The 5 most frequent reasons for consumption were: enlargement the energy 29.5%, improvement of the performance 17.1% and endurance 10.3%, replacement of nutrients 11.1% and avoid the fatigue 10.3%. Around 29.5% of the consumers declared more than one reason to intake dietary supplements.

DISCUSSION
The main motivation of the dietary supplements intake was to increase the performance, cited by 17.1% directly and indirectly by 54.7% of the runners. In this study, the use of dietary supplements by road runners in Brazil reached lower levels if compared to the USA in 1987(3) and the gymnasts in Portugal(4). The gymnasts mean bone mineral density increased among the season, as well as their height and weight. Gymnasts were weekly submitted to a training programme that differed significantly (p<0.05) from preparatory period [15.4 (± 6.1) hours] to transitory period [11.0 (± 3.2) hours] and competitive period [9.8 (± 3.2) hours] of training. The primary aim of this investigation was to study and to compare the effect of physical exercise in bone mass in sixty competition female gymnasts [11.2 (± 3.2) years; 140.8 (± 13.1) cm; 35.2 (± 9.75) Kg] of Federação de Ginástica de Portugal (Portuguese Gymnastic Federation) in preparatory and transitory training periods.

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The training information was assessed using a questionnaire where the subjects reported the amount of time spent training per week. It was observed that the consumption of supplement is strongly correlated (R2 = 0.93) to the running distance a week, and good correlation (R2 = 0.74) with years of practice of the sport, the longer the time a runner has practiced the sport, the higher is the training volume and the supplement intake. The most consumed dietary supplements by road runners were: carbohydrates 52.17%, vitamins 28.70% and proteins 13.48%. The 5 most frequent reasons for consumption were: enlargement the energy 29.5%, improvement of the performance 17.1% and endurance 10.3%, replacement of nutrients 11.1% and avoid the fatigue 10.3%. Around 29.5% of the consumers declared more than one reason to intake dietary supplements.

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BONE MINERAL DENSITY AND CALCIUM INTAKE IN YOUNG ATHLETES DURING A SEASON
Silva, M.
University Fernando Pessoa, Portugal

The practice of physical exercise can help to prevent bone mass lose, which can be associated to age and menopause. It is still unknown the effect of physical exercise in competition athletes, before the peak bone mass is acquired and according to the sport. The practice of road races has exhibited an exponential growth in the last decade(1) and the consumption of dietary supplements is significant in practitioners of physical activities in Brazil(2). The aim of this study was to identify the reasons of the consumption of dietary supplements in road runners.

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THE EFFECTS OF CHO FEEDING ON FUEL SELECTION DURING LOW-INTENSITY SHIVERING
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During cold exposure, carbohydrates (CHO) play a substantial role in providing substrate for shivering muscles. Little is known about the advantages provided by CHO feeding for shivering endurance and cold survival. Results from a recent study showed that maximal exogenous glucose oxidation (~180 mg/min) is attained when 50g of glucose is ingested over 2-h in men shivering at a low-intensity (~2.5
times resting metabolic rate or 20% VO2max. Exercise studies have shown that rates of exogenous glucose oxidation are influenced by the type and quantity of CHO being ingested, the timing of ingestion, and the exercise intensity during ingestion. These factors ultimately affect the bioavailability of the ingested glucose. During moderate intensity exercise (~50% VO2max), maximal exogenous glucose oxidation was found to reach ~1 g/min when CHO was given intermittently throughout an exercise bout (see Jeukendrup (2004) for review). Whether exogenous glucose oxidation can approach rates seen during exercise, or can be increased above the values previously seen in cold exposure studies, remains to be determined. The purpose of this study was to determine (1) the effects of ingesting glucose at the onset of cold exposure versus following 60 min of shivering and (2) the effects of ingesting two types of CHO in combination on fuel selection. Using a combination of indirect calorimetry and stable isotope methodologies, whole body fuel selection and exogenous glucose oxidation rate was monitored in 6 non-acclimatized adult men wearing a liquid conditioned suit perfused with 4 degree Celsius water for 150 min, following a 120 min baseline period. Participants ingested solutions which delivered glucose at a rate of 0.8 g/min at the onset of cold exposure (G0), 0.8 g/min after 60 min of cold exposure (G60) or delivering both glucose and fructose at a rate of 0.4g/min (10.8g/min total) after 60 min of cold exposure (GF60). Results showed that although CHO and lipid oxidation and their relative contribution to heat production increased during cold exposure when ingesting a CHO beverage, the timing in which it was ingested did not modify fuel selection. Further, ingesting different CHO in combination had no effect on fuel selection. However, exogenous glucose oxidation during cold exposure was significantly greater in the G0 and GF60 condition relative to G60 (p<0.05) but no significant difference was found between the G0 and GF60 conditions. In conclusion, whether a CHO beverage is given at different times during cold exposure or contains a combination of CHO had no effect on whole body fuel utilization. Further work is needed to determine the partitioning of the CHO utilization in order to identify whether the contribution of carbohydrate sources are modified, particularly to determine whether glycogen is spared as a result of ingesting these beverages.

References:

EFFECT OF THE CREATINE SUPPLEMENTATION ASSOCIATED TO THE WEIGHT TRAINING PROGRAM ON MUSCULAR STRENGTH IN YOUNG WOMEN

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Introduction: Several studies have demonstrated that creatine supplementation is claimed to increase muscle reserves of this substance, enhancing the gains of muscular strength, results of the weight training program, by the increase of the corporal mass due to the water retention and/or increase of the protein synthesis. Objective: To verify the effect of the creatine supplementation associated to the weight training program on muscular strength in young women. Methods: Thirty-one women (20.2 ± 2.8 years, 58.8 ± 8.3 kg, 165.2 ± 5.2 cm) were divided by a double-blind design in creatine supplementation (CR, n = 16) or placebo (PL, n = 15) groups after 16 weeks of regular resistance training. The creatine supplementation or placebo (maltodextrin) was consumed in four 5 g/day doses during the first five days (20 g/day). Therefore, a single 3 g/day dose was ingested in the following 51 days. The muscular strength modifications were measured by the 1-RM test, applied in three exercises (bench press, squat and biceps curl) in two moments (pre-supplementation and post-supplementation) during the study. ANOVA with repeated measures, followed by the post hoc Scheffé test, when P<0.05, were used for data treatment. Results: In the exercise of bench press, the muscular strength increased significantly after the period even for the supplementation CR group (+7.7%, P <0.001) than PL group (+3.1%; P <0.001). However, there was significant difference in the post-supplementation moment among the groups (P <0.01). Besides that, in the squat exercise, a significant increase of the muscular strength was only observed in the CR group (+4.4%, P <0.001). In the biceps curl exercise, both groups presented gains of significant strength, CR group (+4.4%, P <0.001) and PL group (+5.1%, P <0.03), indicating an improvement in the performance of the pre-supplementation group comparing to the post-supplementation group. Conclusion: Based in the results, we can conclude that the creatine supplementation seems to enhance the gains of muscular strength in women included on a weight training program.

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FOOD INTAKE OF ADOLESCENT ELITE FEMALE ARTISTIC GYMNASTS IN TWO DIFFERENT SETTINGS (BUFFET VS. FIXED MENU) DURING PRESEASON TRAINING PERIOD

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Introduction
Competitive female artistic gymnasts dedicate a great deal of their day to training, and live outside their family environment from an early age. These athletes reach maximum performance during adolescence, a time in which nutrition takes on a crucial role. During the same training period we assessed food intake of these gymnasts following a buffet (B) or a fixed menu (FM).

Methods
Subjects were 16 Spanish adolescent gymnasts from the National Team. Ten gymnasts (age=16.1±1.4 yr; weight=45.5±6.5 kg, height=152.0±0.0 cm; BMI=19.6±1.9 kg/m2) were enrolled in B, and twelve gymnasts (age=15.0±1.7 yr; weight=42.5±3.9 kg, height=150.0±0.0 cm; BMI=18.7±1.1 kg/m2) in FM. Six from each group were evaluated twice. Diet composition was estimated by food weighing (Mettler-Toledo Scale with 1g accuracy) for 2 days. During the same days they completed a 24h activity questionnaire to provide energy expenditure estimation (EE(R)I). Results
Similar energy intakes (Kcal/d) and EER (Kcal/d) were found in B (EI=1998±246; EER=2113±121) and in FM (EI=2021±216; EER=2028±182). Energy distribution from macronutrients was modified toward healthier profile when gymnasts consumed FM, in which carbohydrates (%CH) increased from 48% to 56% (p<0.01) and lipids (%L) decreased from 34% to 25% (p<0.01). These positive modifications were especially significant in dinner (increased %CH (p<0.01) and decreased %L (p<0.01)). Moreover, absolute CH and L intakes (g/d) increased (p<0.01) and decreased (p<0.05) respectively in FM group. In both settings we found marginal micronutrient intakes (according to DRI’s) for %vitamin E, %calcium and %magnesium, but with setting B all of them were much more suboptimal.

Discussion/Conclusion
Although values of energy intakes in both setting were similar we found a better energy distribution when gymnasts consumed a FM, which could be beneficial to their successful performance due to body image and weight control are areas of concern in this sport. These young sport women did not select health food items and the marginal intakes increased with B setting. Nutritional counselling and intervention can be more effectively when suspected inadequate diets are confirmed with this type of studies. Nutritional education is necessary for elite sport teenagers because nowadays hotels and high performance centers tend to offer buffet setting)

References:

THE ANALYSIS OF THE RESPIRATORY FUNCTION IN MEN WITH ASTHMA IN RELATION TO OBESITY
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The recent research revealed that both obesity and the incidence of asthma and severity of its course has been increasing greatly over the last years [1,2]. There is also evidence that there is a correlation between BMI body mass indicator and increased risk of asthma. The aim if this study was the assessment of chosen parameters of the respiratory system in males suffering from asthma in relation to their obesity.

Material and methods
The object of the analysis was a group of 60 patients divided into three groups depending on the level of obesity estimated by means of BMI, WHR, LBM factors and fat body mass according to Wielinski formula [3] Group I were 20 obese men (average age is 59.9, bronchial asthma average duration is 19.7 years), group II were 20 overweight men (average age equal to 63.4, asthma average duration equal to 23.6 years), group III were the 20 men with regular body mass (average age equal to 62.1 years, bronchial asthma average duration equal to 19.6 years). The value of somatic traits were measured according to Martin’s and Seller’s technique [4]. Spirometry parameters was measured for all individuals. Measurement was made by FLOWSCREEN spirometer (780, 578, v. 1.3) Erich Jaeger, in sitting position. In an exerted outbreath trial the correlation between flow and volume of the expired air was analysed. The following parameters were used: FVC, FEV1, FEV1/FVC, PEF, MEF50, MEF25. Diagnosis of functional changes was conducted according to Quanjer’s criteria [5]. The results of investigations were analysed by means of Statsoft’s STATISTICA 6.0 analytics software package using of the basic descriptive statistics measures. To check that exist significant differences of mean values of investigated parameters between the groups, NIR, MANOVA test was used.

Conclusion: It was concluded that the average functional parameters of the respiratory system are considerably lower in the obese patients than in overweight patients and in patients with regular body mass. It indicates that obesity has an unfavourable effect on the respiratory activity.

References:

OXIDATION OF MALTOSE AND TREHALOSE DURING PROLONGED MODERATE INTENSITY EXERCISE
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University of Birmingham, United Kingdom

Purpose: The aim of this study was to compare the effects of trehalose (TRE) and maltose (MAL) ingestion on exogenous CHO oxidation rates and blood metabolite responses during prolonged moderate intensity cycling exercise. Methods: Nine trained subjects performed 3 randomly assigned bouts of exercise separated by at least one week. Each trial consisted of 150-min of cycling at 55% of maximal power output (Wmax) while ingesting a solution providing either 1.1 g/min TRE, 1.1 g/min MAL or water (WAT). Results: Total CHO oxidation rates were significantly higher (P < 0.05) in both the MAL (2.09 ± 0.18 g/min) and TRE (1.92 ± 0.32 g/min) trials compared to the WAT trial (1.62 ± 0.28 g/min). Peak exogenous CHO oxidation was significantly higher in the MAL trial compared to the TRE trial (0.91 ± 0.19 and 0.73 ± 0.22 g/min respectively, P < 0.05). The MAL trial resulted in significantly reduced endogenous CHO oxidation rates compared to the WAT trial (0.72 ± 0.25 and 1.62 ± 0.28 g/min respectively, P < 0.05). When compared to the WAT trial, total fat oxidation over the same period was significantly reduced in both CHO trials (0.91 ± 0.19, 0.68 ± 0.19 and 0.79 ± 0.19 g/minWAT, MAL and TRE respectively, P < 0.05) and tended to be lower in MAL compared to TRE (P < 0.06). Discussion: Both solutions maintained high plasma glucose concentrations. MAL had a sparing effect on endogenous CHO stores. The reduced exogenous CHO oxidation rate of TRE compared to MAL is probably due to a reduced enzymatic hydrolysis rate within the small intestine, causing a slower delivery to the muscle.

BODY COMPOSITION CHANGES DURING TWO SEASONS IN ELITE SOCCER PLAYERS, WHOSE NUTRITION CONDITIONS WERE CONTROLLED
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The object of this study was to examine the changes in the body composition of elite professional soccer players during two seasons, whose nutrition composition were controlled, and to determine the effects of nutrition and body composition control on soccer players.
18 soccer players of the professional soccer league of Turkey (age 24.6±4.1 years, height 180.7±4.8 cm) participated in the study. In order to determine the body composition in total 10 anthropometrical measurements have been made during two seasons in intervals of 2 months. Skinfold thickness was taken from eight different locations of the body (Holtain caliper: 0.02mm sensitive) and the Yuhazs formula was used for calculating the body composition. For the arrangement of their nutrition plan, the nutrient elements equal to the energy to be taken daily as to the ideal body weight of the players have been determined, and this information has been conveyed to the players. On days, on which extensive single trainings of one and a half hour were performed, the daily needed average energy was 3484.6±28 kcal in the 1st season and 3499.5±28 kcal in the 2nd season. According to the results of each body composition measurement, the nutrition program of the respective player has been arranged again. In the statistical evaluation of the difference between the measurements the Paired-Samples T test has been used. The following values were obtained for the anthropometrical measurements: body weight was respectively for the first and second season 76.9±6.6 - 77.4±6.8 kg, BMI 23.4±1.1 - 23.5±1.4, FFM 68.7±5.7 - 69±5.8 kg, fat 10.6±1.2 - 10.7±1.6%, and fat mass 8.2±1.4 - 8.4±1.4. No significant difference (p>0.05) have been found between all measurements performed in both seasons. As a result, it has been understood that fat-free body weight losses affecting performance are inhibited in soccer players, whose nutrition and body compositions have been controlled during the whole season.

EFFECT OF SHORT-TERM ARGinine SUPPLEMENTATION ON NITRIC OXIDE, VASODILATION, AND PERFORMANCE IN ATHLETES

Liu, TH., Lo, YW., Wu, Cl., Chiang, CW., Chang, CK.
Taiwan Sport University, Taiwan

It has been shown that supplementation of arginine could induce vasodilation via increased nitric oxide (NO) production. The purpose of this study was to investigate the effects of short-term oral supplementation of arginine on endothelium-dependent vasodilation (EDVD) and exercise performance in well-trained athletes. This study used a cross over design. Ten male college judo athletes completed arginine trial (ARG, 6 g/d for 3 d) and placebo trial (CON) in a random order. Sixty minutes after consumption of the last dose of arginine or placebo, the subjects underwent a repeated high-intensity anaerobic test on a cycle ergometer (resistance 0.05 kp/kg BW, each set contains 20 sec all-out exercise and 15 sec rest, total 13 sets). Blood samples were obtained via an indwelling cannula before, during and 0, 3, 6, 10, 30 and 60 min after exercise. EDVD were measured using a photoplethysmography before and after exercise. There was no significant difference in peak and average power in each set of exercise between the two trials. Nitrate and nitrite (NOx) concentrations were significantly higher during and 6 min after exercise compared to pre-exercise levels in both trials. ARG showed significantly higher stiffness index than CON at 3 min after exercise. No significant difference was found between the two trials in plasma NOx, reflection index, stiffness index, and heart rate at other time points. The results suggested that short-term arginine supplementation had no effect on NO production, EDVD, and anaerobic exercise performance in well-trained male athletes.

ERASMUS MUNDUS MASTER IN ADAPTED PHYSICAL ACTIVITY: AN IDEAL STRUCTURE FOR INTERCONTINENTAL COOPERATION IN TEACHING AND RESEARCH

Djobova, S., Dobreva-Faria, I., Vancoppenolle, H.
National Sports Academy, Bulgaria

In January 2005, a proposal for a joint Master Program in Adapted Physical Activity (APA) was selected for a period of 5 years, under the call of Erasmus Mundus Master Programmes from the European Commission. Erasmus Mundus aims to enhance the quality of higher education in Europe by improving the cooperation between European Universities and providing a joint diploma for non-EU and EU students. The European Consortium is formed by the K.U.Leuven (Belgium), Norwegian School of Sport Sciences (Norway), University of Limerick (Ireland), Palacky University of Olomouc (Czech Republic). The Erasmus Mundus framework allowed us to extend the original European Master in APA beyond the borders of Europe by providing substantial scholarships for both students and scholars from outside Europe to either attend or teach in the course. A partnership was established with three non-European Universities as well - the University of Queensland (Australia), the University of Stellenbosch (South Africa) and the University of Virginia (USA). In the dynamically changing world, the issues of globalisation certainly influence the sustainable development of APA as an academic discipline. This presents a significant challenge for the European APA scientists. In terms of the internationalisation process, the objectives of the Partnership between the Consortium and the non-European universities are to discuss means of co-operation through exchanging expertise in teaching and research. At the time of increasing demands toward the service provision, our aim is to reach excellence in the preparation of human resources with essential scientific backup in the area of APA. The international cooperation will enable students and academic staff to gain experience abroad which in term will enrich our European programme with intercultural aspects. Since the development of the science of APA has older traditions in North America and Australia as compared to Europe, this partnership will contribute to the European developments in APA. The program has duration of 1 year, consists of 60 ECTS and involves a study period in at least 2 of the 4 consortium universities within Europe. It is a postgraduate university program, providing a state-of-the-art on research and teaching methodology in adapted physical activity (APA), and the social, pedagogical, and technical aspects of physical activities and sports, adapted to the needs of the persons with a disability. A unique feature and an example of best practice is the fact that every year EMMAPA gathers together in one place the top experts from all over Europe in the field of APA. Every year the best professors in the APA field from all over the world have been invited to come and give presentations as well. This opportunity gives numerous benefits, mainly in terms of students’ knowledge and awareness towards the latest developments and research in this specific academic area.

PP-OS01 Other Sciences

ERASMUS MUNDUS MASTER IN ADAPTED PHYSICAL ACTIVITY: AN IDEAL STRUCTURE FOR INTERCONTINENTAL COOPERATION IN TEACHING AND RESEARCH

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SPORT, ALCOHOL SPONSORSHIP REGULATIONS AND YOUTH DRINKING: A STATUS REPORT

Sparks, R., Pinsky, I., Castaneda, L., Jette, S.
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This presentation examines the current status of international efforts to restrict alcohol sponsorship of sports and cultural events as a means to limit youth exposure to potentially harmful messages that associate drinking with social status, sexual prowess and health. Sport, as defined by the ECSS, has a broad range of individual, group and population-level benefits, including physical fitness, mental well-being, social relationship formation and enhancement, and personal and collective self-expression and identity formation (www.ecss.de). These benefits are becoming better documented, as are best practices for configuring, implementing and conducting sports activities in ways that capitalize on sports’ benefits. Nevertheless, in many countries the broader social practice of sport still engages ulterior activities such as smoking and drinking that can detract from these benefits, and public messages about sport are integrated with commercial messages about tobacco and alcohol products and the benefits of their consumption. While regulations governing tobacco sponsorship and sports-related tobacco marketing are becoming more widespread, alcohol regulations are much less developed globally (Sparks et al., 2005). One reason for this is that the epidemiology of alcohol use has not been as widely studied in the sports context, particularly among youth.

What is clear at this juncture is that the celebratory context and group cohesive and culturally expressive force of sports is a highly productive and profitable framework in which to market alcohol products, particularly beer. It is also clear that major transnational breweries such as Inbev, Heineken, Anheuser-Busch and SABMiller are increasingly using sports and cultural events as opportunities to build brand equity among youth, maximize market penetration and increase sales as they jockey for position within an emerging oligopoly in the global beer industry. The presentation provides a summary of global regulations in alcohol sponsorship and evaluates the efficacy of these regulations in view of the marketing practices of the beer industry. Case examples are taken from the EU (Portugal and Latin America) and Brazil. Issues raised include the health burden of drinking rates among youth, the ineffective nature of current regulations, and the innovative capacities of the alcohol industry including its ability to capture the attention and interests of youth. The presentation concludes with suggestions for how to better regulate alcohol sponsorships by using a transnational regulatory model similar to the WHO Framework Convention on Tobacco Control.

A SURVEY ABOUT THE PERFORMANCE OF IRAN SPORT FEDERATIONS AND ORGANIZATIONS IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

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Aim: The world web sites are charged as a useful media for communication the knowledge and information on sport society union. These webs are the gates of distributing the special information, the same organization, and the mentioned information is a kind of expressing about the same organizations for its partners, the aim of this survey is the investigation about the situation of Iran sport federations and organizations web-sites, based on public and specific evaluation.

Procedure: The attendant survey is related to investigate on 78 web-sites on Iran sport sport federations and organizations by using the modern abilities and possibilities in three motor search as like Google, Yahoo and Lycos in the regions of com, ir, org. we could not get to 22 sites through these 78 sites, the instrument of Data gathering and evaluation list have prepared some fields caused of question standable by experts and was possible that we could get a primary studying in context by kranbakh alphabet (82%).

Results: some results of this survey are as following:

1-57.1% of these sites are becoming up-to-date, and through these sites we have only 7% sites that they are up-to-date in 24 hours a day and night.
2-The access speed to the Electronic address is 78.6% and the access speed to the joints is 37.5% and they are evaluated in good rate.
3-62.3% of these web-sites acted uncompleted and 76.8% of them did not answer to messages at all.
4-In 65.6% of these sites have not been declared institutional and scientific articles.
5-68.23% of them paid attention to Athletic News, 57.87% to domestic News, 9.55 to Sport for All, 5.62% to sport events and 2.07% to women sport.
6-In a comparison there is a noticeable and significant relation between the Athletic and public sports (r=-0.351, p= 0.01)
7-There is a noticeable relation between the lack of attention to public sport and woman sport that it was on the level of 0.05% on web-sites.

Discussion: based on the survey results the sport federations and organizations in Iran acted weekly in declaring the information sources, and also their attendance in different web-sites all over the world is not regulated and also is not on a correct program and political procedure. So, it is suggested that these kinds of organizations will be programmed according to international big political procedure in web-sites and fields to communicate the mentioned information to their partners and audiences all over the world.

THE MANY FACES OF THE LINEAR MIXED-EFFECTS MODEL: APPLICATIONS TO SPORT SCIENCES DATA

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Repeated measures, longitudinal data and multilevel data arise frequently in sport sciences due to the high statistical power of the corresponding experimental designs. Such grouped data are commonly analysed by repeated measures analysis of variance (ANOVA) but it requires making stringent assumptions (compound symmetry), needs balanced data (no missing value) and lacks flexibility. The linear mixed-effect (LME) model from Pinheiro and Bates (2000) combines the usual parameters describing the fixed effects in the population and the random residual errors with a new feature: a random part describing the effect of the grouping factor (ie. usually the subjects) which leads to a natural modelling of the within-groups correlation, especially in longitudinal data. Moreover, a freely available package (nlme) extends the R statistical software for plotting grouped data, estimating LME models and testing hypotheses. Computer operations are detailed in an accompanying research report (freely available from the authors) based on four real sport sciences examples from a variety of research areas: neurosciences, psychology and kinesiology. First, nine novice skiers performed a course inspection before the start of the competition. Motor imagery times were recorded after the reconnaissance, before the start and after the physical performance. These times were compared with their actual durations. The [4] missing values problem was solved in this repeated measures ANOVA setting by the LME model.
Second, four groups of 24 subjects were studied: sedentaries, climbers, handball players and sprinters. Their capacity of temporal anticipation was tested in four reaction time tasks with variable foreperiod duration. The LME model was used to analyse the effects of sporting activity and experimental task on their performance.

Third, two groups of inmates (11 sedentaries and 15 sportmen) were compared to study the effect of physical practice on the evolution of stress (measured six times) in prison. Three covariates were considered: age, time spent in detention and penal status. An analysis of covariance, including repeated measures and many missing values, was performed as a LME modelling.

Finally, the electromyographic (EMG) activity of three lower limb muscles was recorded in 21 non cyclist subjects while pedalling on a bicycle ergometer at five cadences. The LME model was used to describe the influence of cadence on EMG responses for each muscle separately and to compare these muscles in a multilevel data framework.

In these examples, the LME model appears as a very versatile statistical tool which allows an easy modelling of grouped data. It may thus be considered a reliable and useful extension of the repeated measures ANOVA, especially by handling missing values, covariates, heteroscedasticity and ad hoc correlation structures.

References:

QRS DETECTION ACCURACY STRONGLY INFLUENCES MEASUREMENT OF HEART RATE VARIABILITY IN HYPERTERMIA

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Purpose: To investigate the effects of ECG QRS detection algorithm and fiducial point selection in measurement of heart rate (HR) and common indices of heart rate variability (HRV) under hypertermic treadmill walking.

Methods: A single subject walked on a treadmill to exhaustion under hot conditions (room temperature 50°C, relative humidity 50%) whilst being monitored by single lead ECG in a lead II configuration. Two different implementations of a popular QRS detector (Pan, Hamilton and Tompkins) were used to locate R-waves for subsequent HR and HRV analysis for standard deviation of RR intervals (SDNN) and low frequency/high frequency (LF/HF) ratios. A third algorithm using matched filtering was used to accurately locate R-waves as detected by Hamilton’s open source implementation and the resulting HRV parameters compared with the results of the original two algorithms.

Results and Discussion: At rest, all three algorithms produced similar results for HR and the HRV indices. Treadmill walking under hot conditions led to increased HR and decreased overall HRV as measured by SDNN. At exhaustion, all three algorithms produced similar HR, but different HRV measurements, which varied by as much as 10:1 for LF/HF ratio. Examination of the detection points showed the differences in HRV measurements were due to a combination of missed beats and irregular reference point locations. These inaccuracies can become particularly large when HF energy is low, which could lead to very different interpretations of the results in terms of sympathetic/parasympathetic balance.

Conclusion: Precision of QRS reference point location is of vital importance in measurement of HRV, particularly when overall HRV is low. Knowledge of the ECG signal (as opposed to a simple list of RR intervals) is very useful as it allows the researcher to examine accuracy of fiducial point locations.

FIGHTING SPORT PROJECT 2000: CREATING A SOFTWARE FOR TRAINING PROGRAMMING IN COMBAT SPORTS

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Introduction
In modern combat sports and martial arts competitions, the training and the high level of specialization of the athletes, play a key role. Therefore is very important to program and plan training in a functional and scientific way.

Filling in a questionnaire, the 95.65% of Italian Karate technicians said to know the advantages of training programming, but only the 86.96% of them actually plan their work. Moreover, only the 22.61% of them stated to know software for training programming, but only the 64.35% of them would be interested in specific software for Karate programming.

On the basis of those data, we thought to create a software based on the basics of training methodology, which might suit Karate technicians needs.

FSP 2000 features
FSP 2000 was created taking the cue from several software employed in other disciplines, such as those of the TOP series of the Prof. Pellis, the Pro Pulses Perf of the Prof. Cometti, the Pro Judo 4 of the Prof. Villani, etc... The software is able to plan trainings starting from the age and the technical-athletic features of each athlete, identifying the program’s objectives through the so called match analysis method and questionnaires (those functions are included in the software).

Such trainings might be organized following the classical model of periodization (Matwejew, Tschiena) or the blocks one (Vercosaszkij), or also mixed models. With FSP 2000 you can decide what to do during your training session: Karate's agonistic training or technical teaching (low level belt and young activity). The performance of each exercise is shown by a descriptive and a multimedia section (through video and images). You can also choose the parameters of the exercise: execution time, recovery time, repetitions, series, volume, density, intensity, loading percentage. The software is able to display the trend of the training’s loading, both for a single session and a longer one, through the intensity/volume chart and the time sharing for each objective.

Conclusions
FSP 2000 is ever growing in order to meet every problem and variable the modern theory and methodology of training and the several needs of sport technicians present.

Now we are modifying some program’s functions to optimize the programming process and we are trying to adapt it to the needs of others combat disciplines (judo, wrestling, boxing, TKD, kick boxing...).

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Matwejew L.P.: La periodizzazione dell’allenamento sportivo - S.d.S. - CONI 1978
Roberto Villani, Programmazione computerizzata dell’allenamento specifico del judoka, IUSM, Roma, a.a. 1999-2000
EVALUATION OF VISUAL POSITION ESTIMATION IN BEACH VOLLEYBALL USING COMPUTER VISION

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In nearly every sports game, coaches are interested in the position of the player during action. For notational analysis of positions, it is common to divide the playing field into zones. For reasons of economy and usefulness an unequal division of playing area is often used (Hughes & Franks, 2004). In beach volleyball the area near the net is of great importance for setting and therefore often defined finer. But the absence of center and attack line and also the distortion caused by the perspective view complicates orientation and assignment to zones for analysts. Nevertheless positions are often estimated with the naked eye due to a lack of available systems or because of high costs.

The aim of this study is the comparison of position estimations by humans with computed measurements. We measure play field positions and the particular zones, using the perspective image transformation between image coordinates and world coordinates of the play field. Assuming a normal distributed measurement error with a variance of 2.5 pixels, evaluated over 2000 user clicks, plays field coordinates and their uncertainties are computed. A detailed description of this uncertainty model is given in Criminisi (1997).

In total, we analyse the results of 14 participants, estimating the positions of the setter at the moment of ball contact in 150 video clips. The playing field was recorded from an elevated position behind the baseline. We divided the playing area into 4 zones at the net border and 2m distance to the net and one zone containing the rest of the playing field. Every clip includes 2 seconds before and after the setter touched the ball. In a first round the participants were asked to assign the position to one of the 5 zones. In the second round test persons marked the position of the setter by clicking on the foot position.

Results prove that humans have great problems in position estimation. Merely 59% votes match to the calculated results. This means that in 41% of all cases people have been fooled. Especially the estimation of the distance between the net and the player induced wrong decisions (82% of all errors). In contrast the assignment towards the 4 zones along the net seems much easier (18%). Findings also reveal that assignment at the court behind the net (44% incongruities) is more difficult than in front (38% incongruities).

In conclusion we found that visual position estimation by humans is very error-prone. Therefore solutions as presented are a great relief in notational analysis. In future projects we want to investigate the effects of a moving camera when analysing positions in sports games. Furthermore we are interested in the influence of different camera perspectives and how visible marks improve the estimating process.

References:

PROCALYSIS: A SOFTWARE TOOL FOR NONLINEAR TIME SERIES ANALYSIS IN SPORT SCIENCE

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The various complex processes in sport can be conceptualized in the framework of dynamic system theory. At least four interrelated hierarchical systems should be considered. 1. The molecular and cellular system, 2. The physiological and psycho-physiological system, 3. The meta-neuronal system, and 4. The social system. The complexity of these system interactions genuinely result in nonlinear and transitional dynamics. In this context Nonlinear Time Series Analysis (NTSA) of one or multiple system parameters provide a promising methodology for comprehension of the facet system outputs in sport processes.

The advent of digital technology and sophisticated algorithms has revolutionized analytical procedures in almost all scientific disciplines. In this context NTSA algorithms were developed e.g. for physiological routines, such as EEG, EMG and ECG. The adaptation or routine employment of NTSA algorithms to the practical sport settings, however, is still hampered by the lack of appropriate software tools, or simply those available fail to provide properties needed for scientific tasks.

We therefore defined specifications, designed and developed a software tool which we termed Procalysis which answers to the needs of scientific and professional environments. In summary, those needs are: 1. experimental and routine data analysis supplied as in conventional tools and, as a key to manageability, 2. data organization. The latter provides a multi-user environment allowing team members work simultaneously, organization of data and sharing primary (raw) and secondary (analyzed) data objects and documents. The architecture developed to meet and the workflow to apply these needs is graphically displayed. First testing suggests widely improved scientifically relevant functions.

We have previously shown that using functions to analyze complex data patterns reduced time spend on data analysis by 85%. This efficacy was further greatly improved by features paralleling work needed in experimental work environments. Applying these procedures in a professional sport environment or extended scientific projects with excessive data loads helps maintain these data structured and secures job efficacy. Sophisticated safety features embedded in Procalysis protect data from unauthorized access.

PREDICTORS OF METABOLIC ENERGY EXPENDITURE FROM BODY ACCELERATION AND HEART RATE MEASURES IN NEW GENERATION COMPUTER GAMES

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INTRODUCTION: Individuals that successfully overcome obesity often have difficulty maintaining weight, fitness and physical activity (1). Adolescents spend most of their leisure time in front of the computer or TV screen, excluding sleeping hours (2). New generation active computer games use this time to stimulate movement. However, game design lacks fundamental knowledge about the correlation between energy expenditure and the body movement. It is questionable whether the very successful single arm movement tennis game (Nintendo, Wii) consumes comparable metabolic energy as the whole body active game (Playstation, EyeToy Kinetic).

The purpose of the study is therefore to first report the differences in energy consumption, heart rate and kinematics between the Nintendo Wii tennis game and the EyeToy Kinetic whole body active game. Second to define predictors of metabolic energy expenditure from heart rate and body kinematics.

METHODS: 20 subjects (age 22-25 yrs, BMI 20.8-24.5) performed a 10 min Nintendo Wii tennis and EyeToy Kinetic game. The order of the games were randomized, second game started when heart rate was at rest level. On separate days before the intervention, subjects were familiarised with both games. Spiroergometry, heart rate (K4, COSMED) and whole body kinematics (Vicon MX-460) were meas-
RESULTS: Heart rate and energy consumption were significantly higher in EyeToy Kinetics whole body game (p<0.001) and (p=0.003) respectively. Best predictors for energy expenditure were the acceleration of the thighs followed by those of the trunk.

DISCUSSION AND CONCLUSION: The results show clearly that the EyeToy Kinetic whole body game consumes significantly more energy. This might be explained by the more intensive movement of the legs compared to the Nintendo console tennis game since thigh movement was the best predictor for all subjects for the energy consumed in all interventions. A sound physiological explanation is that large muscle mass is involved into leg movement. Game designers are therefore advised to increase leg movement during game play to intensify the energy expenditure.

References.

TRANSFER FUNCTION PREDICTION OF CORE TEMPERATURE FROM FOREHEAD AND CALF TEMPERATURES IN HOT ENVIRONMENTS

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Purpose: To determine the feasibility of using generalized transfer functions (identical transfer function parameters for an entire population) to permit estimation of body core temperature from forehead or calf temperature measurements in hot environments.

Methods: 15 subjects (10 male, 5 female) ages 23 - 40 were subjected to hot conditions in an environmental chamber (mean 50ºC, 50% RH) for an average of 20 minutes in which they undertook a variety of tasks (10-15 minutes of walking, followed by resting, then psychological and neurological testing). No form of body cooling was used. Subjects wore light clothing without head cover. Core temperature was measured by radio transmitter temperature capsule (Jonah TM, Mini Mitter) whilst forehead and gastrocnemius medialis temperatures were measured by skin temperature patches (Mini Mitter). MATLAB TM System Identification Toolbox was used to determine the best transfer functions that related inputs (forehead or calf temperatures) to output (core temperature), after the forehead temperature exceeded core temperature for each subject (below this point the core temperature remains fixed near 37ºC so linear transfer functions are not suitable models).

Results: Second order low pass filters were found to accurately model core temperatures from forehead temperatures or calf temperatures with generalized transfer functions. Pearson correlations were 0.93, 0.94 and 0.99 with RMS errors of 0.27ºC, 0.27ºC and 0.1ºC for forehead, calf and forehead+calf temperature inputs (p < .001 for all).

Discussion and Conclusion: The Critical Internal Temperature hypothesis suggests that humans reach exhaustion at core temperatures near 40 ºC, independent of physical activity. It would be therefore beneficial to measure core temperatures in people at risk of hyperthermia, such as those who work outside in hot climates. However, continuous estimation of core temperature is not a trivial task. The wireless transmitter pills used in this experiment are expensive when used many times. Temperature sensors inserted in the ear canal can be uncomfortable in field use and their accuracy has been questioned in comparison with true core temperature. Although the environmental conditions in this study were well regulated, the generalized transfer function approach permitted good estimation of core temperature. Further studies with larger number of subjects, under different environmental conditions and clothing types are warranted.

SPORTS SOCIETIES AND ORGANISATIONS AT THE TURN OF THE 19TH AND 20TH CENTURY IN PSKOV PROVINCE

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Velikie Luki State Ac demos of Physical Education and Sport, Russia

Introduction. The history of physical training and sports of Russia at regional level is studied insufficiently. Especially it concerns the period of occurrence of sports movement organisations at the turn of the 19th and 20th centuries.

The purpose. 1. To reveal all sports societies and the organisations of the Pskov province at the turn of the 19th and 20th century (till 1917).
2. To classify them according to their goals.

Methods: Problem-chronological, comparative-historical, historic-typological, statistical, local (studying of the sports organisations in concrete region).

Results. There were 2 types of sports societies at this period. The first type developed only one sports event. They are: The Pskov gymnastic society that was the first officially registered in the territory of Pskov province. It was founded by the German lived in Pskov. The Pskov society of bicyclists, the Bezhanitsky society of skiing, the society of athletics and physical development in Pskov, the gymnastic Society ‘Falcon’ in Phlom, the Pskov gymnastic society ‘Falcon’ that was founded by the Czech experts V.L.Sedijachik and K.M.Kovarzh. The chair- man of the society (A.G. Goltib) was included in Council of the Russian “Falcons”. K.M.Kovarzh was the participant of the second generally congress of the Union Russian “Falcon” in Kiev in 1913. The Pskov chess circle. Some “chess maestro” H. Kapablanka (the future World Champions), Znosko-Bohrovsky, Z. Tarrass visited Pskov.

The second group didn’t focus main sports event but gave the opportunity to their members to take different kinds of sport (The Pskov society of fans of sports, the Opochetks society «Health and force». Its purpose was to promote physical development of persons of both sexes. Its chairman was a woman. The Pskov society of assistance to corporal education of studying youth. The Purpose was.” to pro-mote of corporal education of pupils in educational institutions of Pskov and to unite, whenever possible, all actions in the field of school sports«. The society «Sports and education» in Pechory.)

Conclusion. During the carried out research there were established that at the turn of the 19th and 20th century in Pskov province there were 11 sports societies with different goal orientation. Among them there were 9 officially registered and 2 without registration (The Bezhanitsky society of skiing, «Sports and education» in Pechory).

SPORT CREED BETWEEN ISLAMIC REFERENCE AND GLOBALIZATION ORIENTATIONS

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Helwan Un - Suez Canal Un, Egypt

Islam considers sport as a valuable part of the civilisation and the historical tradition. Physical activities are to be found in numerous and various cultures and they existed long before the 6th century, the time when Islam emerged. Prophet Mohamed practiced sport and he
encouraged men and women to follow his example. There are many Islamic texts which refer to the benefits of physical activities and which give guidelines how to practice sport. Basis of this paper is a historical and philosophical analysis and an interpretation of Islamic texts which show that Islamic laws with regard to sport are consistent with human, moral and social values all over the world. Thus, Islamic rules do not conflict with sport activities.

HORSEBACK ARCHERY OF JAPAN: FOCUSED ON THE EXISTING SKILL, YABUSAMÉ
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At the end of the 11th Century, a powerful battle skill called horseback archery existed in Japan. It combined the mobility of a horse with the bow and arrow. Horseback archery was renowned as 'an archery horse's way', and regarded as an important battle skill at the time. Because horseback archery is the combination of archery and horsemanship, great skill was required in both areas. Warriors devoted many hours of dedication and great expense to this practice horseback archery was certainly not easy to master.

When training, the warriors mainly practiced three skills known as kisha mitsumono. The first was called yabusamé, where they would shoot three targets at a gallop, one after the other. The second, kasagaké, involved shooting one target placed far away, again while galloping. The third was inu-umono, in which warriors had to shoot a dog released in the training grounds while on a horseback. Although horseback archery played a vital part in warfare, as time went by it was used less and less. There is no exact theory behind why this happened, but factors such as changes in the army formations, weapon-manufacturing skills, and military strategy could have had an effect on its decline. Despite this, horseback archery remained known as a warrior's finest skill. In present day, the only skill of kisha mitsumono that is still practiced is yabusamé. It has been preserved under the rule of Edo Shogunate as Ogasawara-School, and under the Higo Hosokawa feudal domain (currently the Kumamoto Prefecture) as Takeda-School. Conventional skills have been preserved in both schools, but neither is considered a practical form of martial art.

The difference between horseback archery performed by warriors in the past and horseback archery of today lies not only in the skills of the riders but also in the horses. If there is renewed study of classical horseback-archery techniques, then it is thought that such would enable linkage to a more faithful and true preservation of tradition.

Poster presentations (PP)

DETERMINATION OF PHYSICAL FITNESS AND MOTOR ABILITIES OF 10-15 YEARS OLD PUPILS IN AUSTRIA
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Many teachers and coaches perceive the decline of the physical fitness of Austrian Youngsters. Based on the latest countrywide data collection in 1995, this study aimed to get a current insight into the physical performance level and motor abilities of the 10-15 years old pupils in Austria. Furthermore the collected data should be used as reference data for age- and sex-dependent inter- and intrindvidual analyses.

In order to provide a countrywide data collection and a sustainable usage of the gained results teachers all over the country were asked to conduct a 5-tests battery, which focuses on the items: speed, leg strength, arm and upper body strength, coordination, and endurance. In addition to the fitness data parameters like sex, age, body weight and height, school type, class type, county and school environment have been collected. Between March and June 2007 data from more than 40.000 pupils (age/percentage of universal set: 10/1,3, 11/11,1, 12/40,4, 13/28,6, 14/11,5, 15/3,3) were collected. The distribution between the sexes was approximately the same. The data were analysed by descriptive statistical methods. The statistical analyses show worrying results. Despite the favourable physical viability girls between the ages 10 and 15 disclose nearly no development in their performance level in all analysed fitness parameters. Boys reveal in speed, leg and arm strength a recognizable development in their performance level, but their motor ability and endurance level remain static like the ones of the girls. As expected pupils in sport classes showed better results in their fitness level which they are also able to improve better than the pupils in regular classes during adolescence. Considering the school type independently of their sex pupils in grammar school reveal nearly in all analysed fitness parameters and at all age groups a higher fitness level compared to comprehensive school pupils. Furthermore our study denotes that pupils aged 10 to 15, regardless of their sex, have a higher BMI than the reference data of the WHO/AGA whereas comprehensive school pupils have a much higher BMI compared to WHO/AGA reference data.

This study approved the perception of teachers and coaches that the physical fitness level and motor abilities of the Austrian Youngsters is really alarming. To get a more detailed insight into the health beneficial factors apart from school and class type additional sociocultural factors should be revealed. For example the living conditions, peer group or sports club membership, daily physical strains, etc. should be surveyed. Similarly to a recent health survey in England, we also detect a worrying increase in the BMI, which appears to have the similar relation in the class and school type like the analysed physical fitness parameters.

EMPE: BRAZILIAN YOUNG ADULTS SPORTS PARTICIPATION MOTIVATION ASSESSMENT
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The present study aimed to investigate the Participation Motivation Questionnaire (PMQ. Gill et al., 1983) validity and reliability after its adaptation to assess Brazilian young adult athletes participation motivation in sports. Beaton et al's (2002) recommendations were followed for cross-cultural instruments' adaptations. An experts' commission assessed the content validity. Three health-related questions were added to the original 30 PMQ items after athletes’ suggestion during the pilot study, and the original 3 points Likert scale was replaced by an 11 points interval scale (from 0 to 10). After collecting data among 132 intercollegiate athletes (64 men and 68 women),
We observed that 19% of students have overweight and 5.6% obesity. These initial results show us that PE in school needs to integrate...

Boys had significantly higher % fat free, weight and abdominal girth, while the girls had a greater and higher % of body fat. Used in data analysis. To analyze the body mass index for overweight and obesity by sex we used the international reference table of health status measures. Institute of Work & Health, American Academy of Orthopaedic Surgeons (AAOS), 2002.

Among the new challenges facing the school are those resulting from the increase of obesity in school population. The World Health Organization’s report (1997), states that the prevalence of childhood obesity is increasing rapidly around the world. This trend is a sign for the school and mostly for Physical Education (PE) in school. Innovation in PE obliges to take into account these new problems in order to get proper answers for student’s new needs. Furthermore, between the roles of the current PE is its contribution to health education. This study is part of a broader study where health is considered as an educational category and whose purpose is to assess sport activity and health indicators among school population. The sample was made of 1172 students of both gender of seventh to twelfth grade (ages ranging from 11-19 years) from 13 schools of the metropolitan region of Porto. We considered indicators of weight, height, % body fat, % fat free mass, abdominal girth and body mass index. Basic descriptive measures and student t-test from independent measures were used in data analysis. To analyze the body mass index for overweight and obesity by sex we used the international reference table of health status measures. Institute of Work & Health, American Academy of Orthopaedic Surgeons (AAOS), 2002.

We observed that 19% of students have overweight and 5.6% obesity. These initial results show us that PE in school needs to integrate these data in order to redefine sport activities and PE classes that can also include long-term sport practice.

HEALTH INDICATORS AMONG STUDENTS FROM SEVENTH TO TWELFTH GRADE - IMPLICATIONS FOR PHYSICAL EDUCATION IN SCHOOLS

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Among the new challenges facing the school are those resulting from the increase of obesity in school population. The World Health Organization’s report (1997), states that the prevalence of childhood obesity is increasing rapidly around the world. This trend is a sign for the school and mostly for Physical Education (PE) in school. Innovation in PE obliges to take into account these new problems in order to get proper answers for student’s new needs. Furthermore, between the roles of the current PE is its contribution to health education. This study is part of a broader study where health is considered as an educational category and whose purpose is to assess sport activity and health indicators among school population. The sample was made of 1172 students of both gender of seventh to twelfth grade (ages ranging from 11-19 years) from 13 schools of the metropolitan region of Porto. We considered indicators of weight, height, % body fat, % fat free mass, abdominal girth and body mass index. Basic descriptive measures and student t-test from independent measures were used in data analysis. To analyze the body mass index for overweight and obesity by sex we used the international reference table of health status measures. Institute of Work & Health, American Academy of Orthopaedic Surgeons (AAOS), 2002.

THE RESEARCH CENTRE OF PHYSICAL EDUCATION AND SPORTS OF CHILDREN AND ADOLESCENTS (FOSS); AIMS AND RESULTS OF THE TRIAD-CONCEPT OF RESEARCH, EDUCATION AND TRAINING PROGRAMS, AND TRANSFER OF KNOWLEDGE

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Starting position:
The university location of Karlsruhe should get a country- and nationwide unique reputation in the domain of school and movement research by the foundation of the FoSS. This goal should be accomplished via practical research in sports, play and movement, as well as the development of teaching programs, and the transfer of knowledge.

Therefore an agreement was signed between the University and the ministry for science, research and art (MWK) of the federal state Baden-Württemberg for a period of four years (2004-2008). Based on this agreement the FoSS was built up with the status of a project and with a budget of 180.000 Euro per annum. The same benefit was contributed by the University of Karlsruhe (TH).

Structure, Goals and Implementation:
The objective of the University of Karlsruhe (TH) and the University of Education (PHI) Karlsruhe under one umbrella is a unique structural characteristic of the FoSS. The institutes of sports science of both universities work in close collaboration in the fields of sports and physical activity of children and adolescents.

The structure of the FoSS consists of an executive board including the managing director, an advisory board, a coordination office with one staff, and two and a half staffs for research, teaching, and transfer of knowledge. The topics of the FoSS are: (1) development, implementation and evaluation of intervention measures in different settings like school, kindergarten, and sports clubs, (2) effectiveness analyses of intervention processes in different action fields like PE, sports in school, health sports, competitive sports of young elite athletes or integration sports, (3) development of materials for lessons, education and training (4) services and advice for different institutions, including scientific policy advice.

Results:
Within the last three years we built up a network with local, regional and national partners. Together with these partners we were carried out 63 projects: 26 in research and development, 16 in education and training, 5 in service, and 16 events for the transfer of knowledge.

The duration of the projects is up to four years. Third-party funds of 800,000 EUR were raised since 2005. Thereby the scientific and teaching staff could be increased by four half-time positions per annum. To transfer the results of our projects, and to improve our network, we co-organized for instance the national Children Congress in 2007 with round about 800 participants.

Conclusion:
The results show, that the concept of the FoSS is successful. To verify this, the FoSS was evaluated in 2007. Four international experts evaluated the FoSS in its concept, its structure and its results. Based on their report the University of Karlsruhe (TH) and the MWK have decided to enhance the FoSS in a second phase. At present, a subsequent agreement on objectives is prepared.

References:
THE TRANSFORMATION EFFECTS OF THE RHYTHMIC GYMNASTICS BASIC BODY ELEMENTS APPLICATION IN PE CLASSIS’ ON THE SOMATIC DEVELOPMENT IN CHILDREN (AGED 9-10 YEARS)

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Rhythmic gymnastics belong to one of the oldest Olympic sports and, as such, it found its place in the programs of physical education teaching at elementary and secondary schools, from the very beginning of the organized studying of physical training. Our research tried to establish whether the systematic application of the elements of rhythmic gymnastics during the regular classes of physical education, could influence the improvement in morphological characteristics among the schoolgirls of younger school age. The research has been realized on the sample of 105 examinees divided into two sub-samples, experimental and control group. The subject were 3rd and 4th grades (between 9 and 10 years of age) elementary school girl’s pupils in Serbia. The research of the longitudinal character has been conducted, in duration of 36 weeks (one school year), within which the exercises twice a week in duration of 45 minutes were performed. Experimental group had an experimental program in teaching physical training where the elements of rhythmic gymnastics were implemented while control group had the regular physical education classes. Assessment of the examinees’ morphological characteristics was conducted by the help of 13 anthropometrical measures, chosen according to the International Biologic Program (IBP), by Martin method in order to cover the four dimensional model. Particularly following the characteristics on which the greatest transformations could be made under the influence of exogenous factors, such as the subcutaneous fat tissue. Examining the results, it can be concluded that the experimental treatment had a significant influence on decreasing the subcutaneous fat tissue. Even thou systematic application of the elements of rhythmic and artistic gymnastics during the regular classes of physical education could influence the improvement in some capabilities among the schoolgirls of younger school age, we should still search for the more efficient application of these elements in the physical education classes which will be more efficient and in the same time give substantial gain in sociological and emotional sense.

PHYSICAL EDUCATION TEACHER EDUCATION CURRICULA AND BEST PRACTICES: AN INVESTIGATION OF STATUS OF ART IN THE LAST THREE YEARS (2004-2007) IN ITALIAN SECONDARY SCHOOL

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Introduction: In Italy the Physical Education teaching is compulsory from primary to secondary schools (students aged 3-19).

Aims: to investigate the PE curricula in the best practice of Italian secondary school.

Method: is based on questionnaires. The data was collected from 100 secondary schools, 900 classrooms, 22,500 students in Piedmont (north-west Region of Italy). The survey lasted three years (2004-2007) at the SIS-University of Turin (Italy). The data indicated the contents of PE curriculum in the secondary school: physical activity and health, development of motor and sport skills, physical activity and expressiveness, physical activity and interdisciplinary knowledge used in the best practices. The statistic analysis is descriptive and used percentages. The questions investigated:

A) Contents of PE curricula in the 5 years of the secondary schools (students aged 14-19)
B) Analysis of content of Health Education

Results and discussion: the data collected from the questionnaires showed:

A) Contents of PE curricula are physical activity and health; development of motor and sport skills; physical activity and expressiveness, physical activity and interdisciplinary knowledge, in the 5 years of the secondary schools (students aged 14-19).

B) Health contents in PE curricula are: 19,66% of annual time (1st Class-students aged 14); 16,95% (2nd Class-students aged 15); 17,4 (3rd Class-students aged 16); 19,60% (4th Class-students aged 17); 22,04% (5th Class-students aged 18)

C) Development a motor and sport skills are: 40,07% of PE curricula annual time (1st Class-students aged 14); 39,49% (2nd Class-students aged 15); 35,45% (3rd Class-students aged 16); 33,24% (4th Class-students aged 17); 31,53% (5th Class-students aged 18)

D) Physical activity and expressiveness are: 11,29% of PE curricula annual time (1st Class-students aged 14); 12,97% (2nd Class-students aged 15); 11,60% (3rd Class-students aged 16); 10,79% (4th Class-students aged 17); 10,43% (5th Class-students aged 18)

E) PE and interdisciplinary knowledge are: 15,29% of PE curricula annual time (1st Class-students aged 14); 11,30% (2nd Class-students aged 15); 16,61% (3rd Class-students aged 16); 20,99% (4th Class-students aged 17); 22,74% (5th Class-students aged 18)

Discussion: The PE curriculum planning in the best practices data shows the trend of: increase the contents of Health with the age of the students, reduce the contents of Motor and Sport Skills with the age of the students, equal the contents of Physical Activity and expressiveness, increase the content of interdisciplinary knowledge with the age of the students.

Conclusion: The survey investigation on the PE curricula best practices can suggest indication for the future PETE (Physical Education Teacher Education) oriented not only to traditionally sport (gymnastics, athletics, swimming, volleyball, basketball, soccer) but also to health prevention, expressiveness PA and interdisciplinary knowledge.

THE ABILITY TO SKIP A ROPE IN LOWER - SECONDARY SCHOOLS IN NORTHERN ITALY

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INTRODUCTION. Rope-jumping was one of the most famous courtyard games practised in Italy. Most often children do not practice any physical activity and spend much of their leisure time doing static games such as computer games. The purpose of this study was to show that this serious reduction in children physical activity not only impacts on motor performance and coordination, but is also associated with an increase in body mass. Specifically this study shows that, across the last thirty years, a simple motor task such as skipping a rope is significantly reduced both in boys and in girls aged 11 to 13 years. METHODS. This study was conducted in North of Italy on a large population of 10-13 years old students (Total 498, 249 males and 249 females) and compared with data collected in a similar children population 30 years ago (Total 1078, 538 males and 540 females). The data were collected through the scholastic system after a rope-skipping test submitted to boys and girls aged 11 to 13 years old in the primary schools during PE lessons. Each student was asked to perform ten rope jumps. The test has been considered valid if: 1) such goal was achieved in independently of the technique and rhythm
of execution of the skip, 2) the skips were performed consecutively without interruption. RESULTS. After 30 years meaningful differences are noticed in body mass, height and BMI. BMI data were compared with the NCHS Growth Charts (I) and a dramatic increase in the proportion of overweight children was observed: 42% of the 11 year-old, 38% of the 12 year-old and 32% of the 13 year-old boys and girl. Concerning the ability to skip the rope we noticed, when comparing the present data with those collected 30 years ago, a deterioration in the ability to perform the task in every age-group. The increase in the percentage of failure in the test of rope-skipping was 16.78%, 15.95%, 15.79% respectively in 11, 12 and 13 years old boys and 9.66%, 12.77% and 11.53% respectively in 11,12 and 13 years girls. Similarly to thirty years ago, also today the girls are better than boys in rope-skipping. Differences among the participants according to their age and birth date were analysed with Pearson's Chi-square test and statistical significance was confirmed by the O.R. (odds ratio) values.

CONCLUSION. The disappearance of the old courtyards, the increase of static games, the lack of motor activities in natural environment and the lack of realization of the scholastic programs and coordinative exercises with small equipments, are likely factors contributing to the observed reduction in rope-skipping ability. In order to combat inactivity and obesity, and promote mobility in school children we propose: to encourage teachers in their didactic scheme to suggest coordinative exercises using simple equipments, such as skipping ropes; to invite parents to choose gifts requiring child movement.

VALIDITY AND RELIABILITY OF THE PEABODY MOTOR DEVELOPMENTAL MOTOR SCALE-2 (PDMS-2): A PILOT STUDY WITH PORTUGUESE PRESCHOOLERS

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The Peabody Motor Developmental Motor Scale (PDMS-2, second edition) is a norm-referenced motor test designed to assess motor development in children from birth to 71 months of age. The PDMS-2 is composed of six subtests: reflexes, stationary, locomotion, object manipulation (Gross Motor Composite), grasping, and visual-motor integration (Fine Motor Composite). A Total Motor Composite score combines the Gross Motor Composite and Fine Motor Composite subtests. Five types of scores can be obtained from the PDMS-2: raw scores, age equivalents, percentiles, standard scores for the subtests, and quotients for the composites. This study was designed to examine construct validity and internal consistency of the Peabody Motor Developmental Motor Scale II (PDMS-2) using a Portuguese sample. Two hundred and seventy children’s aged 27 to 71 months, from different preschools were assessed, and its results tested by a CFA. The structural model showed a good fit (INF= 97; CFI= 98; RMSEA= 016) to the original structure proposed by Folo and Fewell (2000), and good internal consistency (ALPHA Cronbach’s = 084), with all coefficient loadings being significant. Future studies will examine the validity and reliability of the PDMS-2 with larger samples, and adding the 27 to 27 months-old group age which is inexistent in this sample.

HEALTH IN PHYSICAL EDUCATION TEACHER EDUCATION CURRICULA AND BEST PRACTICES: AN INVESTIGATION OF STATUS OF ART IN THE LAST THREE YEARS (2004-2007) IN ITALIAN SECONDARY SCHOOL

Cazzoli, S., Cecchin, S., Griseri, G., Scaglia, R.
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Introduction: the scholastic Physical Education is compulsory from primary (3-11 year olds) to secondary schools (11-19 year olds) in Italy. The PE teachers are generalist in the primary school and they attend the University Faculty of Education for four years. The PE teachers are specialists in the secondary schools and they attend at Faculty of Physical Education and Sport Science for five years. Than they attend at SIS (School Interateneo for Secondary School teacher specialisation) and they obtain the licence for became PE professor in the secondary school (student aged 11-19). The survey aims it is investigated the relationship between Health and PE curricula. Method: is based on questionnaires. The questionnaires were made up of closed answers and multiple choice. The questionnaires has been given to 100 PE in-service teachers in the secondary schools. The data was collected from 100 schools, 900 classrooms, 22,500 students in Piedmont (nord-west Region of Italy). The survey lasted three years (2004 – 2007) at the SIS-University of Turin (Italy). The survey investigation on the PE curricula best practices can suggest indication for the future PETE (Physical Education Teacher Education) oriented not only to traditionally sport (gymnastics, athletics, swimming, volleyball, basketball, soccer) but also to health prevention.

PHYSICAL EDUCATORS’ CONCEPTIONS ABOUT PHYSICAL EDUCATION AND STUDENTS’ HEALTH-RELATED PHYSICAL ACTIVITY

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Introduction
The existence of quality in physical education (PE) programmes depends largely on the way PE is perceived and practiced by those who are responsible for its teaching. Appropriate amounts of moderate to vigorous physical activity (MVPA) for at least 50% of lesson time are suggested [3]. Some of the barriers that inhibit PE teachers to teach effectively are inadequate facilities, lack of time, poor quality programmes etc. Aside from these barriers teacher's attitudes and beliefs regarding physical education play an important role [1]. The purpose of this study was to investigate the relationship between teachers' conceptions toward physical education and what is taught in their classes.

Methods
The Physical Education Conceptions Questionnaire was applied to 32 middle school PE teachers. The questionnaire consisted of four constructs, namely PE as entertainment, PE as training, PE as teaching and PE as health enhancement. The students' behaviours were assessed through the SOFIT [2] during three lessons for each teacher. Descriptive analysis and percent occurrence of intervals were calculated for each SOFIT subcategory. The categories of walking and very active were combined to create a measure of time spent in MVPA. The two categories of teachers' behaviour, promotes and demonstrates fitness, were summed to create one category teachers' fitness behaviour. Pearson correlation was applied to estimate the relationships between PE teachers' conceptions about physical education and their teaching behaviour.

Results
The PE teachers consider that PE should: firstly, promote health related physical fitness (M=3.80 on a scale of 1 to 5); secondly, promote skills (M=3.98); thirdly, be organized according to PE as entertainment (M=3.82); and, finally, be organized according to PE as training (M=3.62). Results from SOFIT indicated that while students on the average performed MVPA for 27.47 min (77.57 % of class time), teachers spent only 7.64 min (21.88 % of class time) to promote fitness. A significant correlation (p<0.01) between PE teachers' conceptions toward physical education and what is taught in their classes was found only between students' MVPA and physical educators' conception regarding PE as training.

Discussion/Conclusion
Although the class time spent in MVPA in this study surpasses greatly the percentage of time found in other relative studies, the time provided for promoting fitness by the PE teachers is much less [2, 3]. This result combined with the fact that MVPA did not correlate with teachers' fitness behaviour (i.e. with PE as health enhancement) leads to the conclusion that the large percentage of time, spent in students' MVPA was not planned by the PE teacher.

References.

THE IMPACT OF REQUIRED PHYSICAL EDUCATION PROGRAM ON FOSTERING A SENSE OF BELONGING TO THE UNIVERSITY
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Introduction
Alumni are important assets of their universities. Their contributions are vital to the continuous development of their universities, especially at the time when the universities are facing budgetary constraints. It is a common understanding that the sense of belonging of the alumni to their universities might affect their links and supports to the universities. One of the benefits of recreational sports programs was providing opportunities for students' interaction [Dalgarn, 2001]. These interaction and collaboration might be essential factors for fostering a sense of belonging to their communities. The purpose of this study is to compare the impact of different physical education (PE) programs on fostering a sense of belonging to the universities.

Purpose
To compare the impact of different PE programs on fostering a sense of belonging to the universities.

Method
Alumni (N=1329) of two comprehensive universities in Hong Kong, the Chinese University of Hong Kong (CUHK) and the University of Hong Kong (HKU), were invited to answer a questionnaire on-line. CUHK provides two-credit required PE courses whereas HKU has no such requirement for graduation. The self-administered questionnaire was sent by e-mail to all alumni of both universities who had graduated between 2001 and 2005. They were requested to complete and return it via the Internet. The questionnaire collected demographic data and information about their perception of the impact of PE programs on fostering a sense of belonging to their universities.

Results
CUHK alumni gave greater value (mean±SE, CUHK vs. HKU: 3.34±.046 vs. 3.15±.042, P<65308, .05) to their university's PE courses in terms of their impact on fostering a sense of belonging to the university, when compared with the HKU alumni who did not have required PE program.

Conclusions
Results of this study suggested that required PE courses in university contribute to the enhancement of fostering a sense of belonging to the university. Such findings were important for the continuous development of universities as they might become more willing to provide support for their Alma Mater whenever necessary.

References.

AN EXAMINATION OF THE RELATIONSHIP BETWEEN PHYSICAL ACTIVITY, SELF-ESTEEM AND ACADEMIC ACHIEVEMENT
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It is suggested that physical activity (PA) can enhance the educational experience of children within the school setting [Co et al., 2006]. Indeed, several studies have demonstrated that academic standards can be improved by introducing PA into the school day [McKenzie et al., 1997]. It is assumed that this positive affect occurs through an increased level of self-esteem (SE), as physically active children often have higher SE and display increased persistence, effort and general motivated behaviours as a result. It is these behaviours that are thought to facilitate academic achievement [Lagault et al., 2006].
Some researchers however, have questioned whether a correlation between PA and academic achievement (AC) exists, and some have suggested that this relationship is in fact negative (see Tremblay et al., 2000). Therefore, there is a clear need for further investigation. This study has adopted a two-staged mixed methods approach, with both stages aiming to identify whether a relationship between PA, AC and SE exists. Stage 1 involved the cross-sectional analysis of PA behaviour (PA questionnaire designed for the study), SE (PSQD, Marsh, 1996; SES, Rosenberg, 1965) and levels of AC (SATs grades) within a sample of secondary school pupils (n=90; age=13-14).

Within Stage 2, a sample group of participants were chosen, based on whether they demonstrated low and high scores on the previous Stage 1 measurements (n=6 per group). The group was questioned with regards to their PA behaviour, aspects of SE and attitudes towards academic work. The findings (to be completed by June 2008) will provide a further opportunity to identify a PA / SE and AC relationship, and can be used to offer an explanation for any causal link.

References.


A STUDY OF PHYSICAL EDUCATION IN THE FIRST, SECOND AND THIRD GRADES IN ELEMENTARY SCHOOLS OF IRAN (A NEW PROGRAM)

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A Study of Physical Education in the First, Secand and Third Grades in E lementary , Schools of Iran

Preface.
Implementation of Physical Education subject in the form of a devised nationwide program took place for the first time in the year 2003.
The aim of this study was to examine how the program implemented at schools in terms of teaching methods and facilities.

Method.
This is a descriptive field study with a researcher made questionnaire. The statistical sample of the study were 8100 teachers of the first and second grades of elementary schools. The cluster sampling was done in 29 provinces of the country.

Findings of the study.
The teachers in the related provinces were well informed regarding the purposes of Physical Education program and %64.67 of them had participated in the predicted courses and %98.32 of teachers were interested in the continuation of training courses. %74.01 of teachers stated that the content of program was balanced with the abilities of students. Also, %44.92 of teachers rated the condition of Physical Education Facilities in schools as good and very good.

Discussion:
According to this study the limiting factor in the way of successful implementation of physical Education program includes: not using PE specialists, shortage of space and facilities, lack of interest and supervision on part of the authorities allocation of mager time to PE in the school curriculum and a lack of interest and supervision on part of parents.

TEACHERS’ AND STUDENTS’ THOUGHT PROCESSES IN PHYSICAL EDUCATION

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The purpose of this study, in which 4 teachers and 198 students took part, was: to analyze teachers’ and students’ thoughts in physical education (PE); to find out if the teacher’s knowledge of his students’ cognitive processes induces his own thoughts. Questionnaires were used to collect data on the students’ way of thinking. The teachers’ thoughts were examined through interviews, thinking aloud and stimulated recall. Regarding students’ thoughts the outcome showed that: during PE classes, the students’ attention is directed to subjects connected with the lesson; in PE, students’ orientations favour the task; they generally have a good perception of ability in PE and a favorable attitude towards it; they consider that the main aim of PE should be health improvement; they show a high level of satisfaction towards classes. Concerning teachers’ thoughts, some points should be emphasized: when planning PE classes, the teachers’ thoughts mainly focus on the syllabus contents and on classroom management; during interactive teaching, the teachers’ thoughts frequently fall upon aspects related to instruction; the majority of the teachers’ interactive decisions are of immediate nature; teachers’ pre-interactive and interactive thoughts as well as interactive decisions are not influenced by the knowledge of their students’ cognitive processes.

THE EFFECT OF EXHAUSTION EXERCISE ON IMMUNE CELLS

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The effect of exhaustive exercise on immune cell
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In vivo depletion of lymphocyte subsets allows investigation of the role of specific subsets in protective immunity. Immune cells are potent intracellular, that regulate inflammation and immune response. The others have shown that exercise causes changes in specific types of immune cells . The changes depend on duration and intensity of exercise.
This study examined the effect of exhausting exercise on the CD4 and CD8. 20 recreational active women volunteered for this study. Who were normal healthy, with no positive clinical finding. After having the procedures fully explained to them written information consent. Height, weight, BMI, body fat and Vo2max of them measured, later subjects performed exhaustive exercise. Protocol exercise was an incremental treadmill. Blood sampling were obtained before and after exercise and were drawn from an antecubital vein with subjects in the seated position. Lymphocyte subsets were determination by 3 color flow cytometry using monoclonal antibodies for T helper (CD4) and T suppressor (CD8).

Statistical analysis: Paired t-test were used to determine before versus after exercise differences, was set at 0.05. Data are presented as mean ± standard error of the mean.

Results: The concentration of cluster designation CD4 and CD8 (T subsets) decreased and there is a fall in the ratio of CD4 to CD8 T cells after exercise (P < 0.05). Reductions of CD4 and CD4 / CD8 were significant. The effect of exhaustive exercise on subjects was significant that may be transient and related with intensity and duration. The results suggest that the exhaustive exercise induced changes in lymphocyte subsets but may not induced suppression immune function.

Key words: exercise, CD4, CD8.

A STUDY ON EFFECTIVENESS OF TEACHING RESPONSIBILITY MODEL IN SCHOOL PHYSICAL EDUCATION CLASS IN JAPAN

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In Japanese Physical Education, social behavior learning has been incorporated in educational instruction as part of schools’ teaching curriculum. However, studies on social behavior learning in Japan have not yet been developed enough to propose clear learning contents and teaching strategies. On the other hand, in the U.S.A., there are programs developed for Physical Education, with specific teaching methods. One of their representative programs is known as Hellison's Teaching Personal Social Responsibility (TPSR) model. Hellison’s TPSR model gives clear instruction for teaching strategies by providing the learning contents in different levels from 0 to 5 in order to clarify in each the content of learning. Furthermore, the program also includes exemplum, modeling or reinforcement of the learning objectives and reflection time (allowing students to look back on their own attitudes and behaviors in the class), which makes the teaching strategies more well-defined.

In this study, a supplementary examination of Hellison's TPSR model is implemented towards a group of Japanese university students. It was done in university Physical Education classes that offer lessons on “Karada-Hogushi No Undo,” the stretching exercises. Two classes served as the experimental subjects; one was the control group, and another the experimental group. Hellison’s TPSR model was introduced only to the second group, while the first group conducted its ordinary program.

The effectiveness of Hellison’s TPSR model was examined by the following measures: a social skills measure, a character self-evaluation check list, a formative teaching evaluation of team building, a questionnaire and participants’ personal comments.

Following are the findings of the experiment:
1. There was a significant improvement in social skills and character development among the members of the experimental group whereas those in the controlled group did not improve as much.
2. It was found that social skills do not improve simply by offering the Karada-Hogushi No Undo. In order to develop social skills, a certain method such as Hellison’s TPSR model is required.
3. Hellison’s TPSR model had a positive effect on students’ moral behavior.

References.

DIDACTIC LABORATORY LIKE SUPPORT SYSTEM FOR MOTOR SELF-EVALUATION

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The axiological dualism body-mind in the field of education has conditioned the school means like a learning setting, marking out logistically its spaces in classrooms and gymnasiums, defining and calling them, respectively, as places of cognitive and places of the operating (Gardner 1991).

During the training of university teachers of primary school, the path of a motor laboratory can be a training mode that allows the student to activate perceptive and learning processes related to a new vision of the body considered like a subject of communication and self-consciousness (Merleau Ponty, M. 2002).

Starting from this field of inquiry in 2000 at the University of Suor Orsola Benincasa of Naples was conducted a search combining the experimental model, the model of action research (Kemmis S. & R. McTaggart 1988) and observational practices.

The objective of this research was to analyse the function of laboratory didactic methodology in the processes of motor self-evaluation. Research has involved 45 students of the first year of the course in Science of Primary Formation that qualify elementary school teacher, that was administered a self-evaluation questionnaire input to track the profile motor in each. Students were asked in the questionnaire to express an opinion on its ability to spatial and time organization, direction and dexterity, static and dynamic balance. Later it was realized a motor laboratory on capacities which students had self-evaluated. The methodology of the laboratory has committed a triangular structure based on the role play (Sibilio, 2002), having provided for the exchange of role (three) between students: simulator, observer and director of physical activities within their group. The experience, which lasts 12 hours, thanks to the performance of students in different functions (role), had a formative connotation based on the model of action research with deliveries simple but specific.

At the end of the laboratory were given the same questionnaire which showed a different self-motor highlighting the potential of this methodology to support teaching evaluation system.

The methodology used in motor field can therefore represent an area of increased awareness of the declared, perceived and represented that allows us to recognize the relationship between action and intention, between desire and act which is one of the crucial points of the process of teaching-learning.

References.

618 13TH ANNUAL CONGRESS OF THE EUROPEAN COLLEGE OF SPORT SCIENCE
HYPOTHESIS OF A DIDACTIC AND EXPERIMENTAL RESEARCH PROTOCOL FOCUSED ON SPORT-PLAY EXPERIENCE DURING CHILDHOOD IN ITALY

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The structure of research in the educational field about motor-sports activities has its own specific procedures, decisions, actions, objectives, contents and methods, involving qualities and specific properties which are very different from those that characterize other disciplines.

A didactic survey conducted at primary school in Italy requires an agreement of a series of theoretical models and the use of scientific procedures which must be appropriate to the complexity of the Italian educational system.

The action research is the most widespread at school. This puts the practice to the test in order to improve and to deepen one’s knowledge, building at the same time a dynamic structure of come into action ideas (Kemmis & McTaggart 1988). The limit of this model lays into the lack of check procedures to ensure the existence of the problem and of its causes, moreover no tools are provided to verify the beginning and the end of the process evaluating variables.

This protocol provides for the integration between action research and observational research and the introduction of procedures and phases that help to give a scientific support the aforesaid problems, introducing starting and final evaluation as a procedure which becomes a part of the school activities.

The proposal provides for some preparatory choices linked to the complexity of educational research in motor-sports field. The first choice is to create a synergy between school and universities and research institutions through the sharing of theoretical elements, methodological frame and procedural aspects. It is therefore essential to create an integrated research team of researchers and teachers who preliminarily share the same methodological approach. The second choice is to include the research activities in the ordinary activities of the school, instead of presenting the proposal as an activity outside the didactic contest. The third choice is to use validated methodologies and tools of observation which should be included in the daily training, sharing their usage. The part of the research to affect change and to overcome the problem needs an unintrusive and very stimulating didactic methodology, considering the delicate period of childhood. The didactic laboratory can be a teaching methodology which allows a not prescriptive use of physical activities and sports games and provides for a internal to the group but not invasive teacher’s function, trying to predominantly produce a inference and avoiding interferences if possible. In the end the protocol requires researchers’ specific skills in sports education, because they are essential both in the choice of tools and methodologies and for the efficacy of observational phases and procedures.

References.

HYPOTHESIS FOR A SEARCH OF SPORT ACTIVITIES IN TECHNOLOGICAL FIELD FOR DIFFERENT ABLED PERSON - DISABILITY AND VIRTUAL SPORT

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Recent surveys Multiscopo Aspects of daily life carried out by the Italian National Institute of Statistics relating to behaviour leisure, culture and social integration of people with disabilities showed that out of the Italian population of approximately 59,131,287 people, 4.3% are disabled whose 83% do not regularly play physical activities. Analysis of the presence of architectural barriers, such as the lack of elevators in their own house, showed that 75% of disabled people in Italy is not allowed to move on their own. These mobility limitations impact on the participation of people with disabilities to physical activities and constitute an input to the search for alternative contexts in which one could satisfy the natural need to know, move and play. In 2001 about 37.6% of disabled people in Italy aged between 18 and 44 years said they use the pc, in 2006 the 46.2% of the disabled population in the same age group had used computer tools radically transforming their way of access to culture and social life. The hypothesis of an applicability of new technologies to sport and to adapted sport experience, through the technological simulator, redefining part of the rich sensory-perceptual and functional inventory of sport. The first stage of this research work is the analysis of movement during virtual sport activity and the evaluation of the differences between virtual and real experience. The system of motion capture as a technology that permits to study the movement through inertial miniaturized sensors and a specific dynamometrical platforms, lends itself to the analysis and the evaluation of the quantities involved in the movement: posture, gestures, physical sequences and coordinative models of disabled people. These are faithfully reproduced on the monitor and describe lines and graphic path through an electronic file. These maps on the evolution of motor, spatial and postural learning engines allow to the disabled person to restore their awareness of the relationship between body attitude and graphical representation opening at the same time new perspectives for research activities between motor-sports activities, technology and different ability.

References.
Studies on evaluation systems used for motor-sport activities at school must not ignore the differences between sport practice and sport education, between two experiences which could seem similar, but are substantially and deeply different.

Goals of the study is to determine the correlation between 4 and 6 years old preschool children’s PA and their FMS developmental status.

Methods: Two rural and two urban preschools participated in the study. 80 (52.6%) out of 152 parents provided informed consent for participation in the study. 32 preschoolers in rural area preschools (16 boys and 16 girls) and 48 preschoolers in urban area preschools (23 boys and 25 girls) participated in the study. The data is collected in autumn, winter and spring. Each period consists of four full days of which two school days and two weekend days. Registering starts at waking up, step counts are recorded at the beginning and end of each school day and at bedtime. Fundamental movement skill development is assessed with the MOT 4-6 (Zimmer & Volkamer, 1987) in autumn and in spring. The Yamax Digiwalker pedometer type SW-200 was used to register step counts. In addition, the preschooler’s were weighted with a digital balance and measured with a standard measuring tape. Data are analyzed using SPSS for Windows.

Results and conclusions: Preliminary results show no significant relationship between preschool children’s daily step counts and their fundamental movement skill development ($r = 1$, n.s.). In addition, these results show no significant ($t = 0.39$, n.s.) differences in PA between girls ($M = 11,110 \pm 3,339$) and boys ($M = 10,775 \pm 3,140$).

References.


MEASUREMENT FOR EVALUATION OF MOTOR AND SPORT ACTIVITIES IN THE EDUCATIONAL FIELD, DURING CHILDHOOD IN ITALY

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Studies on evaluation systems used for motor-sports activities at school must not ignore the differences between sport practice and sport education, between two experiences which could seem similar, but are substantially and deeply different. The motor-sports activities practices at primary school with its aims (The New Didactic Programmes for Primary Schools of 1985 according to D.P.R.12 of February 1985, No. 104, National Recommendations of the Ministry of National Education of 2007), its values, its cultural, structural, organisational and didactic characteristics does not equals to sport practiced at a sport federation or at an association. The aims, the methods of teaching, the skills of experts who lead sport experience are different. Also measurement for evaluation in motor-sport and educational activities at primary school must be adapted and shaped according to the educational structure, characteristics, functions and methodologies of primary school.

In order to conform itself to the requirements of National Programmes and the Recommendation for primary school the evaluation system must meet the requirement to appreciate and to measure the relationship between child’s action and motor behavior during activities, through the identification of indicators and causes of motor difficulties and the observation not only of executive, but above all resolute child’s skills in psychokinetic situations which allow the emerging of the relationship between cognition and action (Ausubel, 1978; Novak, 1998).

An example of the most effective integrated methodologies for evaluation of motor difficulties in children between 4 and 12 years is the Movement Assessment Battery for Children (Henderson S.E. & Sugden D., 1999). This evaluation tool has two complementary parts:
- A test for the evaluation of performance which includes 32 items organized into 4 sets of eight tests, each designed to be used with children from four different age groups who must perform, in a standardized manner, a series of motor tests that involve manual skills, skills with the ball and static and dynamic balance.
- A check-list which includes 60 items divided into 5 sections, whose first 4 consider child motor performance in more and more complex situations, while the fifth section detects behaviors related to physical activity. The playful executive characteristics of testing and the simplicity and originality of behaviors marked in the checklists are a model of how an effective investigative tool could become a true recreational activity, which can be harmoniously inserted in the teaching activities of the primary school, ensuring scientific and methodological procedures in the collection and in the processing of data.

References.


HYPOTHESIS OF EMPIRICAL RESEARCH IN ORDER TO INVESTIGATE THE POSSIBLE RELATIONSHIP BETWEEN BODILY EXPERIENCE AND SPATIAL REPRESENTATION

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In recent decades the relationship between movement and space image gave rise to a scientific interest by psychological, neurological, psychological and educational research areas. Howard Gardner, theorizing a spatial and a motor shape of intelligence connected and relatively autonomous, studied in depth the relationship between movement and space image in chess saying that the legendary memory of chess players not be reduced to a simple mechanical reminder memory of a chess player proves more lasting, because it codes plans and ideas, not just a simple list mechanically reminded (Gardner, 1985, p. 214).

The results of the latest neuroscientific research on mirror neurons (Rizzolatti, 2006) and the processes of motor anticipation and control (Berthoz A., 1997 - Schmidt R. A., 2000) have particularly encouraged further investigations on the possible relationship between body and cognition in the process of acquisition of learning space (Piaget, 1952 - Dewey, 1915 - Bruner 1971).

In 1998 in the province of Naples (Italy) the possible correlation between body experience and motor activity has been object of an experimental research designed to check the incidence of motor-sports activities on memorization and mental representation through the graphic sign involving 16 students of the first class of the Secondary School (Junior High School). The experimental survey combining the model of empirical research (Kemmis S. & McTaggart R., 1988), and observational research (Thomas, Nelson & Silverman, 2005), provides for a protocol which included an experimental process characterized by verbal indications concerning the specificity of the test, how to conduct, the time of intervention and the performance of a specific exploration path of places and space and a reproductive process characterized by a motor performance of a prepared path, an observational process aimed at the systematic observation of the motor path made by the researcher and the reproducing of the motor sequence.

The results showed an interesting correlation between the motor executions of a path and its subsequent graphical representations, the observation of a path made by others and its later graphical representation, the observation of a graphic image of the path and its subsequent execution.

References


SELF-PERCEPTION OF THE PROFESSIONAL COMPETENCE IN TEACHERS OF PHYSICAL EDUCATION WITH DIFFERENT LEVELS OF PROFESSIONAL EXPERIENCE

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Performance in any professional domain depends not only on the acquired competence level but also on the self-evaluation of performer competences. Hence the perception of one’s own competence becomes a decisive professional competence factor. The purpose of this study was to examine Physical Education teachers’ self-perception of competence on three dimensions: knowledge, skills and attitudes. The likert-type Self-Perception of Professional Competence Scale Specific for the Sport Professional (adapted from Nascimento, 1999; Feitosa, 2002) was administered to a sample of 595 teachers of Physical Education, which were subdivided in three groups: low experienced (0-2 years), high experienced (10-12 years), and most experienced (more than 20 years). Basic descriptive measures and General Linear Model with multivariate tests were used in data analysis. The overall mean value of PE teachers’ self-perception of professional competences was relatively high (3.87). The skills subscale presented the highest mean value (3.94), while the knowledge subscale presented the smallest mean value (3.82). Multiple comparisons put in evidence that the most experienced teachers rank higher in all dimensions of self-perception of competence scale. Yet, in the attitudinal dimension, no statistical differences were found in relation to the low experienced group. In this dimension, both of those groups rank significantly higher than the experienced group (10-12 years). Professional experience emerges as a distinguishing factor of self perception of competence. Results convey that the most experienced PE teachers were more confident in their levels of knowledge and skills. Less experienced PE teachers also rank high in the attitude dimension, which incorporates aspects like investigative attitude, self-criticism spirit, initiative, creativity, at odds with the experienced group (10-12 years), who apparently seems to express signs of professional accommodation, routine and motivational decrease.

THE PEDAGOGICAL CONTENT KNOWLEDGE OF TEACHERS OF EXERCISE PHYSIOLOGY

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The study on the pedagogical content knowledge (PCK) is in the paradigm of the reasoning and the teachers’ action, considered one of the most important areas of educational investigation at the present time. It represents an appropriate combination among the content and pedagogical knowledge of the teachers. As Exercise Physiology is a fundamental discipline to the Physical Education degree, and there are few researches in this area, it is necessary to investigate it. So, the purpose in this study is to analyze the characteristics of the PCK of the teachers in teaching the Exercise Physiology. The research subjects were ten teachers of this discipline from private and public Physical Education Universities of Belo Horizonte-Brazil. The volunteers were from different gender, title and ages, as well as time experience in teaching. Their teaching plans and structured interviews were the instruments analyzed. The data study had a qualitative approach, therefore, using analytical techniques of the content for description, interpretation and explication of the data. It began by the identification of meaning units and later it was organized in categories. The results indicated that the teachers select the contents prioritizing, above all, which they consider more important for the initial formation. And also, the main contents inserted in their teaching plans, as well as in their reports, were the acute and chronic exercise, being possible to approach any physiologic system in both options. It is remarkable that the contents that are excluded or treaten in a superficial way were: renal, immune and neural system. And this happens...
because the students start the course having a deficient knowledge in many areas, and also because the teachers do not have enough time for teaching the complete content. It was verified the teaching strategies, that the theoretical and practical classes are considered the most relevant, besides the use of some didactic-pedagogic resources. However, they do not explain very well their teaching methodologies and the reasons for the use of such strategies. It is also noticed that there are few innovative practices in the evaluation system. Both demonstrate little association between the pedagogic aspects and the diagnosed problems in the context. Through those results, it is possible to conclude that the selection and organization of contents is originated in the interconnection between the content and the context knowledge, which demonstrates a maturation in the PCK under this prism. However, it is verified a deficit in the PCK when the pedagogic aspects are analyzed, as well as the interrelation to the context. These characteristics demonstrate that the subjects are in PCK development.

PROFESSIONAL BURNOUT OF FEMALE AND MALE PHYSICAL EDUCATION TEACHERS: A FOUR-PHASE TYPΟLOGICAL MODEL

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INTRODUCTION The best-known professional burnout concept is Maslach’s tri-dimensional model (Maslach & Jackson 1984), where burnout initiates increasing emotional exhaustion (EE), followed by negative sense of personal accomplishment (spPA), and in consequence depersonalization (DP). Progressing in time, the syndrome is manifested differently in various individuals. Recognizing the tri-dimensionality of the phenomenon, Golembiewski suggests a reverse direction of symptom occurrence and proposes an eight-phase model of the phenomenon intensification (Golembiewski & Munzenrider 1988). Two different concepts describing burnout have been termed facing theories (Noworol 2000). The problem of facing theories has been solved by developing a concept based on data clustering. Thus, a typological model emerged, with a special case represented by a four-phase model of professional burnout (Noworol 2000), as well as a typological model based on Golembiewski’s eight-phase model (Noworol & Marek 1994). The premises of the general model include tri-dimensionality of the syndrome, temporal continuity of the process, macro-path specific for the profession (a cluster of individual paths), the effect of external factors (Noworol 2004).

METHOD The experiment was carried out from V 2006 to VI 2007, in PE teachers N=1563: females N=686 (43.9%); males N=877 (56.1%). The Maslach Burnout Inventory (MBI Form Ed.) was employed. Statistical methods included data clustering (K-mean method), U Mann Whitney test.

RESULTS Using the four-phase model, two macro-paths were plotted that illustrated the dynamics of burnout in female and male PE teachers. The different course of burnout paths was indicated by a significantly higher depersonalization (DP) level in men (p<0.001). Initially, women and men react to professional stress (T1 phase) with emotional exhaustion or negative sense of professional achievement - T1 phase (the path bifurcates). At high emotional exhaustion, women begin to depersonalize their pupils (T2 phase) and undergo burnout (F3 phase; N=98, 14.3%). In men, in T2 phase, the path continues to be bifurcated: one branch is identical with the path for females, the other with negative sense of professional achievement at school, illustrates increasing depersonalization, the effect is burnout (N=99; 11.3%).

References.

PROFESSIONAL SOCIALIZATION IN PHYSICAL EDUCATION; TEACHER EDUCATORS AND STUDENTS TEACHER’S PERCEPTIONS IN POLYTECHNIC HIGHER EDUCATION

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The aim of this study was to describe, analyze and compare the identity and professional perceptions of the teachers educators and last year students, and to understand the conceptual similarities within and between peers on the polytechnical system of physical education teachers curriculum.

The participants were 210 teacher educators, 368 and 326 students (respectively in the first and second moment), belonging to 21 public and private institutions. Two different questionnaires were used. Answers were analyzed by content, using an inductive deductive approach categorization. Comparisons between groups were made using non-parametric statistics.

Results showed differences on biographic, professional, and conceptual characteristics of the teachers educators studied. Similarities were found between PE specialized teachers and final year PE students, suggesting a strong identity and conceptual coherence of the education processes.

Final course year induced changes on the students thinking processes, resulting on significant modifications of their perceptions about the inquired themes. This conclusion suggests that this final stage of the students teachers education plays a positive role and a significant socializing influence.

PREFERENCES AND PERCEPTIONS OF ATHLETES REGARDING THE FEEDBACK PEDAGOGICAL OF FOOTBALL COACH

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Introduction

We want to know, the level of satisfaction of athletes about Feedbacks sent by the coach. We study the preference of athletes about the different types of Feedbacks and also the perception that they have of Feedbacks sent by coach. After that, we want checking the relationship between what the athletes prefer and what they understood of what their coach said.

Methods

One football team of Sport Lisboa e Benfica (Under 14) and their coach were observed. The instruments used to collect data were the Questionnaire of satisfaction and perception (Franco and Simões, 2006), shooting for drills and the codification of Feedbacks sent by the
Echocardiographic changes in the development of the heart in young swimmers

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Introduction

Breath hold ability has been shown to be affected by many factors such as stimulation of facial cold receptors, lung volume, diving response, breath hold experience, aerobic capacity and age. On the average, females compared to males have smaller lung volume, lower aerobic capacity and lower level of hematocrit (Hct) and haemoglobin concentration ([Hb]) and thus, it is reasonable to hypothesize that breath hold ability would be lower in females than males. The aim of this study was to elucidate the effect of gender on breath hold time.

Methods

A group of 16 healthy subjects, 8 males (M) and 8 females (F), aged 18-30 yrs, without breath hold experience, performed: a) an incremental cycle ergometer test to exhaustion so as to measure aerobic capacity, b) pulmonary function tests for the determination of forced vital capacity (FVC), total lung capacity (TLC) and inspiration capacity (IC), and c) a breath hold protocol which included 8 repeated maximal efforts with a 2-min interval between efforts on two separate condition: without (BHFOI) and with face immersion (BHFI) in cold water (14.8±0.07°C). All apnea efforts were performed at 80% of the individual sitting FVC and upon termination subjects exhaled forcefully where PETO2 and PETCO2 were recorded. Hct and [Hb] were evaluated before the breath hold protocol.

Results

Fitness level was higher in males compared to females (M: 49.7±7.3 ml/kg/min vs. F: 36.4±5.4 ml/kg/min, p<0.05). Similarly, pulmonary capacities were lower (p<0.01) in females than in males. Especially, FVC was 3.53±0.62 l vs. 3.77±0.58 l, TLC was 3.57±1.68 l vs. 3.74±1.08 l and IC was 7.86±0.81 l vs. 5.66±0.33 l for males and females, respectively. Hct and [Hb] were higher (p<0.01) in males (Hct: 44.83±1.83 % and [Hb]: 14.44±0.97 g/dl) compared to females (Hct: 38.81±2.60 % and [Hb]: 12.67±1.41 g/dl). Breath hold time gradually increased (p<0.01) by 31.23±17.50 sec in males and 22.64±23.31 sec in females from the 1st to the 8th apnea without significant differences between genders and between conditions. Maximal breath hold time was attained as average of the last four efforts and no difference was observed between genders (M: 91.45±11.18 sec and F: 100.09±7.27 sec, p>0.05) or between conditions (BHFOI: 94.41±10.45 sec vs. BHFI: 97.12±10.23 sec, p>0.05). PETO2 and PETCO2, did not differ either between genders or between conditions just before apnea. The average values for M and F were 109.45±11.18 mmHg and 100.09±7.27 mmHg and at the breaking point were 78.78±2.09 mmHg, 51.62±1.42 mmHg for PETO2 and PETCO2, respectively.

Conclusion

It appears that despite gender differences in physiological and anthropometrical traits, breath hold ability was not different between males and females, both not experienced in apneas.

Echocardiographic changes in the development of the heart in young swimmers

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High-level training induces morphologic cardiac adaptations. The effects of training on young athletes’ hearts are not yet clear (Ozer S., Manolás V. M.). The aim of the study was to assess cardiac development in swimmers aged 14 to 21. We studied 125 male swimmers divided in eight subgroups according to their age. Echocardiographic examinations using a Hewlett-Packard Sonos 100 CF echocardiograph were carried out as a part of a complex investigation. Both M-mode and two-dimensional imaging were employed for measurements. All measurements were in accordance with the recommendations of the American Society of Echocardiography. Body surface area was estimated from the Du Bois nomogram.

References


Related presentations (PP)

PP-PM04 Physiology 4

The effect of gender on maximal breath hold time

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Sunday, July 12th, 2008 14:15 - 15:15
Rapid increase of height and body mass measures ended after the age of 17. Most cardiac parameters continued to increase for one more year. After age of 18 we can see slow increase of all echocardiographic characteristics but significant differences among the age groups disappeared after allometric scaling.

The development of the heart in young swimmers is a relatively smooth process. The biggest difference between body and heart measurements appeared in the age groups of 14 and 15. Therefore in those age groups there is a danger of overloading young swimmers having relatively small-sized hearts.

**References.**


**HEART RATE VARIABILITY DURING HYPERBARIC HYPEROXIA IN ENDURANCE-TRAINED ATHLETES**

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Hyperoxia is known to decrease the heart rate (hyperoxic bradycardia [1]). It is also reported that endurance-trained athletes show a lower resting heart rate [2]. An increase in the parasympathetic nervous activity is thought to contribute to these phenomena [3, 4]. This study aimed to evaluate whether the heart rate of endurance-trained athletes decreases further in response to hyperoxia. In addition, we also examined the change in their heart rate variability under hyperoxic condition.

The study population was comprised of 7 male swimmers (age, 21 ± 1.4 years, mean ± SD) who trained 2 h/d for at least 4 d/w and 7 untrained healthy men (age, 27.3 ± 2.9 years). Written informed consent was obtained from all the subjects. They were seated in the hyperbaric chamber for 60 min; they breathed air at normal pressure (1.0 atmospheres absolute [ATA]) for 10 min (baseline) and 100% O2 at 1.3 ATA for 30 min (hyperbaric hyperoxia [HBHO]). It took 10 min both to increase and decrease the atmospheric pressure. R-R intervals (RRI) were measured for 10 min at the baseline and under HBHO (40 50 min of the experimental protocol). Time domain and frequency domain analyses of the heart rate variability were conducted. The mean RRI and the standard deviation of RRI (SD of RRI) were calculated as the time domain parameters, and low frequency (LF; <0.15 Hz), high frequency (HF, 0.15–0.5 Hz), and total power (TOT) were calculated as the frequency domain parameters. The values obtained during HBHO were compared with those obtained at the baseline by using a paired t test. The alpha level was set at 0.05.

In untrained healthy men, the mean RRI was greater during HBHO than at the baseline. The SD of RRI as well as LF, HF, LF/HF, and HF/TOT remained unchanged. On the other hand, in endurance-trained athletes, the SD of RRI was greater during HBHO than at the baseline, with no difference in the mean RRI. LF and HF tended to increase in response to HBHO. These results suggested that although hyperoxic bradycardia did not occur in the endurance-trained athletes, their SD of RRI increased. It is reported that the SD of RRI is related to the parasympathetic nervous activity: an increase in the SD of RRI correlated with an increase in the parasympathetic nervous activity [5]. In endurance-trained athletes, an increase in the parasympathetic nervous activity in response to HBHO might be reflected in the SD of RRI, a manner different from that observed in untrained individuals.

**References.**


**EFFECTS OF PASSIVE LEG RAISING DURING RECOVERY PERIOD AFTER HIGH INTENSITY EXERCISE ON CROSS SECTIONAL AREA OF INFERIOR VENA CAVA**

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Introduction. Much blood flow, which is increasing during exercise, is distributed to activity muscles. The muscle inactivity immediately after exercise using lower limb would rapidly decline venous return from lower limb. In general, we obtain venous return from lower limb using muscle pump functions by voluntary muscle contraction or in order to maintain volume of venous return after main exercise. The techniques to increase volume of venous return from lower limb are not only by voluntary muscle contraction but also water immersion and leg raising and so on. We confirm that cross sectional area of inferior vena cava was enlarged by passive leg raising. However, stroke volume during passive leg raising didn’t increase, i.e. enlargement of the cross sectional area of inferior vena cava during passive leg raising represents a pool of venous blood in the abdomen. If cross sectional area of inferior vena cava is enlarged by passive leg raising after exercise, as well as at rest, the passive leg raising after exercise might not relate to the increase in the volume of venous return to heart. We investigated whether the passive leg raising after exercise influenced to cross sectional area of inferior vena cava.

Methods. Seven healthy young males volunteered to participate in this study. All subjects signed the informed consent forms prior to participation in this study. The subjects had a mean age 22 (SD 2) years. Subjects performed high intensity exercise using cycle ergometer for 15 minutes after at rest in supine position. Exercise intensity was 80% peak oxygen uptake of every subject by cycle ergometer. After exercise, subjects maintained recovery period for 15 minutes. At rest and recovery positions were in supine position and in supine position with passive leg raising. The angle of passive leg raising was 30 degrees, and subjects were raising their both legs using gatch bed. We measured the cross sectional area of inferior vena cava using ultrasound at rest, during exercise and during recovery period (at 5, 10 and 15 minutes). We also measured heart rate (HR) throughout the experiment. Data are expressed as the mean [SD]. P<0.05 was considered significant.

Results and discussion. In supine position during recovery period, the cross sectional area of inferior vena cava were significantly less than at rest (P<0.03), but they showed no difference in supine position with passive leg raising during recovery. These data suggested that passive leg raising after high intensity exercise using bicycle ergometer partially contribute to acceleration of venous return from lower limb. Furthermore, the cross sectional area of inferior vena cava in supine position with passive leg raising during recovery period were significantly less than that of a rest with passive leg raising. This implies that inferior vena cava was induced venoconstriction by high intensity exercise.
FASTING DURING RAMADAN DOES NOT AFFECT ISOKINETIC KNEE FLEXOR/EXTENSOR PERFORMANCE

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Background. During the Holy Month of Ramadan Muslim's fast everyday for four weeks between the hours of sunrise and sunset. Based on the 10 month lunar calendar Ramadan starts 10 days earlier each year, which could possibly impact on Muslim athlete's yearly training and competition cycles. Purpose of this study was to determine the effect of Ramadan upon work capacity of the knee extensor in active, injury free middle aged Muslim men. Methods. Following a familiarization session 11 healthy males (aged 30.5 ± 8.8 yrs) undertook four different trials with their dominant leg on an isokinetic dynamometer at speeds of 60, 120, 180, 240 and 300°/sec. The four trials were conducted over a three month period, the first commenced one month before Ramadan (CON1), the second in the days before Ramadan (PRE), the third in the final two days of Ramadan (POST) and the fourth one month after Ramadan (CON2). Subjects were tri-axial accelerometers in the 3 days leading up to each trial. All trials were conducted at the same time of the day and were preceded by anthropometric and body composition measurements. Differences between trials were analyzed with one-way repeated measures ANOVA for the anthropometric and activity data and two-way repeated measures ANOVA for the performance data (Time x Contraction Speed). Significance was set at the P<0.05 level. Results. There were no changes in any variable between the CON1 and PRE trials, attesting the reliability of the PRE recording. No changes were recorded between trials in body mass, body composition, activity and energy expenditure. Furthermore, work capacity was not significantly modified at the end of Ramadan. However, our data showed a significant improvement (P < 0.05) in work capacity one month after the end of the Ramadan (CON2). This effect was independent of contraction velocity with 3.2, 4.9, 4.5, 6.5 and 2.0 % increases in total work between POST and CON2 trials at 60 (214.6 ± 22.7 vs. 221.4 ± 31.7), 120 (192.6 ± 21.1 vs. 202.0 ± 27.8), 180 (175.1 ± 20.3 vs. 183.0 ± 30.3), 240 (155.9 ± 23.5 vs. 166.3 ± 27.6) and 300°/sec (144.5 ± 28.4 vs. 147.5 ± 26.7), respectively. Discussion/Conclusion. Ramadan did not have an effect upon habitual activity of this cohort and consequently, there were no changes in body composition. However, despite isokinetic force production remaining unaltered throughout the testing period, the post Ramadan increase in total work capacity suggests there may be a positive delayed effect upon muscle force production due to Ramadan.

MECHANOMYOGRAPHIC CHANGES TO THE BICEPS BRACHII FOLLOWING HIGH INTENSITY RESISTANCE TRAINING

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The contractile properties of skeletal muscle are tightly coupled with morphological changes that occur with physical training. The purpose of this investigation was to consider the effect of attempted high velocity movement and repetition failure on muscle contractile properties of the biceps brachii as measured by mechanomyography (MMG) in untrained healthy males (N=27). All subjects completed a 4-wk progressive resistance training (control) period prior to the experiment. On the basis of one repetition maximum (IRM) strength gain, subjects were allocated to 1 of 3 elbow flexion (60° - 160°) treatments: (EC) attempted explosive concentric and controlled 2-s eccentric; (SSC) attempted explosive concentric and eccentric; and (C) controlled 2-s eccentric and concentric training. Subjects then exercised a further 3 days per wk for 12 wks at 85% IRM. Group (C) performed four sets to repetition failure, completing 6.1 ±0.1 repetitions per set. The two explosive exercise groups performed four sets of reduced workload. EC (4.2 ±0.1) and SSC (4.2 ±0.0) replications. Percutaneous neuromuscular stimulation electrodes were placed equidistant from the MMG recording site. The MMG laser sensor was positioned 5cm perpendicular to the muscle belly of the long head of the biceps brachii. The subject remained relaxed with the elbow flexed at 90° while a single electrical pulse 100μs in duration was delivered to the muscle (Digitimer, DS-7). To avoid over saturation of the muscle, stimulation current increased gradually from 40 mA until maximal muscle belly displacement (Dmax-v) was observed. The average of 3 MMG waveforms were recorded at 1 kHz prior to storage and analysis utilizing LabVIEW® (Ver7.0) software. IRM strength significantly increased in all groups: (EC) 28.17% (6.28±0.46kg); (SSC) 34.22% (6.28±0.32kg) and (C) 29.43% (5.85 ±0.63kg), no significant difference was observed between groups. Significant training induced increases were observed in Dmax-v: (EC) 45.6% (2.1 ±1.1mm), (SSC) 68.9% (2.9 ±1.3mm) and (C) 65.2% (3.5 ±0.7mm) and normalised contraction time (TC): (EC) 45.7% (0.023 ±0.019mm/ms), (SSC) 88.5% (0.053 ±0.022mm/ms) and (C) 84.9% (0.060 ±0.017mm/ms), however, no significant difference was observed between groups. Our results demonstrate significantly improved contractile properties of the biceps brachii following 12 weeks of high intensity resistance training. Furthermore, the investigation demonstrated repetition failure is not required to induce significant contractile performance changes to the biceps brachii if contractions are performed with explosive intent.

HAEMATOLOGICAL PROFILES OF ELITE EAST AFRICAN ATHLETES OVER A NINE YEAR PERIOD

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The World Anti-Doping Agency (WADA) is currently considering use of abnormal blood profiles that can reflect blood manipulation and therefore an anti-doping rule violation. However, chronic altitude exposure also has the potential to influence indirect indices of blood doping. While most Kenyan and Ethiopian athletes live and train in their native east African regions, they must frequently travel to lower altitudes for competitions. There is therefore an urgent need to consider the natural changes in erythropoietic indices from altitude exposure in an attempt to differentiate these responses from blood doping. Methods: 649 blood profiles collected between 1999 and 2007 from 289 (192 males, 97 females) elite athletes from east Africa were screened using the transversal [2nd generation, n=289; [1] and longitudinal (3rd generation, n=33; [2]) approaches to erythropoietin (EPO) screening in athletes. Blood indices were compared at altitude and at sea level. Seasonal variations in haematological parameters and urinary test results for EPO were also considered. Results: Mean haematological indices of elite east African athletes were within published cut-off thresholds for indirect blood markers of doping. The blood profiles of all athletes varied considerably over time (coefficient of variation for haemoglobin, Hb CV. 0.2-11.7%, haematocrit, Hct CV. 2.0-13.9%, Reticulocytes CV. 9.4-74.9%, and OFF-hr CV 3.4-36.5%) and attained peak levels with altitude exposure, peak Hb (range: 170-191 g/L); peak Hct (range: 49-63%). During the assessment period, the Hb cut-off of 160 g/L for females was exceeded at least once (range: 1-4) by 14.2% (n=41) of athletes at altitude, whereas 4.2% (n=12) of athletes exceed the Hb cut-off at sea level. At altitude, 11.1% (n=32) of athletes exceeded the Hct cut-off of 50% for males and 47% for females on at least one occasion compared to 3.5% (n=10) of athletes at sea level. 1.4% (n=4) of athletes exceeded the OFF-hr cut-off of 133 for males and 123 for females at altitude (OFF-hr range: 129-143). No athlete exceeded the OFF-hr cut-off threshold at sea level. For reticulocytes, 4.2% (n=12) of athletes exceeded the > 2.0% cut-off at altitude and 2.1% (n=6) of athletes at sea level. 51.5% (n=33) of the athletes exceed the 1 in 50 cut-off threshold for OFF-hr scores and Hb z scores and would therefore be deemed suspicious. During the study period, 180 urine samples were analysed.
for EPO with 1 positive test for a female athlete. Conclusions: A significant number of elite east African athletes tested had substantially elevated haematological parameters and considerable fluctuations from historical baseline values reflecting numerous confounding factors such as ethnicity and altitude exposure.

References.

EFFECTS OF INTENSITY VARIATION AND MUSCLE FATIGUE DURING KNEE-EXTENSION EXERCISE ON MUSCLE PERFUSION AND OXYGEN UPTAKE

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The linear relationship between muscle blood flow (perfusion) and oxygen consumption during incremental exercise has been well established (e.g. Andersen&Saltin 1985). However, the intensity is rarely steady-state or incremental during exercise events. On the other hand, sustained exercise induces muscle fatigue and although the field is well studied (e.g. Amann et al. 2006; Gandevia 2001), there is still missing data about how muscle blood flow and oxygen uptake respond to muscular fatigue during variable intensity exercise.

Thus, quadriceps femoris muscle perfusion and oxygen uptake were measured from healthy male subjects (n=8) during fatigable, intermittent isometric (1-s on, 2-s off) one-legged knee-extension exercise. Resistance during the first 6-min of the experiment was 50% MVC (HI-1), followed by 6-min at 10% MVC (LO), and finishing with 6-min at 50% MVC (HI-2). Muscle perfusion was measured during the last 3-min of each intensity period using positron emission tomography as earlier described (Laaksonen et al 2003). Arterio-venous blood samples, together with muscle perfusion values, were used to determine oxygen uptake and oxygen extraction fraction (OEF). In addition, blood samples for determination of hemoglobin saturation (Hbsat%) were taken. Results are presented as mean (standard deviation).

MVC decreased by 11% during the experiment (before 537(87) N vs after 476(37) N; p=0.04). Muscle perfusion during HI-1 (26(5) mL 100g-1 min-1) and HI-2 (28(4) mL 100g-1 min-1) was higher than during LO (15(3) mL 100g-1 min-1; p<0.01), and no difference between HI-1 and HI-2 was observed (p=0.44). Oxygen uptake was also higher during both HI workloads (HI-1 3.3(0.4), and HI-2 4.1(0.6) mL 100g-1 min-1) compared with LO (45(8)%; p<0.01). Interestingly, oxygen uptake was higher (p<0.01) and OEF tended to be higher (p=0.06) during HI-2 as compared to LO (1.4(0.4) mL 100g-1 min-1; p<0.01). Similarly, OEF was higher during HI workloads (HI-1 62(7) and HI-2 70(7)%) as compared with LO (45(8)%; p<0.01). Interestingly, oxygen uptake was higher (p<0.01) and OEF tended to be higher (p=0.06) during HI-2 as compared with HI-1. Arterial Hbsat% was 98(1)% during the entire experiment. Venous Hbsat% decreased from resting values (70(1)% to 59(6)% during HI-1 (p<0.01), increased to 58(7)% during HI-2 (p<0.01), and decreased again to 31(6)% during HI-2 (p<0.01). No difference was observed between HI-1 and HI-2 (p=0.25).

Decreased MVC after the experiment indicates that the relative work rate during HI-2 was higher than during HI-1 due to muscle fatigue. Since muscle blood flow has been earlier found to be strongly associated with oxygen uptake, the finding of higher oxygen uptake during HI-2 as compared with HI-1 indicates impaired oxygen delivery to working muscles but this is compensated by higher oxygen extraction from blood.

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COMPARISON OF VENTILATORY THRESHOLD (VT) MEASUREMENTS TO LEAVE THREE COMMERCIALLY AVAILABLE FACEMASK ON-LINE GAS ANALYSIS SYSTEMS

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The anaerobic threshold (Lan) is considered the gold standard for the prescription of the intensity and physical activity. The indirect calorimetry allows identifying with precision the ventilatory threshold (VT). This method is not invasive and alternative for the determination of the Lan. The VO2000 is a portable metabolic measurement system (MedicalGraphics Corp., St. Paul, MN). It was adapted for Schneider et al. (1993). Computerized method was based on the analysis of the two straight lines determined by linear regression explaining VO2 versus VO2. Thirteen (8 males, 5 females) healthy young subjects (20.8±2.5 yrs, 62.4±10.8 kg, 166.5±9.6 cm) volunteered for the study. The subjects performed three maximal incremental tests, until voluntary fatigue, changing the facemasks in randomly order. Prior to each test, the VO2000 was calibrated according to the manufacturer’s instructions, which consisted of performing an auto-calibration routine to the oxygen and carbon dioxide analyzers. In the incremental test, the subjects pedaling a mechanically braked cycle ergometer (Monark8), throughout multiple stages of increased workloads. At the first stage subjects cycled at 50-60 rpm unloaded during one minute followed by 30 watts with increment in each minute. The one-way ANOVA for repeated measures did not show difference among the facemasks either to VT: mouthpiece (38.4±5.6 mL kg-1 min-1), silicone (30.7±5.1 mL kg-1 min-1) and neoprene facemask (31.5±7.4 mL kg-1 min-1), respectively. In conclusion, the facemasks for this metabolic measurement system used to collect VO2 data did not influence on the VT.

ENERGY EXPENDITURE DURING CANYONING ACTIVITY

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Aim: The purpose of this study was to determine the intensities and energy expenditure (EE) of the Canyoning practice.

Methodology: Participated voluntarily in this study 10 male adults (age of 25.10 ± 3.57 years old; height: 176 ± 6.29 cm; weight: 71.10 ± 6.81 kg; percent fat: 17.16 ± 3.53%; VO2max: 60.25 ± 7.07 mL kg-1 min-1; HRmax: 189.40 ± 7.17 bpm). The subjects realized a track of River Ancora, and for such was proceeded a description of the vertical and horizontal displacements and manoeuvres, in way to characterize the whole accomplished course. The EE was determined through calculation of the linear regression between the behaviour of HR and of VO2. To calculate the linear regression equation, maximum consumption of oxygen was measured in a situation of continuous sub-maximum progressive incremental test.
Results: It was determined, a heterogeneity in the distribution of the mean values of HR and VO2 during de Canyoning practice. The VO2 mean of the totality of the subjects, in the practice of Canyoning, was of 24.50 ± 6.46 ml.Kg⁻¹.min⁻¹. The analysis of FC and VO2 during the practice of a typical course of Canyoning requests a level of effort of moderate intensity, according to the ACSM (2005). From the VO2 analysis the Canyoning practice could be considered as predominantly aerobic. The mean HR measured was 114 ± 8.32 bpm, correspondents to an intensity 60,54% HRmax. The mean EE verified was 7.45 ± 2.53 Kcal.min⁻¹ corresponds to the recommendations of ACSM (2005). The vertical and horizontal speed of displacement during the 2300m of the river track was 0.142 m.s⁻¹.

Conclusions: The Canyoning practice has characteristics of an intermittent and heterogeneity effort, considering HR and VO2 behaviour. From the VO2 analysis was verified that the practice of Canyoning is predominantly aerobic.

TENDON-MUSCLE PROPERTIES AND PHYSICAL FUNCTION IN RHEUMATOID ARTHRITIS

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Background: Most research in rheumatoid arthritis (RA) has focussed on the mechanisms and consequences of joint inflammation and the resulting joint damage, with much less emphasis on the metabolic and architectural changes in skeletal muscle which contributes to the disability seen in this disease. Loss of muscle mass occurs in most patients with RA and contributes significantly to reduced strength and function. The elastic characteristics of tendons also influence muscle strength as the force generated by muscle fibres is transmitted via the tendons. Thus the aim of this study was to investigate whether RA leads to qualitative changes of the tendon-muscle complex as a contributor to the reduced physical function.

Methods: Maximal isometric and isokinetic quadriceps muscle torque, and antagonist muscle co-contraction were assessed in 23 patients with stable RA (mean age 60 years, age range 22-72 years) and age- and sex-matched (64% female) sedentary controls (mean age 60 years, age range 25-76 years). Measurements were taken on a Humar Norm isokinetic dynamometer. Antagonist co-contraction was determined by electromyographic activity. Resting fibre fascicle length, pennation angle and muscle volume were measured via ultrasound to determine physiological cross-sectional area (PCSA) of the muscle and muscle quality (defined as force per PCSA). Ultrasound was also used to assess patella tendon (PT) stiffness and Young’s modulus (YM) in a subgroup of 16 matched pairs. Participants also completed lower body physical function tests, and a whole body DXA scan to measure appendicular lean body mass (ALM).

Results: There were significant differences in muscle architecture with 13.5% lower PCSA (p = 0.03), 12.5% smaller pennation angle (p = 0.01) and 12% longer fibre fascicles (p = 0.06) in the RA patients relative to the controls. Despite this, there was no difference in quadriceps isometric torque (144.6 vs 155.6 Nm), isokinetic torque (at 50 and 100 degree.s⁻¹), antagonist co-contraction, nor in muscle quality (24.0 vs 22.0 Ncm⁻²). Maximal PT elongation was similar in the two groups (5.54 vs 5.06 mm), as was PT stiffness and YM (ns). Physical function was significantly lower in the RA patients: 27% in balance (p = 0.01), 20.2% in 50-foot walk (p < 0.001), 14.8% in 8-foot up and go (p = 0.01) and 10.5% in 30-second sit to stand (p = 0.09). Patients had a 4.4% increased body mass index (27.6 vs 26.4) with a 5.8% reduced ALM.(16.3 vs 17.3 kg; p = 0.09).

Conclusion: The quality of the tendon-muscle complex is not compromised in RA patients despite changes in muscle mass and architecture.

A SINGLE BOUT OF MODERATE INTENSITY EXERCISE INCREASES FREE-LIVING PHYSICAL ACTIVITY ENERGY EXPENDITURE OVER THE FOLLOWING THREE DAYS IN SEDENTARY MALES

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Introduction: Appropriate physical activity behaviour plays a critical role in weight maintenance. There is a direct increase in thermogenesis during a bout of exercise but it is unclear whether this affects subsequent physical activity behaviour in the following hours and days. The main objective of this study was to investigate whether a single bout of walking in the laboratory leads to changes in subsequent physical activity energy expenditure in free-living conditions.

Methods: Ten sedentary males (Age, 28 ± 2 years; Body Mass Index, 22 ± 1 kgm⁻²; maximum oxygen uptake, 49.8 ± 1.7 mlkg⁻¹min⁻¹) and percent body fat, 18 ± 1%; mean ± SEI participated in this study, which had been approved by the local ethics committee. On one occasion subjects walked on a treadmill at a target exercise intensity of 40%VO2 max for 60 min and on another occasion subjects rested in the laboratory for the same period of time. Fasting venous blood samples were taken at regular intervals before and after rest or exercise. Physical activity energy expenditure was estimated using synchronised measurement of movement and heart rate (Actheart, Cambridge Neurotechnology Ltd., Cambridge). Physical activity energy expenditure (PAEE) represents the energy expended during physical activity recorded in 1 min epochs above rest and not including diet-induced thermogenesis. The data were analyzed using two way repeated measures ANOVA and paired t-test.

Results: The mean daily free-living PAEE over the three days following walking at 40%VO2 max after subtraction of energy expended during the 60 min walk was 35% greater than the rest trial (1065 ± 133 kcal vs. 789 ± 92 kcal, P=0.009). Daily PAEE following exercise was higher than following rest on the main trial day (57%), and the periods 14-38 h (25%) and 38-62 h (26%) after exercise. The increase in daily PAEE was explained by increases in mean light intensity PAEE (between 2.4-4.78 metabolic equivalents or METs) following exercise over the three days (509 ± 65 kcal vs. 356 ± 56 kcal, P=0.0006). Mean PAEE in this MET range following exercise was higher than following rest on the main trial day (71%), and the periods 14-38 h (24%) and 38-62 h (31%) after exercise. There were no changes in circulating concentrations of leptin, adiponectin or acylated ghrelin concentrations in either trial. A single bout of walking at 40%VO2 max induced positive changes in subsequent free-living physical activity energy expenditure over the three days following exercise. This was mostly accounted for by increased low-to-moderate non-exercise behaviour such as standing and walking in the 2.4 to 4.78 METs range.

THE EFFECTS OF EXERCISE-INDUCED MUSCLE DAMAGE ON AGILITY AND SPRINT RUNNING PERFORMANCE

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Exercise-induced muscle damage (EIMD) has been shown to impair linear sprint running performance (Twist and Eston, 2005). However, the effects of EIMD on the ability to change direction rapidly have not been investigated. Therefore, the purpose of this study was to assess the effects of EIMD on sprint running and agility performance. Twelve healthy adults were randomly allocated to an experimental in
Moreover, a significant speed by time interaction (P<0.05) indicated that peak torque was reduced to a greater extent at the slower (6%, 5%, 9% and 26% respectively) in the experimental group, whilst the control group remained unchanged (P>0.05). Furthermore, there were significant correlations for perceived muscle soreness with agility turn time (r=0.82, P<0.05) and contact time at the agility turn point (r=0.94, P<0.05). These findings indicate that agility and sprint performance is significantly reduced following EIMD, and provides further evidence that following muscle damaging exercise, performance of activities requiring rapid generation of force is impaired. This has implications for athletic performance involving sprint tasks with rapid changes of direction. 

References.

**EFFECTS OF ACUTE HYPOXIA ON MOTOR AGILITY**

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**Introduction**
Motor agility, defined as rapid whole-body movement with change of velocity and/or direction in response to a stimulus (Sheppard and Young, 2006), is an important ability for success and safety in alpine sports. Although such activities are performed in high altitudes, there is little information about the effect of hypoxia on motor agility. Thus, effects of acute hypoxia on motor agility have been studied in a controlled, randomized, double blind experiment.

**Methods**
A total of 48 sport students (age: 22±2 yrs) were randomly assigned to the hypoxia group (HG, 10 males, 14 females) or to the control group (CG, 9 males, 15 females). The motor agility test, which measures reaction time, was carried out modifying the protocol of Hamar and Zemková (1998). Subjects reacted to a signal by jumping as fast as possible into the correct area. 20 jumps were performed in each trial. The mean of the best 2 out of 3 consecutive trials was used. Both groups performed normoxic pre-tests (PT) under laboratory conditions. The HG repeated the re-test (RT) in hypoxia (FIO2 = 15.0 %, corresponding to an altitude of about 3500m) and the CG in normoxia 1 week after the PT. All RT were made in the same normobaric hypoxic chamber with no knowledge of FIO2.

**Results**
Motor agility improved in acute hypoxia compared to normoxia and remained unchanged in the CG. Results (means ± sd in ms): HG PT: 858.08 ± 53.23, RT: 841.00 ± 56.49, p < 0.040. CG PT: 838.94 ± 50.92, RT: 843.89 ± 61.61, p < 0.932.

**Discussion**
Acute hypoxia resulted in improved motor agility. This finding could be due to an increased activation of the sympathetic nervous system which in turn increases also physiological tremor (Krause et al., 2000). The mechanisms which produce such a generalized arousal remain unknown. It can be speculated that peripheral chemoreceptor input comprises the afferent limb of a polysynaptic facilitatory pathway, in which the efferent limb includes the muscle spindle-la-afferent reflex pathway (Krause et al., 2000).

References.

**ARE CHANGES IN LOW-FREQUENCY HEART RATE VARIABILITY RELATED TO CHANGES IN ARTERIAL STIFFNESS IN MIDDLE-AGED MEN AFTER EXERCISE TRAINING?**

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**BACKGROUND.** Baroreflex sensitivity (BRS) declines with age and central arterial stiffness increases with age. It has been suggested that stiffening of the carotid artery impedes baroreflex function. Cross-sectional research suggests that baroreflex function is enhanced in older physically active men despite age-related arterial stiffness (Hunt et al. 2001). Exercise training increases BRS and reduces arterial stiffness. The low frequency (LF) component of spectral heart rate variability (HRV) has been proposed as an index of BRS. Stiffness of the central arteries (carotid-femoral) can be measured by pulse wave velocity (PWV). This study investigated whether changes in the LF component of HRV were related to changes in PWV in middle-aged men after 12 weeks of exercise training.

**METHODS.** Participants were healthy sedentary men (n =36), mean (SD) age 51 (7) years (range 40-64 years), stature 1.9 (1.8) m, body mass 89.9 (9.7) kg. Data was collected at baseline and after a 12-week exercise intervention, in which participants performed at least 150 minutes per week of moderate-to-vigorous physical activity (e.g. brisk walking, jogging, cycling). Participants rested supine for 15 minutes before data collection. HRV was derived from a 5-min ECG recording during paced breathing. LF power was calculated within the frequency range 0.04-0.15 Hz. Carotid-femoral PWV was assessed using Complior. Resting blood pressure (BP) and resting heart rate (HR) were also measured. LF data was natural log-transformed for analysis (LFin). Pearson’s correlation was used to test for relationships between LFin and PWV and other measured variables at baseline, and between changes (Δ) in LFin and PWV and other measured variables at follow-up. Significance was accepted at p<0.05

**RESULTS.** At baseline, mean (SD) PWV was 8.4 (1.6) ms-1. Median inter-quartile range LF was 236 [191-369] ms2. Mean (SD) BP was 130 (15)/82 (7) mmHg, and RHR was 61 (8) bpm-1. At baseline, LFin was significantly correlated to PWV (r=-.361, p=0.031), age (r=.347, p=0.038), and systolic BP (r=.384, p=0.021). At follow-up, median (interquartile range) for moderate-vigorous physical activity level was 3.8 (3-1.5-6)
ECCENTRIC CONTRACTIONS OCCUR FREQUENTLY IN EVERYDAY AND SPORTS ACTIVITIES. THIS TYPE OF CONTRACTION HAPPENS WHEN ACTIVATED MUSCLES ARE FORCIBLY LENGTHENED. ECCENTRIC CONTRACTIONS ARE CHARACTERIZED BY THE ABILITY TO ACHIEVE HIGH MUSCLE FORCE WITH LESS ENERGIC COST. THE AIM OF THE PRESENT STUDY WAS TO INVESTIGATE THE CHANGES IN MUSCLE ARCHITECTURE DURING ECCENTRIC CONTRACTIONS IN VIVO. THE BEHAVIOUR OF MUSCLE FASCICLES WAS ANALYSED DURING PASSIVE STRETCHING AND ECCENTRIC CONTRACTIONS AT DIFFERENT INTENSITIES. TWELVE HEALTHY MALE SUBJECTS (AGE: 22.7 ± 3 YEARS) TOOK PART IN THE STUDY. MUSCLE ARCHITECTURE WAS INVESTIGATED NON-INVASIVELY USING ULTRASONOGRAPHY. THE FASCICLE LENGTH AND THE DEEP PENNATION ANGLE OF THE GASTROCNEMIUS MEDIALIS (GM) MUSCLE WERE RECORDED DURING PASSIVE STRETCHING AND ECCENTRIC PLANTARFLEXION AT 20%, 40% AND 60% OF MVC. MUSCLE LENGTHENING WAS INDUCED BY A MOTOR-DRIVEN COMPUTER CONTROLLED ERGOMETER (PASQUET, 2006). THIS DEVICE, EQUIPPED WITH A FOOTPLATE FIXED TO THE ROTATIONAL AXIS OF THE MOTOR, RECORDED THE TORQUE GENERATED BY THE PLANTARFLEXOR MUSCLES UNDER STATIC AND DYNAMIC CONDITIONS. THE ANGULAR DISPLACEMENT OF THE ANKLE RANGED FROM +10° TO -30° DORSIFLEXION AND THE SPEED OF MOVEMENT WAS SET AT 25°/S.

AT REST (+10° DORSIFLEXION), FASCICLES LENGTH WAS 54.5 ± 3.2MM. DURING ECCENTRIC CONTRACTIONS AT 20, 40 AND 60% OF MVC, FASCICLES LENGTH INCREASED PROGRESSIVELY AND REACHED 34.4, 32.7 AND 34.6%, RESPECTIVELY, AT 30° OF ANKLE DORSIFLEXION. DURING PASSIVE LENGTHENING, FASCICLES LENGTH INCREASED BY 44.8% (P<0.001) AT 30° OF ANKLE DORSIFLEXION. FOR THE ANKLE IN NEUTRAL CONDITION, PENNATION ANGLE WAS 20.9 ± 3.1°. DURING ECCENTRIC CONTRACTIONS AT 20, 40 AND 60% OF MVC, PENNATION ANGLE DECREASES BY 11.4% (P<0.001), 13.9% (P<0.001) AND 10.3% (P<0.001), RESPECTIVELY. DURING PASIVE LENGTHENING, PENNATION ANGLE WAS REDUCED BY 32.6% (P<0.001). IN THE LATTER CASE, PASSIVE STRETCHING INDUCED AN EXPONENTIAL INCREASE IN TORQUE THAT REACHED 55.3 Nm AT 30° OF ANKLE DORSIFLEXION. FOR THE SAME ANKLE ANGLE, THE TORQUE DEVELOPED DURING ECCENTRIC CONTRACTIONS AT 20, 40 AND 60% OF MVC REACHED 80.1, 98.5 AND 118.3 Nm, RESPECTIVELY.

THE MAIN FINDING OF THIS STUDY IS THAT ALTHOUGH THE TORQUE DEVELOPED DURING ACTIVE MUSCLE LENGTHENING INCREASES WITH THE INTENSITY OF CONTRACTION, FASCICLES LENGTH CHANGE IS SIMILAR FOR CONTRACTIONS RANGING FROM 20 TO 60% MVC.

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CHANGES IN MUSCLE FASCICLES DURING ECCENTRIC CONTRACTIONS FOR DIFFERENT INTENSITIES

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Eccentric contractions occur frequently in everyday and sports activities. This type of contraction happens when activated muscles are forcibly lengthened. Eccentric contractions are characterized by the ability to achieve high muscle force with less energy cost. The aim of the present study was to investigate the changes in muscle architecture during eccentric contractions in vivo. The behaviour of muscle fascicles was analysed during passive stretching and eccentric contractions at different intensities. Twelve healthy male subjects (age: 22.7 ± 3 years) took part in the study. Muscle architecture was investigated non-invasively using ultrasonography. The fascicle length and the deep pennation angle of the Gastrocnemius Medialis (GM) muscle were recorded during passive stretching and eccentric plantarflexion at 20%, 40% and 60% of MVC. Muscle lengthening was induced by a motor-driven computer controlled ergometer (Pasquet, 2006). This device, equipped with a footplate fixed to the rotational axis of the motor, recorded the torque generated by the plantarflexor muscles under static and dynamic conditions. The angular displacement of the ankle ranged from +10° to -30° dorsiflexion and the speed of movement was set at 25°/s.

At rest (+10° dorsiflexion), fascicles length was 54.5 ± 3.2mm. During eccentric contractions at 20, 40 and 60% of MVC, fascicles length increased progressively and reached 34.4, 32.7 and 34.6%, respectively, at 30° of ankle dorsiflexion. During passive lengthening, fascicles length increased by 44.8% (p<0.001) at 30° of ankle dorsiflexion. For the ankle in neutral condition, pennation angle was 20.9 ± 3.1°. During eccentric contractions at 20, 40 and 60% of MVC, pennation angle decreases by 11.4% (p<0.001), 13.9% (p<0.001) and 10.3% (p<0.001), respectively. During passive lengthening, pennation angle was reduced by 32.6% (p<0.001). In the latter case, passive stretching induced an exponential increase in torque that reached 55.3 Nm at 30° of ankle dorsiflexion. For the same ankle angle, the torque developed during eccentric contractions at 20, 40 and 60% of MVC reached 80.1, 98.5 and 118.3 Nm, respectively.

The main finding of this study is that although the torque developed during active muscle lengthening increases with the intensity of contraction, fascicles length change is similar for contractions ranging from 20 to 60% MVC.

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POSITION SENSE AND REACTION ANGLE AFTER ECCENTRIC EXERCISE: THE REPEATED BOUT EFFECT

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Unaccustomed exercise, especially when it involves eccentric actions, leads to muscle damage (Nosaka and Sakamoto 2001). When a bout of eccentric exercise is repeated within several months the muscle damage produced is much less than the first bout, a phenomenon known as repeated bout effect (Jamurtas et al. 2000). No studies have investigated the effect of repeated eccentric exercise on position sense or muscle reaction angle of animals or humans. The adaptation to eccentric exercise provides an interesting model to study this relationship because responses to a damaging eccentric exercise (bout 1) can be compared to a relatively non-damaging eccentric exercise (bout 2). Based on our previous finding of disturbed position sense and reaction angle after a single bout of eccentric exercise (Paschalis et al, 2007), the purpose of the present investigation was to examine the effects of a repeated eccentric exercise on position sense and muscle reaction angle. Fourteen healthy women underwent an isokinetic exercise session on their knee flexors in their dominant leg, while the other leg was served as control, which was repeated after four weeks. Muscle damage indices (isometric peak torque, range of movement, delayed onset muscle soreness), position sense (at 30o, 45o and 60o knee flexion) and joint reaction angle (at 20o, 40o, and 60o) of the knee were examined before, immediately after as well as at 1, 2, 3, 4 and 7 days after exercise. Both the first and the second eccentric exercise caused muscle damage and disturbances in position sense and reaction angle to release. However, judging from the less significant differences after the second bout of exercise compared to the first one and the several significant differences at each time-point between the two bouts, the second bout produced lower and smaller alterations in muscle damage indices, position sense and reaction angle to release, compared to the initial one. The main finding of this study is that position sense and joint reaction angle to release of the lower limbs may adapt in response to a repeated bout of eccentric exercise, leading in less disturbances in these motor features after the second bout of exercise. These adaptations may have occurred, at least in part, due to an attenuation of the eccentric exercise-induced muscle damage after the second bout.

REFERENCES.

RELATIONSHIP BETWEEN THE CARDIAC AUTONOMIC NERVOUS SYSTEM ACTIVITY AND MENSTRUAL CYCLE IN EXERCISE HABIT

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INTRODUCTION: In previous studies, it had been observed that cardiac autonomic nervous system activity changed during menstrual cycle. Cardiac parasympathetic nervous system activity at rest showed the high values in follicular phase and the low values in early luteal phase. The data of healthy sedentary or recreationally active young women were examined in these studies. Serum oestadiol and progesterone concentrations in the exercise group who habitually performed exercise were lower in luteal phase. It is unknown whether cardiac autonomic nervous system activity is same finding with sedentary during menstrual cycle in the exercise group. The purpose of this study was to prove that relationship between the cardiac autonomic nervous system activity and menstrual cycle in exercise habit.

METHODS: Six healthy young women with exercise habit (age 21.8±0.4 years; height 158.2±3.5 cm; body weight 53.3±2.1 kg; mean±SD) and Two sedentary women (age 23.5±0.7 years; height 162.8±1.8 cm; body weight 59.2±3.1 kg) participated in this study. They were with a normal menstrual cycle. All subjects provided informed consent for their participation with the experimental procedures conducted in conformance. We measured cardiac autonomic nervous system activity at five points in the menstrual cycle (M, menstrual, F, follicular, O, ovulatory, EL, early luteal, and LL, late luteal). Cardiac autonomic nervous system activity and HR were measured using the MemCalc methodology. The frequency domain was divided into two parts: high frequency (HF, 0.15-0.40Hz) and low frequency (LF, 0.04-0.15Hz).

Cardiac autonomic nervous system activity was transformed into logarithmic values to obtain a statistically normal distribution. log HF was an index of cardiac parasympathetic nervous system activity. RESULTS and DISCUSSION: log HF at rest of the sedentary subjects showed the high values in F phase and the low values in EL phase. HR at rest of the sedentary subjects showed the high values in EL phase. It was similar to the previous studies. log HF at rest of six subjects with exercise habit showed no same tendency. Two of six subjects showed the low values in EL phase. Moreover, three of six subjects showed few changes. One of six showed the low values in EL phase as well as the sedentary subjects. HR at rest of subjects with exercise habit showed no same tendency. Three of six subjects showed the high values in LL phase. One of six subjects showed few changes. One of six subjects showed the high values in M phase as well as the sedentary subjects. And one of six subjects showed the high values in M phase. Fluctuations in cardiac parasympathetic nervous system activity at rest of sedentary subjects correlated with the balance between oestadiol and progesterone concentrations.

However, subjects with exercise habit were not an agreement in result. These results suggest that an exercise habit may fluctuate cardiac parasympathetic nervous system activity with menstrual cycle.

INFLUENCE OF ECCENTRIC EXERCISE-INDUCED MUSCLE DAMAGE ON PULMONARY OXYGEN UPTAKE AND MUSCLE DEOXYGENATION KINETICS DURING HIGH-INTENSITY EXERCISE

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Unaccustomed eccentric exercise is known to have a profound impact on muscle structure and function and is associated with delayed onset muscle soreness. However it is not known whether associated microvascular dysfunction, including a reduction in microvascular O2 pressure (PO2mv), compromises blood-muscle O2 flux by disrupting the matching of O2 delivery (QO2) to O2 utilisation (VO2). The deoxyhaemoglobin concentration (Hb) signal measured using near-infra-red spectroscopy (NIRS) can be used to provide non-invasive assessments of the muscle QO2/VO2 balance in the microcirculation of the area of skeletal muscle under interrogation. The purpose of this study was therefore to use NIRS to investigate the influence of eccentric exercise on the dynamic balance between QO2 and VO2 following the onset of high-intensity exercise.

Nine physically active men completed ‘step’ tests to high-intensity exercise (70% of the difference between the gas exchange threshold and VO2peak) from an unloaded baseline on a cycle ergometer. These tests were performed both before and 48 h after eccentric exercise which consisted of 100 squats performed as 10 sets of 10 repetitions with a load corresponding to 70% of body mass. Markers of muscle damage (plasma creatine kinase (CK) activity, perceived muscle soreness and isokinetic peak torque) were measured immediately before the pre and post exercise tests and also at 24 h after the eccentric exercise. NIRS and breath-by-breath pulmonary VO2 were measured continuously during the exercise tests and subsequently modelled using standard non-linear regression techniques.

The eccentric exercise was effective in provoking significant changes in all markers of muscle damage: CK activity, pre 172±123, 24 h post 740±666 U/l; soreness, pre 0.6±5.48 h, post 7.1±1.5 (where 0= ‘no soreness’ and 10= ‘worst soreness ever’); peak torque, pre 287±39, 48 h post 227±60 Nm; all P<0.05). There were no changes in phase II pulmonary VO2 kinetics following the onset of exercise (time constant, pre 25±4, post 24±2 s; amplitude, pre 2.36±0.23, post 2.37±0.23 L/min; all P>0.05). However, both the time delay (pre 4.1 s, post 6±1 s) and the mean response time (pre 14±3 s, post 19±3 s) of the (Hb) response were significantly slower following eccentric exercise (P<0.05).

The slower (Hb) kinetics observed following eccentric exercise is consistent with an increased QO2/VO2 ratio during transitions to high-intensity exercise. Since pulmonary VO2 kinetics were not altered by the intervention, the increased QO2/VO2 ratio must reflect an increased local muscle blood flow. It is speculated that an increased QO2 is necessary to compensate for the reduced PO2mv resulting from the eccentric exercise (Kano et al., 2005). In this way, the increased QO2 could act to raise the O2 pressure head and thus preserve muscle VO2 in the transition from rest to exercise.

References

EFFECT OF FEEDING VERSUS FASTING DURING PROLONGED EXHAUSTIVE EXERCISE ON SALIVARY IMMUNOGLOBULIN A, LYSOZYME AND ALPHA-AMYLASE

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A decreased level of mucosal immune defence has been implicated as a causal factor for the reported higher incidence of upper respiratory tract infection in athletes (Gleeson et al., 1999). Eating activates both gustatory and mucosal receptors which may stimulate the secretion of proteins into saliva via autonomic mechanisms (Pedersen et al., 2000). Therefore, the aim of the present study was to investigate the effect of feeding versus fasting during prolonged exhaustive exercise on the salivary secretion rates of immunoglobulin A (s-IgA), lysozyme, alpha-amylase and cortisol. Using a randomised cross-over design and following a 10 12 hour overnight fast, 24 fit healthy...
The performance of rapid (ballistic) contractions is influenced by the conditions under which they are performed (Van Cutsem & Duchateau, 2005). For example, we have shown that the rate of isometric torque development was greater when the ballistic contraction was preceded by a rapid contraction of the antagonist muscles compared with a ballistic contraction performed from resting condition (Richartz et al., unpublished observation). In this study, we investigated the time course of change in the activation of the ankle dorsiflexor muscles during a two-hour stay in a snow hole. Six healthy young men participated in this study. Each of them gave us an informed consent. HR, RT and SSTS were measured during two hours. The snow hole was 115cm height, 175cm wide and 200cm interior. RT decreased significantly in all subject (P<0.05). However, the rate of decrease in RT was half as compared to the pre-experiment. On the other hand, HR was not changed. A score of SSTS was significantly increased in all subjects (P<0.05). These data suggest that using a heat insulating material is effective to inhibit a decrease of rectal temperature during a short stay in snow hole. Second experiment; The purpose of this experiment was to examine the effects of HR, RT and SSTS using a heat insulating material during a two-hour stay in a snow hole. Six healthy young men performed a two-hour test in a snow hole. HR showed no significant difference during a two-hour stay. RT significantly decreased in all subjects (P<0.05). However, the rate of these decreases was a quarter as compared to pre-experiment. SSTS was significantly increased in all subjects (P<0.05). These data appear to be associated with factors associated with skin temperature. It was considered that using thermal underwear inhibited the rectal temperature. Third experiment, The purpose of this experiment was to investigate the effects of HR, RT and SSTS using a heat insulating material, thermal underwear and heat-and steam-generating sheets during a two-hour stay in a snow hole. Eight healthy young men performed a two-hour test in a snow hole. HR was no significant difference during a two-hour stay. RT significantly decreased in all subjects (P<0.05). SSTS was significantly increased between the zero minutes of experiment to fifty minutes and after that (P<0.05), it was kept to steady state. It was considered that using the thermal underwear and heat-and steam-generating sheets inhibited a subjective thermal sensation. All the results found that everything is totally effective to prevent the coldness using heat insulating materials, thermal underwear and heat-and steam-generating sheets, during a two-hour stay in a snow hole.

CHARACTERISTIC OF MUSCLE ACTIVATION DURING A BALLISTIC CONTRACTION PRECEDED BY A RAPID ANTAGONIST ACTIVATION

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The performance of rapid (ballistic) contractions is influenced by the conditions under which they are performed (Van Cutsem & Duchateau, 2005). For example, we have shown that the rate of isometric torque development was greater when the ballistic contraction was preceded by a rapid contraction of the antagonist muscles compared with a ballistic contraction performed from resting condition (Richartz et al., unpublished observation). In this study, we investigated the time course of change in the activation of the ankle dorsiflexor muscles when the ballistic action is preceded by a rapid submaximal contraction of their antagonist muscles. Five healthy subjects participated in this investigation. They seated on a chair with their right foot strapped to a footplate with the ankle and knee angles at 90° and 120°, respectively. The task consisted successively: (1) to sustain a submaximal force (20% of MVC) with the dorsiflexors, (2) to perform a rapid contraction at ~50% of the maximal force with the planter flexors (antagonists) and (3) to produce, without transition, a ballistic contraction with the ankle dorsiflexors. The isometric torque developed by the ankle muscles was recorded by a transducer. The EMG activities of both agonist (tibialis anterior) and antagonist (soleus and gastrocnemius) muscles were obtained by means of two surface electrodes placed over each muscle. The motor evoked potential (MEP) induced by transcranial magnetic stimulation (TMS) and the Hoffmann reflex (H-reflex) were also recorded at different times of the task. The EMG responses to both stimulations were normalised to the responses obtained while performing the sustained submaximal contraction at 20% of MVC.

The results show that during the antagonist contraction, the EMG of the tibialis anterior dropped to 70% of that recorded during the sustained contraction of the agonist at 20% of MVC. During the ballistic contraction with the agonist, it raised to nearly 30% of the control value. The activation of the agonist was preceded by a silent period (SP) of 35 ± 5 ms. The changes in MEP and H-reflex followed the same time course throughout the task. They never surpassed 50% of the control values during the antagonist activation, increased progressively during the SP and reached values of 120% and 150% for the MEP and H-reflex, respectively, during the ballistic action.
In conclusion, this study shows the presence of a SP in the activation of the ankle dorsiflexor muscles when a ballistic action is preceded by a rapid submaximal contraction of their antagonist muscles. The SP seems to play a role in the increase in the rate of torque development during a subsequent ballistic contraction (Van Cutsem et al., 2005). Regardless of the exact origin of SP, the similar time course of change for the MEP and H-reflex during the task suggests the contribution of post-synaptic inhibitory mechanisms.

References

ASSOCIATION OF METABOLISM AND SUBSTRATE SELECTION FOLLOWING HIGH-INTENSITY EXERCISE
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Background
Metabolism during sprint exercise has received considerable attention, but a renewed interest in applications for sprint training indicates that a better understanding of metabolism during recovery from this type of exercise is needed. The aim of this study was to examine the effect of a single 30-s sprint on substrate selection during recovery.

Methods
Following ethics committee approval, seven physically active males (mean age (SD), 25.5 (2.9) yr; body mass index, 24.9 (3.5) kg/m²) gave informed consent to participate, before completing two trials in a random order after an overnight fast. In one trial, they performed a single 30-s sprint on a cycle ergometer against a resistance equivalent to 7% of their body mass (EX). In the other trial, they rested in the laboratory (CON). Blood samples were taken at intervals pre- and post-exercise, and at equivalent times in the rest trial. Expired air samples were collected using the Douglas Bag method for calculation of the respiratory exchange ratio (RER). Data were analysed using paired t-tests; statistical significance was accepted at P < 0.05.

Results
Sprint exercise elicited an increase in blood lactate concentrations with highest measured concentrations at 10-min post-exercise (EX vs. CON; 6.5 (0.8) vs. 3.9 (0.9) mmol/L, P < 0.01). Plasma free fatty acids concentrations decreased after exercise with lowest measured concentrations at 5-min post-exercise (EX vs. CON; 0.18 (0.03) vs. 0.33 (0.20) mmol/L, P = 0.08). The RER increased from pre-exercise (EX vs. CON; 0.86 (0.08) vs. 0.85 (0.11), P = 0.72) to 5-min post-exercise (EX vs. CON; 1.12 (0.13) vs. 0.76 (0.02), P < 0.01), before decreasing to lowest measured values at 30-min post-exercise (EX vs. CON; 0.61 (0.04) vs. 0.76 (0.03), P < 0.01).

Discussion
A single 30-s sprint resulted in an RER of less than 0.7 within 30 min of post-exercise recovery. Such a low RER indicates that indirect calorimetry might not be a sensitive tool for the assessment of fat and carbohydrate oxidation after sprinting. Specifically, the occurrence of metabolic processes such as protein oxidation, gluconeogenesis and ketogenesis might reduce RER resulting in over- or underestimation of rates of fat and carbohydrate oxidation. For example, direct oxidation of protein has a respiratory quotient (RQ) of ~0.8, but conversion of glycogenic amino acids into glucose has an RQ of 0.1-0.4, depending on the substrate used to fuel this process. If the glucose derived via gluconeogenesis is subsequently oxidised, the overall RQ will be the same as if the protein had be oxidised directly, however, net storage of this glucose, as might occur following demanding exercise, might result in a low RQ that, in turn, reduces the measured RER. Further work is warranted to improve understanding of the extent and impact of these processes as part of a wider understanding of metabolism and substrate selection following high-intensity short-duration exercise.

EFFECT OF A GROWTH HORMONE RECEPTOR ANTAGONIST (PEGVISOMANT) ON FAT METABOLISM DURING AND AFTER 45-MIN OF CYCLING IN HEALTHY ADULT MALES
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Background
Exercise stimulates the release of growth hormone (GH), which has a powerful lipolytic effect. GH administration increases fat oxidation in the resting state; however whether GH augments fat oxidation during exercise remains unclear. Previous studies investigating the role of acute GH administration during exercise have failed to show an elevation in whole-body fat oxidation despite substantial increases in lipolysis and fatty acid availability. The aim of this study was to limit the action of GH by administering a GH receptor antagonist (pegvisomant) in order to investigate the role of GH in regulating fat metabolism during, and in recovery from, a bout of moderate intensity exercise.

Methods
Following local Ethics Committee approval, 12 men aged 18-25 years were familiarised before completing two trials in a random order at least 7 days apart. Participants cycled for 45 min at 60% VO₂ max under normal conditions (CON), or 72 h after the administration of pegvisomant (PEG). Expired air and blood samples were taken at intervals pre- and post-exercise, and at equivalent times in the rest trial. Substrate oxidation was estimated from expired air and blood samples for calculation of the respiratory exchange ratio (RER). Data were analysed using paired t-tests; statistical significance was accepted at P < 0.05.

Results
Pegvisomant administration led to a significant reduction in pre-exercise IGF-I (PEG vs. CON; 80 (24) vs. 111 (24) ng/mL, P < 0.01, d = 1.3) and GHBP (150 (155) vs. 596 (291) pmol/L, P < 0.01, d = 1.5) concentrations, suggesting that pegvisomant successfully limited the action of GH in the PEG trial. At rest, there was a significant reduction in fat oxidation in the PEG compared to the CON trial (0.07 (0.03) vs. 0.09 (0.03) g/min, P = 0.043, d = 1.0). During exercise, mean fat oxidation was significantly greater in the PEG than the CON trial (0.48 (0.1) vs. 0.39 (0.1) g/min, P = 0.03, d = 0.8), whilst FFA and glycerol concentrations were consistently, although not significantly, greater during exercise and recovery in PEG than CON. Mean carbohydrate oxidation during exercise was significantly lower during the PEG than the CON trial (1.6 (0.4) vs. 1.9 (0.3) g/min, P = 0.05, d = 0.4). During recovery there were no differences in fat oxidation between trials whilst mean blood glucose concentrations were lower in the PEG trial (4.0 (0.5) vs. 4.2 (0.2) mmol/L, P = 0.21, d = 1.0).

Conclusion
Limiting the action of GH in healthy young men reduced fat oxidation at rest but, in contrast to expectations, increased fat oxidation and decreased carbohydrate oxidation during exercise.
EXHAUSTIVE EXERCISE CAUSES INTESTINAL CONTRACTILITY IMPAIRMENT BY INCREASE OF MAXI-K+ CHANNEL MRNA EXPRESSION

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Introduction. The effects of exhaustive exercise (EE) on the intestine are poorly understood. EE is associated with alterations of the expression of genes, like Maxi-K+ channel (KCa 1.1) and CaV1.2 channel, which could interfere with the intestine contractility. We thus investigated the effects of EE on the intestine contractility and the possible relationship with those two gene expression alterations. Methods: C57Bl/6 mice were assigned to control (CT), exercised for 4 (E4), and 10 days (E10) groups. EE program consisted of a daily treadmill running session at 85% of the maximum velocity until exhaustion. Contractility was evaluated by determining Emax and EC50 from non cumulative concentration-isometric contraction curves in response to carbachol (CCh), bradykinin (BK) and KCl. The mRNA of KCa 1.1 and CaV1.2 genes was quantified by real-time RT PCR. Results. The contractility was significantly impaired in E4 animal group, with 50% decrease in the efficacy of KCl, CCh and BK couplings. After 10 days of EE, it was not observed any alteration on the contractile response. The CaV1.2 expression was not significantly affected by 4 or 10 days of EE, while the expression of KCa 1.1 channel increased by 112% only in the E4 animal group. The increase of potassium current could explain the contractility impairment. Thus, we performed concentration-isometric contraction curves in presence of 1mM TEA+, a KCa 1.1 channel blocker. The presence of the blocker restored the efficacy of KCl, CCh and BK couplings to the levels observed in the control group. Conclusion. Altogether these results suggest that EE increases the BK channel mRNA expression, which increases the potassium current. This EE effect is responsible by the intestinal contractility impairment. Support: FAPESP and CNPq

DIFFERENT FLOW RESPONSES OF RENAL AND SPLANCHNIC ARTERIES DURING DYNAMIC EXERCISE

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Purpose.
The blood flow in abdominal viscera has been described as the ‘blood giver of circulation’ and is believed to play a major role in cardiac distribution during exercise. Several investigations have reported that the abdominal blood flow decreases during exercise in proportion to the exercise intensity (Grimby, 1965; Rowell, 1974; Flamm et al, 1999). However, since visceral regions are consisted of functionally different organs such as kidneys and gastrointestinal tracts, it was hypothesized that blood flow regulation during dynamic exercise is different among arteries supplying to specific organs (Eriksen & Waaler, 1994; Perko, 2001). To verify this hypothesis, we studied the blood flow responses in the renal artery (RA) and the superior mesenteric artery (SMA) during dynamic exercise with graded workloads.

Methods.
Nine healthy female volunteers whose mean age was 23 (SD= 3.3) yr participated in the present study. After 10-min resting, the subject performed a 15-min bicycling exercise including three workloads of 30%, 50%, and 70% of peak oxygen uptake for 5 min for each workload. The exercise was done on a recumbent ergometer. Oxygen uptake, carbon dioxide production, minute ventilation, heart rate (HR), ECG, arterial mean blood pressure (MAP), and cardiac output (CO: Finometer) were continuously measured through the experiment. Time-averaged mean blood flow velocity (MBV) in RA and SMA was measured by using Doppler method. The conductance in RA and SMA were calculated as the quotient of MBV values in RA and SMA and the corresponding MAP values.

Results.
During dynamic exercise, the responses in oxygen uptake, minute ventilation, MAP, CO, and HR, respectively, increased linearly with three workloads from rest to 30%, 50%, and 70% of peak oxygen uptake. The conductance in RA, however, demonstrated a significant reduction during three workloads, by 19(5SD=11)% 29(5SD=13)% and 45(5SD=13)% of the value at rest for 30%, 50%, and 70% of the peak oxygen uptake, respectively. In contrast, the conductance in SMA showed no significant decrease from the resting level. The percent reduction of the conductance in SMA during exercise was 5(5SD=15)% 11(5SD=16)% and 19(5SD=16)% for the three workloads, respectively. Thus, the dynamic exercise produced a different response in the conductance between RA and SMA.

Conclusion.
The present data supported the hypothesis that blood flow regulation among visceral arteries is differential during dynamic exercise. The RA appeared to be more sensitive to exercise stimulus than the SMA, whereas the artery supplying to the digesting gastrointestinal tract such as SMA, might be some degree exempt from flow-reducing participation during exercise.

References.

ACUTE EFFECTS OF DIFFERENT TRAINING CLASSES IN GLYCAEMIA LEVELS, IN INDIVIDUALS WITH TYPE 2 DM

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Background: Exercise is a key element in the prevention and treatment of type 2 Diabetes mellitus (DM). There are evidences that aerobic, resistance and combined aerobic and resistance training have long term effects over glycaemia levels (Sigal et al 2007). However, it’s also important to know the acute effects of these different types of exercise. Exercise prescription for individuals with diabetes should be oriented to allow a better control of glycaemia as well as to avoid situations of hypoglycaemia/hyperglycaemia during exercise.

Objectives: The purpose of this study was to find out the acute effects of different training classes in glycaemia levels, in individuals with type 2 DM.

Methods: Fifteen, both genders, individuals with type 2 DM aged 68.4 years±7.6 were submitted in different days to 3 different types of classes: Aerobic Training (AT), Resistance Training (RT), Combined Resistance and Aerobic Training (CT), and to a no-exercise control situation (C). Time from last meal and respective content were the same for all individuals in all situations considered. Classes’ duration was 45 minutes, at a moderate intensity (Rate of Perceived Exertion level 12-13). Glycaemia levels were evaluated before and after each class. Paired samples t tests were performed to check for significant differences between pre-post exercise levels of glycaemia.
Results: No significant differences were found between pre-exercise glycaemia values, which confirm situation’s comparability. All conditions showed lower post-exercise glycaemia levels, however, CT was the only condition that that revealed significant differences Mean difference 25,2 mg/dl (CI 95%+9,7 a +40,1) P=0,04. Mean Differences for the other conditions were: C 0,3 mg/dl (CI 95%-12,4 a +13,1) P=0,956, RT 4,3 mg/dl (CI 95%-3,9 a +12,5) P = 0,276, AT 8,3 mg/dl (CI 95%-1,7 a +18,7) P = 0,08 Desert the magnitude of decreases found in CT, there were no cases of individuals with final glycaemia levels below an acceptable level (50 mg/dl). This was the only condition where all individuals reached optimal final levels of glycaemia (<150 mg/dl). It was also the condition that showed the smallest variability (sd=17,8 mg/dl) compared with AT (sd=31,6 mg/dl) and RT(sd=32,3 mg/dl).

Conclusions: Results are in order with Sigal et al (2007) which reached the conclusion that combined aerobic and resistance training was the better condition to achieve the control of glycaemia in individuals with type 2 DM.

CT seems to be an effective and safe prescription for individuals with type 2 DM with a well controlled level of glycaemia, thus it may play an important role in the treatment and control of type 2 DM.

Reference:

**EFFECTS OF TRAINING IN THE FASTED STATE IN CONJUNCTION WITH FAT-RICH HYPERCALORIC DIET ON MUSCLE METABOLISM AND ENDURANCE PERFORMANCE**

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Introduction: Insulin sensitivity has been shown to be reduced with hypercaloric high-fat diet, which promotes a positive fat balance and an imbalance between lipid storage and fat oxidation(1). A high turnover rate of intramyocellular lipid (IMCL) is proposed to reduce accumulation of toxic lipid intermediates interfering with insulin signalling (2). An acute exercise bout in the fasted state stimulates IMCL breakdown (3), the purpose of this study was to compare the effect of exercise training in the fasted state versus the postprandial state on endurance performance, IMCL content and whole body insulin sensitivity during a period of six weeks of hypercaloric (normal diet + 30% kcal/day) high-fat (50-55%) diet.

Methods: Twenty-eight healthy moderately active males (18-25y) performed training sessions (6wks, 1-1.5h sessions@70-75% VO2peak, 4d/week) either in the fasted (F; n=10) or the carbohydrate-fed state (CHO; n=10), or had no training (ICON; n=8). Before and after the intervention period, subjects performed a 2h constant-load bicycle exercise (~63% of VO2 peak), followed by a 15-minute time trial (TT). Needle biopsies were taken from m. vastus lateralis and blood samples were taken before, and immediately after the 2h exercise and time trial. Glucose tolerance was measured by a 2h oral glucose tolerance test (OGTT). Results: Time to exhaustion during an incremental exercise test similarly increased in both F (+16%) and CHO (+14%). Peak VO2 increased from 60.5 ± 1.5 to 64.7 ± 1.8 ml.min.kg⁻¹ in CHO (p<0.01), but not in F (60.3 ± 2.2 to 61.2 ± 2.6 ml.min.kg⁻¹; p=0.51). TT performance was improved to the same degree (~24%) in both training groups (p<0.0001) but was unchanged in CON. Area under the glucose curve during OGTT decreased after training in F (p<0.01), whilst it was unchanged in CHO and CON. Fiber type-specific IMCL content and insulin data of OGTT are currently being analyzed. Conclusion: Compared with training in the carbohydrate-fed state, training in the fasted state during a period of hypercaloric high-fat does not enhance endurance performance, but could improve glucose tolerance.

References:

**THE RELATIONSHIP BETWEEN BLOOD FLOW AND NITRIC OXIDE EMANATING FROM HUMAN SKIN FOLLOWING THE WRIST FLEXION-EXTENSION EXERCISE**

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Introduction. Nitric oxide (NO) is the most important endothelium-derived relaxing factor, which plays a pivotal role in modulating smooth muscle tone in the human conductance and resistance vessels [1]. Jungersten et al. [2] have suggested that NO is increased with increased cyclic wall stress associated with increased pulsatile blood flow during acute exercise. Previously, we [3] have been detected NO emanating from human skin (skin-gas). The purpose of this study was to examine whether increased blood flow during acute exercise would relate human skin-gas NO concentrations or not.

Methods. Ten healthy male students (21.7 ± 2.2 years; mean ± SD) volunteered as the subjects. The subjects performed the repetitive wrist flexion-extension exercise at 25% maximal voluntary contraction at a pace of a time per second until voluntary exhaustion. The skin-gas samples were obtained by the covering index fingertip for 30 sec with a polyfluorovinyl bag (Tedlar bag, GLScience, Tokyo, Japan) in which pure nitrogen gas was introduced, and collected in a sampling bag at rest and after exercise (0-0.5, 2-2.5, 4-4.5, 6-6.5, 8-8.5, 10-10.5 min). Blood flow was measured with a noncontact-type laser-Doppler flowmetry (LDF) probe on the skin surface of the annular fingertip (ALF-21, Advance, Tokyo, Japan).

Results and Discussion. The mean ± SD time to exhaustion of the exercise was 216 ± 50.6 sec. No significant higher levels were found in the index fingertip blood flow levels after the exercise compared to the resting values, however, the peak blood flow levels of each subject significantly increased compared to the resting levels (p<0.01). The skin-gas NO concentrations significantly increased 4-4.5 min after the exercise.
Oxygen uptake kinetics at the onset of heavy intensity exercise have been shown to be faster in young children compared to older children (Fawkner and Armstrong 2004) and in young adults compared to older adults (DeLorey 2004). The exact mechanisms are not known therefore the purpose of this study was to gain further insights by simultaneously examining the relationship between pulmonary oxygen uptake kinetics and muscle deoxygenation at the onset of heavy intensity cycling exercise in 8 girls (aged 9.7 ± 0.4 years) and 8 female adults (aged 22.4 ± 5.2 years).

A single exponential following a time delay was used to analyse both the averaged oxygen uptake (phase 2, time constant) and the Hb response (from exercise onset).

We conclude that increased blood flow during the repetitive low intensity exercise stimulates vascular endothelial NO production and local NO release. The changes in the skin-gas NO concentrations observed in this study have suggest that the repetitive wrist flexion-extension stimulate endothelial NO production by increases in shear stress during the exercise.

Conclusions.

References.

**RELATIONSHIP BETWEEN OXYGEN UPTAKE KINETICS AND MUSCLE DEOXYGENATION IN CHILDREN AND ADULTS AT THE ONSET OF HEAVY INTENSITY CYCLING EXERCISE**

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University of Wales Institute Cardiff, United Kingdom

Oxygen uptake kinetics at the onset of heavy intensity exercise have been shown to be faster in young children compared to older children (Fawkner and Armstrong 2004) and in young adults compared to older adults (DeLorey 2004). The exact mechanisms are not known therefore the purpose of this study was to gain further insights by simultaneously examining the relationship between pulmonary oxygen uptake kinetics and muscle deoxygenation at the onset of heavy intensity cycling exercise in 8 girls (aged 9.7 ± 0.4 years) and 8 female adults (aged 22.4 ± 5.2 years).

Each subject performed at least 4 step change transitions from unloaded pedalling to a constant work rate corresponding to 40% difference between their previously determined ventilatory threshold and peak oxygen uptake. Each participant’s breath by breath responses were interpolated to 1s intervals, time aligned and averaged. A near infrared spectroscopy (NIRS) device (Hamamatsu NIRO 300) was used to sample changes in deoxyhaemoglobin (Hb), data were collected at 1s time intervals and individual tests were time aligned and averaged. A single exponential following a time delay was used to analyse both the averaged oxygen uptake (phase 2, time constant) and the Hb response (from exercise onset).

Oxygen uptake kinetics were significantly faster in children at the onset of exercise as shown by the phase 2 time constant (23.5 ± 6.5s in children vs 35.3 ± 6.5s in adults P<0.05). The kinetics of muscle deoxygenation as shown by the MRT for Hb (time delay + time constant) were significantly slower in children compared to adults (28.3 ± 8.1s vs 20.4 ± 8.6s P<0.05). There was no correlation between oxygen uptake and Hb kinetics in either children (23.3s ± 8s vs 28.5s ± 7.7s respectively; P> 0.05) or adults (33.3 ± 9.6s vs 20.4 ± 8.6s respectively; P> 0.05).

The faster pulmonary oxygen uptake kinetics and slower muscle deoxygenation in children compared to adults indicates an age and/or maturational effect on the relationship between oxygen delivery and utilisation at the onset of heavy intensity exercise.

Conclusions.

References.

**CIRCADIAN RHYTHM IN 10-KM LABORATORY RUNNING PERFORMANCE**

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ABSTRACT

A wealth of research shows that physiological variables related to gross motor performance follow a time-of-day (TOD) effect. Recently a circadian rhythm in 200m time-trial performance has been reported, with faster times in the evening and worst performances in the early morning. Whether this variation in performance applies also to longer distances is unclear. Therefore, we tested the hypothesis that a circadian rhythm exists for a 10-km time-trial run.

Friday, July 11th, 2008

EXPERIMENTAL PROTOCOL

Ten male sport science students (X±SD: peak = 61.2±9.4 ml.kg.min-1, age = 26±6 years, body mass = 81.2±14.8 kg and height = 179±8 cm) took part in the study. The local Ethics Committee of the University approved the study. The subjects completed two familiarisation trials to the best of their ability at a self-selected pace. The subjects then completed six 10 km time-trials at 06:00, 10:00, 14:00, 18:00, 22:00 and 02:00 h. The design of the study was such that the sessions were counterbalanced in order of administration and a standardised 5-min warm-up at 10 km.h-1 was completed prior to each time-trial. Heart rate, RPE, and split times were measured every 1 km during the time-trial, together with the subjects’ perception of the pacing required to finish as quickly as possible (1-5, too slow/5, too fast). Finger tip blood lactate samples and intra-aural (IA) temperature were taken at rest and immediately after the time-trial. The 95% ratio limits of agreement for the 10 km time-trial performances on these individuals were /= 0.77, assessed in a prior test-retest study. Data were analysed using an analysis of variance model (TOD x distance) for performance times, IA temperature, 916; blood lactate, 916; body mass and 916; osmolarity. A two-way analysis of variance model (TOD x time-trial distance) was used for RPE, heart rate and split times. Group covaraior analysis was employed on resting intra-aural temperature and time taken to complete the trials. Resting IA temperature and finishing time both showed a significant circadian rhythm (P<0.05) with mesor, amplitude and acrophase of 36.58C vs 30.35C, 0.357C vs 0.357C and 19.43 vs 17.41 h, respectively. TOD variations were absent from any pre-post measures. There was a TOD effect in split times, heart rate and perception of optimal pacing, with heart rate and RPE reflecting the faster speeds (hence, lower split times) during the evening, and a perception at this time of having paced too fast to sustain performance to the end of the time-trial.

During the time-trial, split times decreased, and RPE and HR increased, from the first to the last km. There were no interactions in any of the variables for TOD x distance (P>0.05).
EFFECTS OF MENSTRUAL CYCLE IN MUSCLE ACTIVITY: BURST RATE AND RELATIVE TIME SPENT SHIVERING

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Cold-induced shivering is characterized by two distinct muscle contraction patterns: continuous low-intensity shivering [at ~1 to 5% of maximal voluntary contraction (MVVC)] and bursts of high-intensity shivering [at 10 to 35% MVVC] (Meigal, 2002, Haman et al., 2004). Even though the physiological importance of this dual pattern remains unclear, it is closely linked to observed differences in fuel selection amongst individuals. In this context, Haman et al. (2004) showed that carbohydrate (CHO) oxidation rate is directly related to burst shivering rate which increases the proportional recruitment of glycolytic type II fibers. Because most of these studies have been carried out in men, little is still known on the effects of hormonal fluctuations during the menstrual cycle on the dual shivering pattern and energy metabolism in women. In the only known shivering study focusing on changes in EMG shivering activity in cold women, Hessermeir (1985) have shown that the onset of shivering is delayed in the luteal phase (LP) when compared to the follicular phase (FP) due to an elevated core temperature. However, effects of the menstrual cycle on changes in muscle shivering activity remain to be established. Therefore, the purpose of this study was to quantify differences in muscle recruitment pattern and fuel selection in two phases of the menstrual cycle. Muscle recruitment in eight muscles and whole body fuel selection were monitored in women exposed to 120 min of cold exposure (57°C liquid-perfusion suit) divided into FP and LP. We hypothesized that muscle activity will be reduced in LP due to higher initial core temperature and that this reduction in overall shivering intensity will reduce burst shivering rate during low intensity shivering (~20% of MV2max). Results show that there is no difference in shivering intensity (MV2 and EMG activity) and burst shivering rate between LP and FP during steady state shivering (in last 15 min). However, significant differences in the duration of an average burst are found resulting in a significantly longer time spent burst shivering in LP than FP (18.4±0.9 % vs 16.3±0.4 % total recording time; p = 0.02). Even though exact reasons for this difference remain unknown, this increase in average burst shivering time is associated with a higher reliance on CHO in LP compared to FP. We conclude that burst shivering activity different in LP than FP and that this change is associated with changes in fuel selection during low-intensity shivering.

References


NEW ELECTROMYOGRAPHIC PARAMETERS FOR SKELETAL MUSCLE PERFORMANCE EVALUATION

Vasilescu, M., Ionescu, A., Rusu, L., Apostol, A.
University of Craiova, UMF Carol Davila, Romania

Authors propose a modern and complex exploration method of muscle fatigue by computerized acquisition and analysis of surface electromyography (SEMG) and mechanomyogram (MMG) during voluntary isometric maximal contraction of flexor hand fingers. The evolution of 12 classical (previously described in literature) SEMG and mechanographic parameters and new parameters and indices were analyzed with dedicated software. This modern exploration method allows precise, quantified, analysis of muscle fatigue phenomenon and, by linear regressions and statistical analysis, permits to differentiate various groups of subjects. The original part of this method consists in the calculation of the Synchronization Ratio (SRa) for the EMGSS, the determination of the percentage of the Synchronization (Syr) between the two EMGSS on the same muscle, the proposal of the Excitation-Contraction Coupling Efficiency Index (ECCEI) who differentiate very well the categories of subjects, the study in time of the parameters through out the I order regression lines, the establishment of the relation between the mechanical and electrical activity of the muscle. With the help of this modern technique, we have studied different athletes categories obtaining very interesting results for the performance and muscle fatigue evaluation.

THE PHYSICAL TRAINING AT THE ANAEROBIC THRESHOLD IS ABLE TO DECREASE THE OBESITY IN RATS

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(1) FC-UNESP, (2) UNIFRAN, (3) FESP UEMG, (4) UNAERP, Brazil

The obesity and their other associated comorbidities are the main problem of public health on the nowadays. The use of physical training on prevention and treatment of this problem can be many times the best and cheapest way to solve it. Although, many authors have been writing about the incapacity of moderate aerobic training for weight control. The high intensity aerobic training (maximal stead state lactate - MSSL) at the intensity related around of the anaerobic threshold (lactate threshold - LT) were observed on thirty young Wistars rats (3 months aged). All animals were divided in 3 groups with 10 rats each (moderate aerobic trained MAC- n = 10; LT n = 10; and control C group n = 10). All groups were submitted to an hiperlipidic diet for 2 months aiming at developing the obesity, before starting of the training. The LT and MAC groups were submitted to an incremental exercise protocol before 5 weeks of training to determine the LT intensity (the blood lactate breakpoint). The hiperlipidic diet was offerad ad libitum for also all the 5 weeks protocol. The training program was continuously performed from 20 to 25 min. swimming per-day, 4 days a week, loaded with 3% body mass (BM) for the AT group, 1 to 1.5% BM for de MAC group. The C group was not submitted to exercise training. It was observed a significant decrease of weight on the LT group after the 5 weeks (pre 449±35 and post 412±25 g) after 5 weeks of moderate aerobic training. On the other hand, the C group showed an increase of weight (pre 449±35 and post 512±38 g) after the 5 weeks. The lost of weight only by the LT group showed that the moderated aerobic intensity was not efficient for this purpose, but could stop the gain of weight. Still, it was concluded that 5 weeks of swimming at MASSF (LT intensity) was strongly efficient to weight decrease in rats submitted to obesogenic diet.

In summary, the parallelism of temperature and time-trial finishing times agrees with previously published research with a delay in acrophase of 2.02 h in performance. The finding of a circadian rhythm in 10 km time-trial performance (duration 30313s) agrees with that of a shorter di...
**MUSCLE OXYGENATION DURING REPEATED SPRINT RUNNING: ACTIVE VS. PASSIVE RECOVERY**

Buchheit, M., Cornicie, C., Abbiss, C., Ahmadi, S., Nosaka, K., Laursen, P.

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Active recovery has recently been shown to impair repeated sprint ability (RSA) during cycling. However the effect of active recovery on muscle oxygenation and short repeated run-based sprint performance is not known. Purpose. To investigate the effect of muscle oxygenation on run-based RSA using active (AR) versus passive recovery (PR). Methods: Ten moderately trained male subjects (27.0 ± 3.7y) performed a maximal isometric 10-s contraction (MVC) and 6 repeated all-out 4-s sprints interspersed with 21-s of either AR (2.0m.s-1) or PR on a non-motorized treadmill. Recording was breath-by-breath for oxygen uptake (O2), beat-to-beat for heart rate (H1R), and 6Hz for near-infrared spectroscopy (NIRS) deoxyhemoglobin (HHb). Capillary blood lactate (Lab) was also measured after each exercise.

Mean running speed (AvSpmean) and percentage speed decrement (%Dec) were computed for each recovery condition. Muscular reoxygenation capacity was determined after MVC (T1/2 reoxy). Results: AvSpmean was lower (3.79 ± 0.09 vs. 4.09 ± 0.10m.s-1, P<0.001) and %Dec higher (7.15 ± 1.16 vs. 3.20 ± 0.42%, P<0.001) for AR versus PR. All cardiorespiratory and NIRS values were higher during AR compared to PR: mean O2 (3.64 ± 0.14 vs. 2.91 ± 0.15L, P<0.001). HR (159.9 ± 2.6 vs. 154.7 ± 2.6bpm, P<0.01), HHb (94.4 ± 5.3 vs. 83.4 ± 1.5% of HHb during the first sprint, P<0.05) and Lab (13.5 ± 0.8 vs. 12.7 ± 0.7mmol.l-1, P=0.03). For AR and PR, AvSpmean was negatively correlated with T1/2 reoxy (P<0.01). Conclusion: As with longer duration high-intensity efforts, muscle (reo)xygenation is likely to be modulated by recovery intensity and appears to be an essential determinant of short run-based repeated sprint ability.

**CEREBROVASCULAR RESPONSE DURING BREATH HOLDING, HYPERVENTILATION AND GRADED EXERCISE IN VARSITY HOCKEY PLAYERS SUFFERING MILD TRAUMATIC BRAIN INJURY: A PRELIMINARY TRANSCRANIAL DOPPLER STUDY**

Len, T., Neary, J., Asmundson, G., Goodman, D., Bjornson, B., Duff, W., LaHue, D., Yagesh, B.

University of Regina, Canada

It is theorized that a neuroautonomic cardiovascula r dysfunction (NCD) occurs with mild traumatic brain injury (mTBI) (1). NCD is the disconnection of the autonomic and cardiovascular systems, which together control cerebral autoregulation. We examined the effect of repeated bouts of hypercapnia, hypocapnia and continuous graded exercise on cerebral autoregulation between participants with a previous (<6 months) or current mTBI and a healthy control group using transcranial Doppler ultrasonography. Studies have shown that middle cerebral artery diameter does not change under physiological stress (2), thus mean cerebral blood velocity (vMCA) was used as an indicator of cerebral blood flow.

Thirteen male hockey players participated in the study and were divided into two groups [10 healthy controls, 3 mTBI]. Across both groups, age was 22.2 ± 1.2 years, height was 183.0 ± 6.3 cm and weight was 85.6 ± 7.9 kg. To evaluate the effect of hypercapnia, hypocapnia and graded exercise on cerebral autoregulation, the subjects performed five consecutive breath-holds of 20 sec (BH) with 40 sec of recovery, five consecutive bouts of hyperventilation (HV) for 20 sec followed by 40 sec of recovery and a 20 minute graded exercise protocol (80W, 140W, 200W, recovery). vMCA was monitored using a 1.6 MHz transcranial Doppler probe sampling at 1 Hz.

vMCA differences at rest and in response to BH and HV between groups were not significant. Percentage change of vMCA was significantly different at the end of the fourth BH and at the beginning of the second through fifth HV (p=0.002 0.044). vMCA values during the graded exercise protocol were not significantly different, however vMCA values at the third minute of recovery from exercise were significantly different between groups (61.1 ± 10.9 cm/s vs 49.3 ± 2.3 cm/s, p=0.016). Percentage change of vMCA at the end of exercise showed a significant difference between groups (29.78% ± 18.31% vs -2.33% ± 14.18%, p=0.047). The observed trend, although not significant, during graded exercise showed an increase in vMCA with increasing intensity in healthy participants while injured participants illustrated a decrease at mild to moderate intensities.

These findings suggest that NCD may be present in mTBI when analyzing using vMCA values alone as an index of cerebral autoregulation. A visual trend of response difference between groups was observed, although not significant. Further research examining a larger sample size is necessary to understand the impact of NCD on cerebral blood flow in mTBI patients.

**PHYSIOLOGICAL STRESS IN SKI MOUNTAINEERING**

Voutselas, V., Nikolaidis, G., Jamourtas, Z., Soulas, D., Papanikolaou, Z., Kritikos, A., Stavrou, V.

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Introduction

Ski mountaineering is a relatively new competition event that combines elements from the alpine ski (downhill skiing), cross-country ski (uphill skiing) and mountaineering techniques. Athletes cover a long distance, in cold weather and high altitude while carrying their equipment (approximately 12kg). No data have been published concerning the physiological stress occurred in ski mountaineering. The aim of the present study was to examine the physiological stress of a ski mountaineering race.

Methods

Eleven highly trained (nine male and two female) ski mountaineering athletes (table 1) participated in the study. Body Mass, hematocrit (Htc), hemoglobin (Hb), GPT, GOT, Uric Acid (UA), Creatine Kinase (CK), Potassium and Testosterone were measured before, immediately after and 1h after the Greek Ski Mountaineering Championship Race (about 110min mean finish time). One way ANOVA was used to examine the differences between the three measurements. The value of less than 0.05 was considered to be statistically significant for all tests.

**Table 1. Athletes Physical Characteristics.**

<table>
<thead>
<tr>
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<th>Physical Characteristics Mean±SD</th>
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<tbody>
<tr>
<td>Age (yrs)</td>
<td>31.9±7.8</td>
</tr>
<tr>
<td>Body Mass (kg)</td>
<td>70.7±11.8</td>
</tr>
<tr>
<td>Body High (cm)</td>
<td>173.8±11.0</td>
</tr>
<tr>
<td>Body Fat (%)</td>
<td>12.3±4.1</td>
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</tbody>
</table>

**References.**


3. Eleftheriou, V., Nikolaidis, G., Jamourtas, Z., Soulas, D., Papanikolaou, Z., Kritikos, A., Stavrou, V. Faculty of Sport Sciences, University of Thessaly, Greece.


INFLUENCE OF CARBOHYDRATE SUPPLEMENTATION DURING TRAINING ON THE DEVELOPMENT OF SPRINT AND ENDURANCE PERFORMANCE

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Carbohydrate supplementation during training is often used to maintain coordination and performance. This might be detrimental for the development of endurance capacity (EC) as Hansen et al. (2005) have shown that the improvement in endurance capacity correlates with the depletion of the glycogen stores during training. On the other hand carbohydrate supplementation increases the activity of anabolic hormones (Nieman et al. 2003). This might increase sprint performance. The aim was to investigate the effects of carbohydrate supplementation during training on the development of endurance performance and on sprint performance. As a training regimen we choose intermittent training because we recently have shown (Frische et al. 2005) that the improvement in EC is larger compared to continuous training.

20 male athletes were assigned to two groups (CON and CH). 4 subjects in each group were endurance athletes. Mean maximal power (WLmax) reached in incremental tests was 4.1 watt/kg (CON) and 4.2 watt/kg (CH). Tests and trainings were performed on a cycle ergometer (Excalibur sport, Lode).

Training: 10 min warming up at 50 % of WLmax, followed by 55 bouts with WLmax minus 10 Watt for 30sec and 10 watt for 30 sec and a cooling down of 10 min at 50 %. Before training food intake was not allowed for at least 3 hours. Tap water intake before and during training was 26 ml/kg body weight. In CH Maltodextrine was added to reach a 9.1 % solution.

EC was tested at 80 WLmax of the initial incremental test. Sprint performance and the ability to perform repeated sprints was tested in 2 Wingate-tests separated by a 60 s rest. The study was completed by an incremental test. During all tests spirometric data (Metalyzer IIIb), heart rate and lactate were measured.

In CH glucose concentration was higher by about 1.5 mmol/l during the training (p<0.02) compared CON. RER was not affected. In both groups the endurance time at constant load increased by about 60%. Lactate, RER, heart rate and ventilation at the end were not different between the groups and between pre and post tests. The increase in VO2max was about 2% in both groups (n.s.). Maximum heart rate was not altered. However maximum [Lactate] and Ventilation increased significantly in both groups with no differences between the groups.

In CON and CH mean and maximum power (+6 and +12%, 2 and 5% respectively) in the Wingate-tests increased significantly, however the increase was significantly smaller in CH (p<0.05). No significant difference between pre and post or between the groups could be seen in the kinetics and the absolute lactate concentration during the tests and during the following 30 min rest.

The development of EC was not influenced by the carbohydrate ingestion, however the improvement in sprint performance was reduced.

The mechanism remains to be investigated.

References:

PHYSICAL ACTIVITY COMPLIANCE IN SEVERELY OBESE WOMEN

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Background: Physical activity (PA) public health recommendations for adults indicate that a minimum of 30 min/d of moderate-intensity PA on 5 d/wk should be achieved (ACSM & AHA, 2007). When this level of activity is accomplished but subjects remain overweight, an increase in PA is advised, attaining 60 min/d of moderate-intensity PA (IOM, 2002). The aim of the present study was to analyze time spent in sedentary activities and different intensity PA levels in severely obese women, and to compare it with actual PA recommendations.

Methods: 9 severely obese women were studied at week 1 of a PA promotion program specially designed for morbibly obese patients (M=39.0y SD=7.2y, M=117.8kg SD=13.6kg, M=1.6m SD=0.1m, M=45.6kg/m2 SD=4.3kg/m2). Daily PA was monitored with accelerometry (Actigraph GT1M), and PA intensity categories were set accordingly to Freedson et al. (1998) cut-points, and expressed in minutes spent in sedentary activities, low-, moderate-, and vigorous-intensity PA. Descriptive analysis was performed, and Wilcoxon’s Signed Ranks Test was used to compare working days and weekend days. Spearman’s test and partial correlations were applied.

Results: Accelerometry revealed a mean result of 170.7 min/d (SD=46.8 min/d) spent in sedentary activities, while low-intensity PA accounted for 304.5 min/d (SD=83.5 min/d), moderate-intensity PA was performed for 511.1 min/d (SD=29.9 min/d), and vigorous-intensity PA was inexist. Time spent in moderate-intensity PA was significantly lower (P<0.05) on weekend days when compared with working
days (63.1 min/d versus 28.3 min/d, respectively). Positive correlations were found between age and daily minutes spent in low-intensity PA (r=0.69, P<0.049). Similar results were observed for BMI (r=0.767, P=0.016), either on weekend days (r=0.817, P<0.007) and marginally on working days (r=0.600, P=0.088). After controlling for age, the relations between BMI and low-intensity PA became marginally significant (r=0.696, P=0.054), and remained significant on weekend days (r=0.730, P=0.040). 77.7% of the subjects met 2007 recommendations, but from these only 33.3% achieved 2002 guidelines for PA. 22.2% of the participants did not accomplish the advised daily PA time.

Conclusion. Although most of severely obese women attained the minimal PA public health recommendations (ACSM & AHA, 2007), this does not seem to be enough in order to reduce or control their weight status. These results may have been influenced by the fact that participants were already on week 1 of a PA promotion program when the data was collected, which might have produced an increase in PA. The decrease of sedentary activities and simultaneously the increase of PA, especially of moderate-intensity, towards 2002 guidelines is advised to impact weight loss reduction and maintenance, contributing to an healthier weight profile and lifestyle.

ARTERIAL BLOOD PRESSURE RESPONSES IN MAXIMAL OXYGEN UPTAKE IN MIDDLE-AGED LONG DISTANCE RUNNERS

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INTRODUCTION

The run practice has shown an exponential rise in the last decades (1). However, it has been related sudden events with life risk associated to this sport practice. In these events, the whole pathophysiology is unknown. The blood pressure (BP) is a strong prediction of sudden events; so this study serve to verify how the BP behaves in middle-aged long distance runners at rest and a maximal oxygen uptake.

METHODOLOGY

20 long distance runners, male, normotensive and without pathologies, with age 47.45 ± 5.46 years, body mass 67.37 ± 10.55 kg, stature 1.70 ± 0.08 m with approximately 14,10 ± 8.49 years of continuous and uninterrupted training on average 56.14 ± 19.66 km/m day. The maximal oxygen uptake was applied (CPX-Ultima, Medgraphics, EUA), with electrocardiogram monitoring in twelve derivations (Wincardio digital sistem, Micromed, Brasil) in incremental protocol with initial speed of 6 Km/h and increments of 0.5Km/h each 30 seconds. The BP was measured by a column of mercury sphygmomanometer at the periods before, during the effort until exhaustion, each three minutes and at the post effort in the minutes 1, 2, 4, 6. The descriptive statistic analysis was through the SPSS 13.0 software.

This study was approved by the Ethic Committee in Research of the Faculty of Medicine Science from Unicamp.

RESULTS

The average speed peak reached was 16.4 ± 1.46 km/h and the VO2 peak 52.16 ± 6.05mlkg-1min-1. At rest the BP systolic in mmHg (SBP) on average measured standing was 128.4 ± 13.76, the diastolic BP (DBP) was 88.8 ± 9.76, at the effort peak the SBP was 173.8 ± 28.5 and the DBP 81.3 ± 12.45. The delta range between the effort peak and rest to SBP was 45.40 ± 14.74 and to DBP ·7.5 ± 2.69.

DISCUSSION

The BP behavior in exercise reflects homodynamic changes on the heart and vessels (2). In this study in long distance runners the SBP and DBP in the rest situation show normal values and similar to Azvedo et al. We can still observe that at the effort peak the SBP show a variation of 35.36%, and these values were expected for trained person, although well conditioned beings could reach superior values (3). Other studies, evaluating the SBP behavior during the effort, are necessary to elucidate these phenomenons, with the goal to evaluate the risks and provide a safer running practice.

References.

THE RELATIONSHIP BETWEEN PHYSICAL EXERCISE AND SOCIAL STRESS IN METABOLIC AND MORPHOMETRIC PROFILES OF FEMALE WISTAR RATS FEED WITH NORMAL AND CALORIC FOOD

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Research Centre in Physical Activity, Health and Leisure, Faculty of Sports – University of Porto, Portugal, Universidade Federal de Goiás-Jataí GO - Brasil

Chronic Stress can elicit a stress response characterized by the increased levels of seric glucocorticoid (GC). GC may induce enhanced caloric foods (CF) intake, which may promote an increase of body weight, abdominal fat deposition (AF), and plasmatic insulin levels. On the other hand, CF and AF may reduce the harmful effects of stress response. It is reported that regular physical exercise (PE) can reduce the stress response and, consequently, may decrease CF intake and AF. The aim of this study was to analyse the relationships among the response of stress, the food intake and the PE in females Wistar rats. The animals (n=48) were randomly assigned in 8 groups (CCFPE, CCFS, CNFPE, CNFS, STCFPE, STCFS, STNFPE, STNFS) based on the following experimental conditions for 40 days: a) paired rats without the response of stress, the food intake and the PE in females Wistar rats. The animals (n=48) were randomly assigned in 8 groups.

Conclusion: Although most of severely obese women attained the minimal PA public health recommendations (ACSM & AHA, 2007), this does not seem to be enough in order to reduce or control their weight status. These results may have been influenced by the fact that participants were already on week 1 of a PA promotion program when the data was collected, which might have produced an increase in PA. The decrease of sedentary activities and simultaneously the increase of PA, especially of moderate-intensity, towards 2002 guidelines is advised to impact weight loss reduction and maintenance, contributing to an healthier weight profile and lifestyle.
METABOLIC AND MECHANICAL PARAMETERS DURING A SIMULATED JUDO FIGHT

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To date, the analysis of physiological and strength parameters required in fight sports has become important (Carballeira and Iglesias 2007; Kraemer et al. 2001). The purpose of this study was to examine metabolic and mechanical changes induced by a judo fight. It was hypothesised an association between selected parameters.

Eight judo fighters of national level participated in this study. Heart rate (HR) was recorded during each judo fight. Before, and immediately after each bout, the following parameters were measured: blood lactate concentration (LA), countermovement jump (CMJ), isometric handgrip strength (IH), isometric bench press strength at 90° (BP90), prone rawing strength at 90° (PR90), and squatl strength at 160° (S160). Isometric strength peak (ISP), isometric strength average (ISA), rate of force development (RFD), time to reach ISP (TISP) and quantity of force developed (QFD) were measured in the last three isometric exercise.

HR resulted in a mean of 92.65 ± 3.26 % of maximum HR. Pre-Post- mean values of measured parameters were: [LA], 5.39 ± 1.91 and of force developed (QFD) were measured in the last three isometric exercise.

Isometric strength peak (ISP), isometric strength average (ISA), rate of force development (RFD), time to reach ISP (TISP) and quantity of force developed (QFD) were measured in the last three isometric exercise.

6.20 % and ISA= 91.60 ± 9.47 %). %HR correlated significantly with the net loss in strength in PR90 after the match (r = -0.786; p = 0.021). [LA] after fight correlated significantly with the net loss in the time required to reach ISP (TISP) in S160 (r = 0.780; p = 0.022). Average value of isometric strength relative to body weight (ISAR) in S160 correlated with the relative LA increment after match (r = 0.706; p = 0.050). In summary, the acute effect of various simulated judo match resulted in an isometric strength loss of a greater extent in the upper limb compared with lower limb. The absence of relationships between metabolic and mechanical parameters could means that specific judo fatigue is related to local fatigue mechanisms.

References.

THE IMPACT OF A NOVEL ICE SKATING BLADE ON PHYSIOLOGICAL DETERMINANTS OF ICE HOCKEY PLAYERS

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Goal: To evaluate the skating performance of ice hockey players under conditions closely mimicking game situations while skating with either a heated or non-heated (control) blade. Methods: Two different levels of skating proficiency (1. Long distance [162 m] sustained explosive speed (short and intermediate duration glide sequence) at maximal skating velocity, and 2. Long term sustained speed (long duration glide sequence) at different submaximal skating velocities) were evaluated by measuring various physiological parameters using the latest state of the art technology (VO2 with a K4b2, Cosmed, Accelerometers on skates and shin bone, and lactate measurements). Results: Skating speed was marginally improved while attempting to skate at maximal speed along the outer perimeter of the rink (perimeter ~162 m). In contrast, all physiological parameters measured at submaximal speed showed a marked improvement when the players skated with the hot blade when compared to the cold blade. Physiological data was recorded on all players except for one who was unable to repeat the measurement. For this reason he was left out of the data analysis. In addition, some of the dependant variables for data interpretation were not included in the analysis due to technical difficulties. In conclusion, the results from the present study clearly show that skating with a heated blade has a positive effect on a large array of physiological parameters involved in skating, particularly those associated with fatigue development. This is an important aspect, since the literature reports that fatigue development during ice hockey may lead to several types of serious injuries (concussions, knee ligament strain, ankle sprains, etc.).

COMPARISON OF COMBAT SPORTS WITH OTHER KIND OF SPORTS THROUGH ECHOCARDIOGRAPHIC PARAMETERS

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Martial arts are more and more popular among the population, not only as competitive sport, but also as leisure-time activity. In the literature we can find only two articles about echocardiographic studies of combat sportmen. The first is by Date et al. (2003) who examined judo players, having compared them with marathon runners and healthy controls. They found significantly higher left ventricular mass and left ventricular wall thickness in sportmen than in controls. Vujin et al. (2006) also found increased thickness of the septum and posterior wall, and statistically significant thickness in judo players than in football players. On the other hand, football players had higher left ventricular end-diastolic volume index and ejection fraction. GOALSETTING: Our goal was to check the cardiovascular adaptation in combat sportmen, 196 endurance, 385 ball game, 73 power, 20 artistic, 59 speed-type, 79 leisure-time sportmen and 75 control (total number. 918 males), between age 17-35 were compared with Tukey Honest Significance Difference probe for unequal groups. RESULTS: The cardiac parameters of competitors of dynamic power sports are very similar to endurance and ball game players, but there is a big difference between the branches of power sports, as body builders and weight lifters have higher systolic blood pressure (p<0,001) and their hypertrophy is stronger than the representatives of martial arts. We also found significant differences with the control groups in pulse (p<0,001) and left ventricular muscle mass (p<0,001). SUMMARY: As in martial art practitioner’s main cardiac measurements looks like in other kinds of sports, and show differences compared to controls, we can say that combat sports are good enough for getting fit and tough.
Previous research has shown that the VO2max of boys who train for either speed or endurance sports are comparable. Mero et al. (1991) have shown a positive correlation between power, as measured in the Wingate test, and lactate production in minutes engaged in speed sports, as opposed to endurance events. Other research has indicated that minors show the same relative improvement as adult in comparable sports, when compared within the same competitive sport (Vitasso et al. 1991). The aim of this research was to compare the physiological parameters in anaerobic endurance of hockey players 16 years of age (U16) to those 18 years of age (U18). The participants on the project were training at the U16 level (n=26) or at U18 (n=21) with 7 and 9 years of playing experience, respectively. The U18 group was tested one week before the participation in World Championship and U16 group in similar training period. The players performed 5 minute warm-up exercises on cycle ergometer (Monark 884E, Sweden) at an intensity of 25 W. After a 3 minutes rest they performed a Wingate test. The resistance depended on body mass according to the equation: \( I_g = 80[g/kg-t] x \) body mass (kg) for U16 group and according to: \( 90[g/kg-t] x \) body mass (kg) for U18 group. Blood lactate level was estimated form blood draws from the finger at the 4th and 8th minute after testing. During the test the value of maximal power (Pmax) was calculated in intervals of 3s. Total work (WTOT) and the time of maximal power achievement (Tuz) were also recorded. Pmax obtained in Wingate test for U18 group was 12.53±0.48 W/kg and was statistically greater than the values obtained from U16 (p<0.001). WTOT and Wtot obtained in Wingate test for U18 group were significantly higher than U16 (p=0.001). Lactate concentration was significantly greater in U18 group at the 4th and 8th minutes after the end of the test. The results of the research show that mechanical parameters describing an anaerobic endurance of ice hockey players are improving, but the ability of metabolic acidosis liquidation raised by anaerobic effort do not change. The results of the research show that similarly as non-training children ice hockey players, in ageing process, show an improvement in anaerobic endurance, but the ability of metabolic acidosis liquidation caused by anaerobic effort does not change. The research was to determine the criterion for assessment of starting acceleration phase. After the warm-up and 3-min break, the subject began to work at full load and the power was recorded every 3 seconds. The mean value of speed for each subject was calculated and then the results were subjected to mathematical analysis. Hockey players were divided into groups according to the type of a task they undertake during the game. The dynamics of power during 30-s work performed at maximal intensity during consecutive stages of a training cycle (in the logarithmic co-ordinate system) was divided into 4 linear segments with each segment is defined by: \( I_gW_{log(Pmax-p/t)} \), in which: \( I_g = \) logarithmic value of maximal power at which the change of metabolism character occurs; \( W_{max} = \) logarithmic value of maximal power in specified metabolic sphere, p-index reflecting the tangent of an angle of the segment gradient in specified metabolic sphere. Segments of different gradient verifies the domination of specified sphere of energetic processes in respective time sections. The depletion of metabolic volume of energy source accompanies the elongation of work time and influences the rate of fatigue accumulation, thus providing information concerning the level of work ability in the specified range of intensity. Analysis of the power - time ergonomic correlation established on the basis of parameters recorded in 30-s exercise performed on cycle ergometer allowed to determine specific criteria of assessment of anaerobic capacity levelreaktualy old hockey players. In describing the phase of starting acceleration, in which reaching of maximal power occurs after work resulting from overcoming of inertia external resistance. This is the only phase of a work, during which a gradual increment of power is observed. This phase consists of the segment of dynamic power increase reflecting the real overcoming of inertia external load and the segment representing the achievement of maximal power. The rate of power increment from the 0 to maximal value constitutes the criterion for assessment of starting acceleration phase.

CRITERIA OF ERGOMETRIC DEPENDENCE POWER VS. TIME IN THE ASSESSMENT OF ANAEROBIC POWER AND CAPACITY IN 18-YEAR OLD HOCKEY PLAYERS

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Ergometric analysis is based on the determination of characteristic features for the correlation between power value and time this can be maintained. The objective of the present study was to evaluate the assessment criteria of anaerobic capacity in U18 hockey players in 8-month training period. The criteria were based on analysis of power - time correlation during a 30-second work performed at maximal intensity on cycle ergometer. The study group was 26 ice hockey players of Polish National Team (18 years or younger). Anaerobic capacity level was assessed on the 30-s cycle ergometer test was carried out in September (after the training period), in December (after the league play-offs) and in March (prior to World Championship). The protocol for the test was: the load was selected according to index of 10% of body weight and the 5-min warm-up performed at 30% of selected load and at frequency of 60 revolutions per 1 minute before the main exercise. After the warm-up and 3-min break, the subject began to work at full load and the power was recorded every 3 seconds. The mean value of speed for each subject was calculated and then the results were subjected to mathematical analysis. Hockey players were divided into groups according to the type of a task they undertake during the game. The dynamics of power during 30-s work performed at maximal intensity during consecutive stages of a training cycle (in the logarithmic co-ordinate system) was divided into 4 linear segments with each segment is defined by: \( I_gW_{log(Pmax-p/t)} \), in which: \( I_g = \) logarithmic value of maximal power at which the change of metabolism character occurs; \( W_{max} = \) logarithmic value of maximal power in specified metabolic sphere, p-index reflecting the tangent of an angle of the segment gradient in specified metabolic sphere. Segments of different gradient verifies the domination of specified sphere of energetic processes in respective time sections. The depletion of metabolic volume of energy source accompanies the elongation of work time and influences the rate of fatigue accumulation, thus providing information concerning the level of work ability in the specified range of intensity. Analysis of the power - time ergonomic correlation established on the basis of parameters recorded in 30-s exercise performed on cycle ergometer allowed to determine specific criteria of assessment of anaerobic capacity level in 18-year old hockey players. In describing the phase of starting acceleration, in which reaching of maximal power occurs after work resulting from overcoming of inertia external resistance. This is the only phase of a work, during which a gradual increment of power is observed. This phase consists of the segment of dynamic power increase reflecting the real overcoming of inertia external load and the segment representing the achievement of maximal power. The rate of power increment from the 0 to maximal value constitutes the criterion for assessment of starting acceleration phase.

ENERGY EXPENDITURE AT THE GAIT TRANSITION SPEED IN MEN AND WOMEN

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Background

When increasing or decreasing the speed of locomotion, spontaneous transition occurs (walk-to-run, or run-to-walk) at approximately the same speed for both genders (2 m/s), and this intensity is commonly referred to as the preferred transition speed (PTS) (Hreljac, 1993). There are no data in the literature regarding the relative energy expenditure at the PTS, i.e. expressed in relation to the aerobic capacity, and eventual gender differences.

Purpose

The aim of this study was to relate the energy expenditure for walking and for running at the PTS to the aerobic capacity, and to determine gender differences.

Methods

Previous research has shown that the VO2max and the segment representing the achievement of maximal power. The rate of power increment from the 0 to maximal value constitutes the criterion for assessment of starting acceleration phase.
Twenty-two male (21.4 +/- 2.4 y, 182 +/- 7 cm), and eleven female (19.4 +/- 0.5 y, 169 +/- 6 cm) physical education students performed two incremental treadmill tests with 4-min stages, walking in one and running in the other, in order to determine steady-state VO2 at speeds below and above PTS (5-9 km/h). A treadmill test to volitional exhaustion was performed for VO2max determination, and a fourth treadmill test was also performed at all subjects, in order to determine their individual PTS.

Results
The preferred gait transition speed did not differ between male (7.13 +/- 0.4 km/h) and female (7.21 +/- 0.3 km/h) subjects, as did not the corresponding energy expenditures for walking (24.3 +/- 3.6 and 26.6 +/- 3.7 ml O2/min/kg, p=0.05), and for running (29.5 +/- 2.6 and 31.3 +/- 2.9 ml O2/min/kg, p=0.05). Men had a significantly higher VO2max than women (50.8 +/- 4.7 vs. 44.9 +/- 4.0 ml O2/min/kg, p<0.01), while the oxygen uptake at the PTS expressed as a percentage of VO2max, was significantly higher for women, for walking (59 +/- 6% vs. 48 +/- 6%, p=0.01) as well as for running (70 +/- 6% vs. 58 +/- 6%, p=0.01).

Discussion and conclusions
The average values for the PTS are in close agreement with previous studies. There is no experimental evidence that can explain why women change gait at the same speed as men, no difference between the PTS of male and female subjects probably reflects the pressure of natural selection, that has favored the development of the same average value for the gait transition speed in spite of significant gender differences in stature, mass and aerobic capacity. Anthropometric, morphological and biomechanical variables will be examined in follow-up studies to elucidate how women make better use of the limited energy sources, having a wider relative range of energy expenditure for walking.

References

RETROSPECTIVE ANALYSIS OF METABOLIC ACTIVITY BY NITROGEN ISOTOPE RATIO ANALYSIS OF HAIR
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Natural abundance stable isotope ratios of organic nitrogen can be used for the determination of metabolic states of any animal organism including humans. Isotopic fractionation during amino acid metabolism in the body results in different stable isotope ratios in dietary, excreted and body nitrogen. Thus, changes in the metabolised proportion of dietary or body protein yield in different isotope ratios in different body compartments. Due to its structure and stability hair is an ideal material for a retrospective analysis. Stable isotope ratio analysis of hair can provide information about an athlete’s protein metabolism up the last twelve months. With knowledge of the athlete’s dietary habits potential catabolic or anabolic conditions of the metabolism can be identified, as physical exercise is associated with an increase in protein synthesis and protein breakdown depending on the amount and sort of exercise.

The retrospective analysis of nitrogen isotope ratios of hair of professional and semi-professional athletes of different sports revealed significant changes of the nitrogen isotope ratios in accordance with the volume and intensity of exercise, documented in the athlete’s training journal. In order to estimate the influence of physical activity on the nitrogen isotope ratios of humans, we examined the nitrogen isotope ratios of urinary urea during and after different types of exercise, in competition and in rest. The nitrogen isotope ratios of urinary urea are strongly negative correlated with the body’s energy balance during exercise. This non-invasive and simple method offers interesting perspectives for the examination of an athlete’s protein metabolism without administration of labelled compounds and a reconstruction of an athlete’s energy balance in the past.

THE EFFECT OF 12 WEEKS AEROBIC TRAINING ON PRE-INFLAMMATORY CYTOKINES, VASCULAR ENDOTHELIAL ACTIVATION AND DECREASE OF ATHEROSCLEROSIS
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Abstract
Background Increasing evidences show that pre-inflammatory cytokines and cellular adhesion molecules that lead to increase of vascular endothelial activity and known as new inflammatory markers are more sensitive in anticipating cardiovascular diseases. And they have an important role in atherosclerosis pathogenesis. The purpose was to determine the effect of 12 weeks aerobic training on pre-inflammatory cytokines TNF-α, IL-1 and Inter Cellular Adhesion Molecules sICAM-1 the factor of activity and adhesive vascular endothelial of Wistar rats.

Methods and Materials. This experimental study was performed in animals’ lab of faculty of physical education at Tehran University. Hence, 24 Wistar male rats of 3 months were kept in a controlled place and were divided into two different controlled (n=12, weight=211±3.8G) and experimental (n=12, weight=208±7 G) groups. The training program was performed under certain duration and speed for 12 weeks - 3 sessions a week. The cupping was held after 14 fasting hours in different stages and with the same conditions. For biochemical analysis and sICAM-1 amounts evaluation it is used from Elisa trade kit of R&D company and for TNF-α and IL-1 amounts evaluation it is used from Elisa trade kit of Koma company by Elisa Reader set Spectera model. Resulting data were analyzed by dependent and independent T tests.

Results A significant increase was observed in (p=0.045) IL-1, (p=0.047) TNF-α, and (p=0.028) sICAM-1 amounts of controlled group. While a significant decrease was observed in (p=0.002) IL-1, (p=0.016) TNF-α, and (p=0.000) sICAM-1 amounts of experimental group. And a significant difference was observed in comparison between controlled and experimental groups in (p=0.039) IL-1,(p=0.028)TNF-α, and (p=0.000) sICAM-1 amounts.

Conclusions Generally the results of this study showed that regular aerobic training (Vo2max 55-85%) causes a significant decrease in amounts of novel inflammatory markers of cardiovascular diseases sICAM-1, TNF-α, IL-1. This decrease accompanies body common inflammation. On the other hand, this training method can play an effective role in inclining the activity of vascular endothelial and atherosclerosis with the decrease of these markers.
CHANGES IN METABOLISM AND SERUM HORMONE LEVELS INDUCED BY A NORTH POLE EXPEDITION

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During an arctic skiing expedition, mean energy expenditure (EE) for 48 days has reportedly been as high as 28.1 and 32.4 MJ/day in two individuals (Stroud et al. 1993). These values are quite close to the EE values during the first 50 days out of 95 days of exercise across Antarctica (29.1 and 35.5 MJ/day). In this study the subjects lost more than 25% of their body mass, although their energy intake (EI) was 21.3 MJ/day (Stroud et al. 1997). In addition to energy deficit, sleep deprivation and cold weather affect the physiological functions during such demanding tasks. The purpose of the present study was to investigate the effects of a prolonged skiing expedition in extreme conditions on plasma lipids, serum hormones and hematocrit. A group of seven healthy men completed a 55-day unsupported ski expedition (over 800 km) to the North Pole. The subjects had all their necessary equipment and food with them in sledges. The daily food rations contained energy of about 23 MJ, of which 60-65% consisted of fat. Despite this high energy intake, mean body mass decreased more than 10 kg in each subject during the expedition. Based on heart rate monitor data, their highest mean energy expenditure was 28.1 MJ/day. In addition to the analyses of EI and EE during the expedition, blood samples were drawn before and several times after it. Triglycerides in plasma did not decrease significantly during the expedition. However, HDL cholesterol (1.28±0.24 vs. 1.86±0.39 mmol/l, p=0.004), LDL cholesterol (3.00±0.42 vs. 4.23±1.26 mmol/l, p=0.045) and total cholesterol (4.77±0.45 vs. 6.40±1.36 mmol/l, p=0.030) all increased. In addition, serum testosterone (26.8±4.5 vs. 11.6±3.5 mmol/l, p<0.001), thyroxine (16.1±2.0 vs. 14.0±2.5 pmol/l, p=0.048) and cortisol (648±193 vs. 327±30 mmol/l, p=0.004) levels decreased, while growth hormone increased from 0.16±0.05 to 9.16±7.31 mlU/l (p=0.017). Across the same time period, serum urea level increased (5.30±0.72 vs. 7.26±1.83 mmol/l, p=0.024), while serum protein levels remained unchanged. Hematological analysis revealed that hemoglobin and hematocrit values decreased (147±6 vs. 135±5 g/l, p=0.009, and 0.44±0.02 vs. 0.42±0.02, p=0.057, respectively). A similar trend was also found for the number of red blood cells (4.93±0.33 vs. 4.52±0.30 U/l, p=0.033), while the respective value of neutrophils remained unchanged (3±0.6 vs. 3.8±0.8 U/l, p=0.140). The strenuous physical loading combined with a great energy deficit caused loss of body mass, despite the high fat intake. It was interesting to notice that the huge fat intake did not increase the triglyceride values but only slightly plasma cholesterol values. Some hormonal changes together with increased urea levels reflect tissue catabolism, but, however, unchanged protein levels suggest that the level of whole-body protein synthesis was maintained constant as Stroud et al (1997) have also suggested.

References

CUTANEOUS TEMPERATURE MODIFICATION AFTER A TRADITIONAL CHIROPRACTIC ADJUSTMENT

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Background
The hypothesis that there may be evidence that paraspinal cutaneous temperature (CT) asymmetry is indicative for the need for an adjustment, an indication of somatospinal inconsistencies requiring a chiropractic adjustment was documented and can be measured with accuracy with infrared cameras. Digitized Infrared Segmental Thermometry (DIST) has been demonstrated to be valid and stable when measured under adequate conditions. The goal of the current study was to evaluate the effect of a traditional chiropractic treatment on CT recordings.

Methods
Participants. We elected to have 10 subjects per group.
Subjects were randomly divided into two groups (n=10 per group), a treatment group and a sham group. The technique utilized was a traditional lumbar roll, with a pisiform contact on the ipsilateral mamillary of L-5. CT was measured on six consecutive tests with DIST. Patients rested on a chiropractic table for eight minutes. After the initial recording, the chiropractor began the treatment, of the pre-evulated subjects, for an L-5 subluxation. The total recording session lasted 10 minutes.

Results
There were statistically significant differences between Sides (FI, 18 = 13.363, p= 0.002, P= 0.932) and Time (F5, 90 = 3.238, p= 0.01, P= 0.872). There was a significant interaction between Sides* Time (F5, 90 = 2.970, p= 0.016, P= 0.838). The average CT at L-5 for the treatment group was 92.67 ± 6.0°F and for the sham group was 91.37°F ± 1.42 and was not statistically different. Treatment group, the treated side was cooler by 0.46°F immediately after the adjustment (11) and later warmed by 0.49°F at the 10 mark in relation to t-2 and 0.95°F in relation to 11, while the contralateral side cooled down for the entire recording period and at 110, by 0.17°F in relation to t-2. Sham group, both sides remain parallel to each other.

Discussion
The main finding is a significant change in CT for the following independent variables: Sides-Time. The second important finding, we measured a CT warming on the ipsilateral side at the moment of the adjustment for the treatment, for 10, then a cooling followed by a rewarming from t1 until t3, then we observed a second cooling at 15 followed by a rewarming at 110. The first rewarming could be a vasculocutaneous reaction due to tissue compression, from the compression of the tissues but he chiropractor’s contact. The second rewarming could be apoptosis accompanied by an inflammatory process injury response releasing cytokines and other inflammatory mediators.

Conclusion
Contacting the skin with the hand with or without a sustained pressure without a thrust produced an initial warming immediately after the contact.

RELIABILITY OF DIFFERENT MODELS TO ASSESS HEART RATE RECOVERY AFTER SUBMAXIMAL EXERCISE

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Introduction
Assessment of HR recovery after exercise is used to monitor cardiac nerves adaptation to increased fitness in healthy subjects and cardiac patients and has been proposed as an independent predictor of all-cause mortality. Various models to assess HR recovery after exercise have been proposed, and several methodological differences, such as exercise intensity and recovery duration, have been
found even in studies that use the same model of analysis. Nevertheless, but poor is the knowledge of their reliability after exercises at the bicycle ergometer. 

**Aim:**
To evaluate the reliability, on a short-term test retest base, of different indexes used to assess HR recovery after 2 levels of submaximal exercise on the bicycle ergometer.

**Methods:** 21 healthy subjects performed 2 exercises at 65% HRmax and 2 at 80% HRmax. Different HR recovery indexes were calculated. Realibility was assessed by ICC and SEM.

**Results and conclusions:**
Our results show that: 1) assessment of HR recovery after 80% HRmax exercise bring more reliable values than after 65% HRmax exercise; 2) reliability increases as a function of recovery time; 3) calculation of recovered HR area (HRRA, percentage HR by time area recovered) is more reliable than other indexes and is robust against minor variations in workload selection; 4) differences in recovery between 65 and 80% HRmax exercise can be assessed by absolute HR decay (delta-HR) at 2 and 3 min recovery and T30-fast (the smallest time constant over a 30 s period); 5) parasympathetic reactivation can be quantified by T30-fast, that showed higher reliability than other methods.

**RISK OF AVOIDING DETECTION OF RHUEPO ALPHA BY APPLICATION OF INTERMITTENT HYPOXIA**
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**Background and objective:** Intermittent hypoxia has been used as a method to improve the exercise performance. However recent publications reflect the anti-doping authorities concern on the use of altitude training simulators systems. The use of recombinant human erythropoietin (rHuEPO) to enhance athletic performance is prohibited.

The aim of our study was to determine whether intermittent hypoxic treatments could mask the detection of rHuEPO abuse. Our hypothesis is that after the hypoxic treatments there is an increase in endogenous levels of EPO and/or reticulocytes and haemoglobin that may camouflage the rHuEPO abuse when determined using indirect (OFF-Hr Score) or direct methods (isolectric focusing technique).

**Design and methods:**
Eight male young Wistar rats were treated, three times a week during two weeks, with 500 I.U. of rHuEPO-alpha. After the treatments the animals were randomly divided into two groups: one normoxic and one hypoxic. The normoxic group was maintained 24 hours at 21% O2 during 23 days. The hypoxic group was maintained 12 hours at 21% O2 and 12 hours at 12% O2 (~4500 m) for the same time period.

**Results:**
After the HuEPO treatment, the hypoxic group of animals produced a faster recovery in the reticulocyte count, elevated levels of haemoglobin and haematocrit and a significant increase in the endogenous EPO levels when compared with the normoxic group of animals.

**Interpretation and conclusions:**
Intermittent hypoxic treatments after HuEPO administration can be considered a system to avoid the detection of the HuEPO by indirect and perhaps direct methods in an animal model.

**ASSOCIATION WITH SERUM HORMONES, PHYSICAL FITNESS AND SLEEP DURING A 15-DAY MILITARY FIELD TRAINING**
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**Military personnel must have a good physical fitness and performance in order to perform his/her duty in all combat environments during different seasons and under varying weather conditions. The present study was planned to investigate association with physical fitness, amount of sleep and hormonal responses during a 15-day military field training (MFT). The main purpose of the MFT was to train offensive manoeuvre of the Brigade in a countryside area. Nine army officers volunteered for the present study, and they conducted different tasks such as leadership and specialist, which were planned for both a war and crisis demands on a company or battalion level. Their daily working routine mainly consisted actions in headquarters that required on-call-duty at all hours. Physical fitness and body composition were measured just before MFT. Serum testosterone (TES) and cortisol (COR) concentrations and sex-hormone-binding globulin (SHBG) were measured before MFT as well as on the days of 8 and 15 after the beginning of MFT. The officers fulfilled daily sleep diaries and, in addition, all events that differed from their normal daily routine were written down. Heart rate (HR) was recorded approximately for 24 hours on the days of 8, 11 and 15 of MFT. The logistics of food and other needed material was arranged by the MFT organization, which then delivered food three times a day to the officers. According to HR responses, there was neither cardiorespiratory strain nor probably energy deficit due to well organized logistics but, however, some hormonal responses and sleep deprivation were observed during MFT. Nevertheless, TES concentrations did not change statistically significantly during MFT (18.0 ± 3.0 nmol/l vs. 17.9 ± 2.2 nmol/l vs. 18.8 ± 4.5 nmol/l) measured before, 8 days and 15 days after the beginning of MFT, respectively. This was also the case for the respective COR levels (45.4 ± 90 nmol/l vs. 485 ± 122 nmol/l vs. 398 ± 101 nmol/l). TES to COR ratio slightly decreased during the first training week (p=0.05), while it increased during the latter week of MFT (p=0.08). Although the hormonal responses were not significant, their strong association with physical fitness (r= -0.67, p=0.03) was observed. Furthermore, TES/SHBG ratio decreased 28% for those subjects whose VO2max was under 44 ml/kg/min. An average of 6 20 h was slept daily but the sleeping rhythm was disturbed due to military tasks. This diurnal sleeping time was strongly associated with TES/COR ratio (r= 0.78, p=0.01). The results indicate that MFT causes stress reactions, which were very individual, even though there was hardly any physical strain and energy deficit. Therefore, we concluded that observed hormonal responses were mainly due to the sleep deprivation and low physical fitness.

**EFFECT OF EXERCISE MODE ORDER ON EXCESS POST-EXERCISE OXYGEN CONSUMPTION**
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Several studies have previously examined the effects of different exercise intensities, durations and modes on excess post-exercise oxygen consumption (EPOC) (Borsheim & Bohr, 2003, Laforgia et al., 2006). However, to the best of our knowledge only a single study investigated the effect of the exercise mode order (resisted and aerobic exercise) on EPOC (Drummond et al., 2005). Thus, the main
purpose of the present study was to compare the magnitude and duration of EPOC after two exercise sessions with exercise mode order as the single difference between them: in session 1(S1), resisted exercises were followed by aerobic running whereas in session 2(S2) the order was inversed. Seven male voluntary subjects [mean age 19.6 ± 1.4 years] randomly underwent two sessions with duration of approximately one hour each. Running exercise was performed for 30 minutes in a treadmill at an intensity of 80-85% of heart rate reserve. Resistance exercises encompassed 3 sets of 10 maximal repetitions from five different exercises. In the two sessions oxygen uptake (VO2) was measured by spirometry (Cosmed K4b2, Italy) at rest [15 minutes] and during recovery phase from exercise (60 minutes). Respiratory, cardiovascular and metabolic parameters such as ventilation (Ve), heart rate (HR), carbon dioxide volume (VCO2) and respiratory exchange rate (RER) were registered in both moments. The magnitude and duration of EPOC was determined from the values of VO2 registered both at rest and recovery. During recovery in both sessions, similar responses were observed for VO2, Ve and HR, which showed significantly higher values than those registered at rest (p<0.05). The EPOC magnitude was not significantly different between S1 and S2 (5.17 ± 2.26 L vs. 5.23 ± 2.48 L). In the first 10 minutes of the recovery phase, VCO2 and RER declined to pre-exercise levels. Moreover, the values of VCO2 and RER in S2 were lower than those in S1. In conclusion, the results of the present study suggest that the exercise mode order do not affect the EPOC magnitude and duration. References


MAXIMAL INTERMITTENT EXERCISE PERFORMANCE IN RELATION TO RELOADED MUSCLE OXYGENATION DURING RECOVERY

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Purpose
The purpose of this study was to investigate the relationship between the reloaded oxygen in working muscle during recovery and the performance of maximal intermittent sprint cycling exercise.

Methods
Seven male athletes [age 20.1±1 yrs; height 180.6±7.6 cm; weight 81.4±8.9 kg] performed the ten intermittent maximal sprint cycling exercise of 6 s with 20 s rest. The cycle ergometer resistance load was 7.5% of body weight. During ten intermittent sprint cycling exercise, mean power during each sprint cycling exercise was recorded. In addition, oxygenated hemoglobin/myoglobin (HbO2/MbO2) of the vastus lateralis were measured using near-infrared continuous-wave spectroscopy. To evaluate the HbO2/MbO2 quantitatively, arterial occlusion was performed until the lowest value of HbO2/MbO2 was observed after ten intermittent sprint cycling exercise. During the recovery immediately after each sprint cycling exercise, the recovery rate of HbO2/MbO2 (ReOxyRate) was measured. The amount of reloaded HbO2/MbO2 (AmtOxy) during recovery after each sprint cycling exercise was measured.

Results & Discussion
Mean power was declined gradually for every sprint trial and the decline rate was -0.182±0.031 Watt/trial. In all subjects, the recovery kinetics of HbO2/MbO2 was biphasic shape at the recovery phase after all sprint trials. In this study, thus, all recovery phases were divided into the first [0-1 s] and second [1-5 s] components. ReOxyRate of first component after first sprint trial was -10.6±14.8 %/s, following 10.6±5.7, 7.4±5.0, 10.4±5.5, 8.6±6.1, 8.1±5.4, 8.8±4.9, 9.1±5.7, 7.8±6.1, and 9.7±6.8 %/s, respectively. ReOxyRate of the second component was increased gradually until six sprint trails and subsequent was stable. There tended to be an inverse correlation between the ReOxyRate of first component after 1st sprint trial and the decline rate of mean power (r=0.628, p<0.01). Kime et al. (EurJAP, 2003) found that higher oxidative capacity muscle exhibited slower re-oxygenation after short-term isometric high intensity exercise. In this study, thus, the decline rate of mean power of the subjects with higher oxidative capacity at the vastus lateralis might be smaller during ten intermittent sprint cycling exercise.

The kinetics of AmtOxy showed the similar with that of ReOxyRate. The total of AmtOxy during all recovery phases after sprint cycling exercise related to the decline rate of mean power (r=0.740, p<0.05). The decline rate of mean power was small when the total of Amt-Oxy was larger. In previous study, the reduction in oxygen availability during high intensity intermittent exercise impaired the ability to maintain a high power output | Balsam et al. Acta Physiol. Scand., 1994]. Thus, the amount of reloaded oxygen into the working muscle during the recovery phase between sprint cycling exercises might affect the decline rate of mean power. In conclusion, the muscle oxidative capacity and the amount of reloaded oxygen into the wors

NON-INVASIVE LACTATE MEASUREMENTS IN HUMAN SKIN USING NEAR-INFRARED SPECTROSCOPY

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OBJECTIVES: The goal of this study was to evaluate the potential of near-infrared spectroscopy (NIRS) for continuous lactate concentration monitoring in human skin. Since NIR light penetrates tissue reasonably well, NIRS has emerged as an important tool for non-invasive human physiological studies.

METHODS: The increase of lactate metabolism of five, healthy subjects was induced by performing Wingate 30-s anaerobic bicycle ergometer sprint. Reference blood lactate levels at certain times after the workout were determined from capillary (finger tip) blood samples with an enzymatic lactate concentration analysis method (Pro Lactate, Akray Inc). NIR spectra were measured in vivo from two locations, forearm and thigh, of each subject before and up to 20 minutes after the bicycle sprint using FT-(Fourier-Transform) NIR spectrophotometer (FTPA2000-263, ABB). Wavelengths from 750-1850nm with a resolution 4cm-1 were scanned 17 times for one spectrum. All together, 25 spectra were collected during the 20 minutes. The fibre-optic bundle, stabilised on the skin, consisted of 40 source and 40 detector fibres arranged randomly in the probe of 3mm in diameter. Due to geometry of the fibre bundle the maximum penetration depth of photons at 1600nm was less than 2mm from the skin surface (calculations were made by Monte Carlo simulation technique). Thus, reflection spectra were collected mainly from the skin dermis layer containing the capillary vessels and lactate. The influence of tissue variation among the individuals was minimized by collecting the background spectrum from skin of each subject before the ergometer
sprint. The multivariate spectral analysis method (Unscrambler 9.7, CAMO SA) was used to compare the difference between NIR-reflectance spectra and the reference lactate levels.

RESULTS: Results show that changes in NIR spectra, collected from all the subjects and both the measurement locations, were repeatable, logical and consistent with the reference lactate concentrations. Predominant change in the spectra occurs at the wavelengths 1140nm, 1400nm and 1650-1750nm. It was further indicated that the changes at 1650-1750nm are related to lactate reference concentration over the course of time. In comparison of measurement locations the thigh was preferred over forearm due to more consistent spectral data.

CONCLUSION: The small amount of reference results and location differences for reference lactate assessments (finger tip) and spectra measurements (thigh and forearm) did not provide estimations of correlation between the enzymatic and NIRS method. However, the indicated result of lactate related changes at the wavelengths 1650-1750nm is comparable with the literature (1) and this range of spectral change may be used for further development of lactate monitoring method. The results suggest the potential of NIRS method for in vivo exercise physiology studies.

REFERENCES:

VALIDITY STUDIES OF A PORTABLE METABOLIC GAS ANALYSING SYSTEM WITH SPECIAL REFERENCE TO A RESPIRATORY GAS DRYING UNIT, LOW TEMPERATURES, HIGH HUMIDITY, EXTERNAL WIND AND STABILITY OVER TIME

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Introduction
Portable gas analysing systems are useful instruments to determine oxygen uptake during sport and other physical activity. Validating such equipment in the outdoor environment in which they are to be used is essential. Most validity studies of the portable system, Oxycon Mobile, have been in controlled laboratory environments and for short periods of time thus not taking into consideration the possible effect on measurements, of cold and humid conditions, external wind or longer periods of time which may be encountered while exercising outdoors. Using the Oxycon Mobile equipment, the aims were a) to test the effect of external wind on VO2 measurements; b) to compare metabolic gas measurements with and without a system for drying the ambient air around the sampling (nafion) tube; c) to investigate the stability of the Oxycon Mobile for measurements of VO2 over a longer period of time during moderate exercise levels performed at low temperatures and high humidity.

Methods
a) Subjects cycled on a cycle ergometer indoors at three different work loads. VO2 uptake was measured via the Oxycon Mobile while wind was applied from three different directions: b) VO2 uptake, carbon dioxide production, the respiratory quotient and ventilation were measured via the Oxycon Mobile at two different loads both with and without a prototype drying system while subjects cycled on an ergometer cycle outdoors in cold and humid ambient conditions: c) VO2 uptake was measured with the criterion Douglas Bag method at the beginning and end of a 45 minute measurement with the Oxycon Mobile so as to allow a comparison of the two methods, taking into consideration the natural physiological drift expected during work over this period of time.

Results
a) External wind directed at a subject from different directions while cycling did not affect the VO2 measurements as compared to no wind: b) There were no significant differences in any of the measured parameters, regardless of whether the drying system was used or not: c) There was a statistical difference in the drift of VO2 between the Oxycon Mobile and the Douglas Bag over the time lapse of the testing. The difference was 1.34 ml/minute, or 60 ml over the 45 minutes testing with the Oxycon Mobile which, physiologically, is minimal.

Conclusion
There were no differences of measurement significance in any of the measured parameters with or without the drying system. External wind from different directions did not either affect VO2 measurements. The ambient conditions tested in this study might not have stressed the system enough to conclude that the Oxycon Mobile gives reliable measurements in colder and more humid conditions, but the tests indicate good stability in measurement values over time.

MAINTAINING EUHYDRATION SUPPRESSES OXYGEN UPTAKE DRIFT DURING MODERATE PROLONGED EXERCISE IN HEAT

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Purpose: This study was examined the effects of maintaining euhydration by ingesting fluids on respiratory response during moderately intense prolonged exercise in heat. A secondary aim was to examine whether maintaining euhydration suppresses the decrease of maximal voluntary contraction (MVC) after prolonged exercise.

Methods: Six healthy young men (age=24.5±2.0yr, VO2max=54.0±9.3ml/kg/min) completed three experimental conditions consisting of a) Subjects cycled on a cycle ergometer indoors at three different work loads. VO2 uptake was measured via the Oxycon Mobile at two different loads both with and without a prototype drying system while subjects cycled on an ergometer cycle outdoors in cold and humid ambient conditions: b) VO2 uptake, carbon dioxide production, the respiratory quotient and ventilation were measured via the Oxycon Mobile at two different loads both with and without a prototype drying system while subjects cycled on an ergometer cycle outdoors in cold and humid ambient conditions: c) VO2 uptake was measured with the criterion Douglas Bag method at the beginning and end of a 45 minute measurement with the Oxycon Mobile so as to allow a comparison of the two methods, taking into consideration the natural physiological drift expected during work over this period of time.

Results
Results: During prolonged exercise, VO2 normalization and heart rate (HR) and BCT were significantly increased. At 90min of DH, VO2 normalization and VE were higher than MW and HF (VO2 normalization: 125±0.03 vs. 115±0.02 vs. 116±0.03 times, P<0.05, VE, 63.7±4.2 vs. 54.0±2.9 vs. 52.3±3.3 L/min, P<0.05 | HR at 90min of DH was higher than HF (173±7 vs. 158±5 bpm, P<0.05), and tended to be higher than MW. BCT at 90min of DH tended to be higher than HF (13.8±0.1 vs. 13.8±0.2, P<0.05): At 90min of DH, RPE-O was higher than W and H (17.7±1.0 vs. 14.3±1.0 vs. 17.3±0.6, P<0.05). RPE-C and RPE-L were higher at 90min of DH than HF (RPE-C; 16.5±1.3 vs. 13.2±0.8, P<0.05, PRE-L; 18.3±0.9 vs. 14.7±0.9, P<0.05). The percentage of pre-value on maximal torque during MVC after prolonged exercise of DH was measured before and after respective prolonged pedaling exercise. During pedaling exercise, VE, VO2, VCO2, RPE, body core temperature (BCT), RPE-Overall (RPE-O), RPE-Cardiovascular (RPE-C) and RPE-Legs (RPE-L) were measured every 15 minutes. VO2 was normalized by converting 1.0 to the VO2 value at 15min.

Discussion: These results demonstrate that maintaining euhydration by fluid ingestion suppresses the elevation of VE and HR, resulted in reducing the increase of VO2. It may be suggested that hypotonic fluid containing carbohydrate (3%) contributes the reduction of fatigue
Military personnel are required to carry heavy combat loads while marching or fighting. The weight of combat gear has increased during the last years and thus it sets higher demands on soldiers' physical performance (Altwells et al. 2006). The purpose of this study was to assess physical performance of soldiers during a simulated training of urban fighting. It was accomplished by carrying either a traditional combat gear (model m/91, mass of 16.8 kg) or a new one (model m/05, mass of 30.3 kg) during a high intensity attacking simulation. Heart rate (HR), blood lactate (BL), RPE, perceived exertion (RPE) and the performance time were measured in 12 healthy male volunteers. The purpose of this study was also to evaluate importance of muscle strength, aerobic capacity and anthropometry on heavy load-carrying performance. Maximal oxygen uptake (VO2max), body composition and muscle strength were measured in laboratory conditions. In the field tests, the length of attacking zone was about 1480 m. All the subjects were instructed to maintain their combat readiness during their action. No statistically significant differences were found either in HR or BL (p>0.05) between the two different combat gear models. The mean ± SD HR values for the subjects with m/91 and m/05 were 159 ± 10 beat/min and 162 ± 8 beat/min, while the respective BL values were 8.6 ± 2.3 and 8.8 ± 3.1 mmol/l. RPE, however, differed slightly but significantly between the actions with different combat gears (p<0.05) being 15 ± 1 mmol/l and 16 ± 1. Thus, the subjects were capable of sensing the higher strain of the heavier combat gear. Therefore, the environmental conditions with combat load of m/05 was longer (1798 ± 333 s) as compared to the respective time with m/91 (1509 ± 126 s, p<0.001). Furthermore, the maximal oxygen uptake (VO2max) was statistically significantly better (p<0.05) for those subjects (3 out of 12) who passed the field test with a heavier combat load (m/05) being 54 ± 2 ml kg⁻¹ min⁻¹ and 50 ± 2 ml kg⁻¹ min⁻¹. The trial time of the field test with m/05 was highly association with maximal strength of lower limbs (r = -0.63, p<0.05) as well as maximal strength of abdominal muscle (r = -0.68, p<0.05) and body mass (r = -0.63, p<0.05). The results suggest that carrying of heavy combat gears during a high intensity attacking sets high physical and physiological demands on body composition, maximal strength of the lower limbs and abdominal muscle of soldiers. Therefore, mobility and load-carryage performance of soldiers should be facilitated. This could be done by selecting soldiers to a certain task according to their physical characteristics and/or by improving their physical training and/or by tailoring a load for specific operations.

Reference.

MILITARY OPERATIONAL STRESS IN 72-HOUR TRAINING OF RECONNAISSANCE PATROLLING
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The main purpose of the present study was to investigate hormonal, haematological and sympathovagal responses during a 72-hour field training (MFT) of reconnaissance foot patrolling. It was hypothesized that soldiers exposed to considerable energy and fluid deficit, sleep deprivation, diminished recovery time and prolonged physical exercise will undergo physiological stress-related changes. A reconnaissance squad, which consisted of ten healthy male soldiers (age 20 ± 1 yr., height 1.79 ± 0.07 m, body mass 74.5 ± 7.9 kg, body fat 12 ± 1.7 %, VO2max 55.9 ± 3.8 ml/kg/min), participated in a 72-hour reconnaissance foot patrolling exercise. Initial measurements were performed a day before the training and the respective daily follow-up ones in the next three days between 08:00 and 09:30 a.m. For studying energy and fluid intake, the subjects kept daily food diaries. They ate only army field rations, of which daily mean energy content was 3426 ± 112 kcal. Heart rate (HR), blood lactate (BL), respiratory (HRV) and heart rate variability (HRV) was continuously recorded, while the distances travelled in terrain were recorded by a GPS-based portable computer. Blood samples for hormones, sex-hormone-binding globulin (SHBG) and creatine kinase (CK) activity were taken from the antecubital vein. During the MFT, the soldiers mean ± SD energy expenditure (EE) was 4646 ± 674, energy intake (EI) 2200 ± 326, and energy deficit (ED) 2405 ± 890 kcal/day. The mean body mass decreased by 2.2 ± 0.8 kg (2.9 ± 1.0 %) being significantly (p<0.001) lower in the mornings of 2, 3 and 4. Serum testosterone (TES) and free testosterone (TESfree) decreased (p<0.01) after 48 and 72 h of the beginning of MFT. During the entire training, the mean TES reduced from 19.0 ± 3.0 to 12.6 ± 6.2 nmol/l and TESfree from 56.0 ± 19.2 to 38.9 ± 21.8 pmol/l. The CK activity started to increase from the beginning of MFT being 167 ± 89 % (p<0.05) higher after 24 h, 227 ± 114 % (p<0.01) after 48 h, and finally 228 ± 88 % (p<0.001) after 72 h. After the first day of the training, blood cell volume and plasma volume decreased 4.0 ± 3.3 % and 4.1 ± 3.4 % (p<0.01), respectively, as compared to the values measured before MFT. The mean HR during MFT was 85 ± 6 bpm, which corresponds to the mean relative HR of 44 ± 4 % from the theoretical strain. On the other hand, ambulatory recording of HRV show changes in cardiac vagal outflow, which may reflect adaptation of the autonomic nervous system to the training.
intermittent exercise period (10min, P2; 15s work/45s rest). The exercise started after the change of the acid base state in P1 by hyperventilation (RAL), CO2-rebreathing (RAC), administration of 0.07 and 0.21g/kgBW (MAC) NH4Cl and 0.2g/kgBW (MAL) NaHCO3 or a 2min bicycle exercise with maximum power reached in an incremental test (EAC). In CON the subjects breathed normal, during PLA 0.12 g/kgBW CACO3 were administered. [K+]i, [Na+]i, pH and [lactate], were measured in venous [ven] and arterialised [art] blood. Mechanical parameters were monitored, m-wave was recorded by surface electrodes. For measurement the motor point of the muscle was stimulated supramaximally with rectangle constant current pulses. The pHven during exercise was significantly different between the groups (p<0.001), the minimum pH ranged from 6.99±0.03 (EAC) to 7.2±0.04 (RAL), CON/PLA (7.17±0.03). Fatigue resistance was highest with RAC (p<0.01) and not different between the other trials. The m-wave in P2 was significant lower with RAC compared with CON and RAL (p<0.001). No differences were found between MAC, PLA and MAL, but with EAC m-wave was elevated compared to CON (p<0.001). In P2 the duration of the m-wave was not different between RAC/PLA/CON, but with MAC it was significantly longer than with PLA/MAL (p<0.001) and with EAC longer than in CON (p<0.001). In the EAC series the lactic acid in P2 was increased due to previous exercise, in the other series it was significantly diminished with AC and elevated elevated with AL (p<0.001, 0.05). The [K+]i in P2 was significantly higher with MAC than with PLA/MAL (p<0.001) and higher with CON than with MAL (p<0.001). In EAC it was significantly lower than in CON (p<0.001), between RAC/CON occurred no difference, but with RAL it was significantly lower than with CON/RAC (p<0.05).

These results lead to the suggestion, that not the acidification per se, but the acidified space and the kind of acidification might explain the differences. Intracellular mechanisms of the excitation-contraction cycle [2,3] and the electrolyte distribution might be affected differently. No correlation was found between m-wave area and performance [4].

References

CARDIOPULMONARY ADAPTATIONS TO INTENSIVE SWIMMING TRAINING IN CHILDREN

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Physiological adaptations to training in adults include increased stroke volume ([SV]) and decreased arterio-venous oxygen difference (a-vO2 diff), thus increasing cardiac output (CO) and peak oxygen uptake (peak VO2). Whether such adaptations occur in children remains controversial. Research suggests that training in children has no effect on a-vO2 diff although some studies have shown increased SV, CO and peak VO2. The present study, which represents the baseline data for a longitudinal investigation, explored the influence of intensive swim training on cardiopulmonary function in a group of children classified as pre or early pubertal.

Participants were 18 swimmers aged 9-12 years (7 boys and 11 girls) training for 8.2 and 5 h wk-1 respectively and 13 untrained children (5 boys and 8 girls) of the same age range. All participants completed an incremental cycle ergometer test to exhaustion. CO, SV and heart rate were measured using thoracic bioelectrical impedance (Physioflow). VO2 was measured using online gas analysis (Cortex). Allometric scaling (log-log ANCOVA) was used to calculate appropriate scaling factors for VO2, CO and SV at peak exercise. As a result peak VO2 was divided by 0.82 for boys but data for girls were not correlated with body mass (p>0.05). Scaling factors for CO and SV were significantly different for boys and girls. CO scaled to body surface area BSA1.52 and BSA1.07 in boys and girls respectively. SV scaled to BSA1.39 for boys and BSA0.84 for girls. Within sex group differences were examined using independent samples t-test with significance accepted at (p<0.05).

There were no significant differences in age, stature, mass, BSA and sum of two skinfold thicknesses between the 4 groups. Adjusted mean for body mass adjusted peak VO2 (L min-1) was significantly higher in the trained (5.57 ± 0.05) vs untrained (4.40 ± 0.06) boys and BSA adjusted peak VO2 (2.68 ± 0.04 vs 2.53 ± 0.4 L min-1 m2) and peak SV (4.34 ± 0.04 vs 4.17 ± 0.05 mL m-1 m2) were also significantly higher in the trained boys. In the girls, absolute peak VO2 was significantly higher in the swimmers vs the controls (4.67 ± 0.3 vs 1.33 ± 0.19 L min-1) but there were no significant differences in allometrically scaled peak CO and peak SV. For the girls only, computed a-vO2 diff was significantly (p<0.05) lower in the swimmers (8.1 ± 1.2) vs the untrained group (9.8 ± 0.5 mL).

This preliminary study has noted interesting sex differences in cardiopulmonary responses to peak exercise between swim trained children and similar aged controls. In boys, higher peak VO2 in swimmers reflects their larger stroke volume (central factor) whereas that of the girls reflects a greater extraction of oxygen at the muscle (peripheral factor). Whether or not these differences existed pre training are not known but future longitudinal analyses will clarify the physiological effects of training.

INFLUENCE OF THIGH SURFACE TEMPERATURE DURING ACTIVE RECOVERY ON POST-EXERCISE LACTATE CLEARANCE AND SUBSEQUENT PERFORMANCE CAPACITY

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Factors influencing post-exercise recovery affect subsequent supra-maximal performance. This study investigated the effects high surface temperature (cold, temperate and warm) during active recovery on post-exercise lactate clearance kinetics and subsequent supra-maximal performance.

Male games players (n=11; mean ± SD, age 22±1 yr, mass 75±8 kg, height 1.8±0.1 m, Pmax 333±27W) performed intermittent sprint sessions separated by three different 30-min randomised recovery interventions. The intermittent sprint protocol was performed on an Excalibur cycle ergometer (Lode Ltd., The Netherlands), the initial sprint session (10 by repetitions of 30s at 40%Pmax followed by 30s at 120%Pmax) increased blood lactate, the post-intervention sprint session to failure (ITT) assessed supra-maximal performance capacity. Blood lactate (BLa) pre-recovery, every 3-min during recovery and post-TTF was recorded from fingertip capillary samples using a YSI1500 products Ltd., USA). Exponential curve fitting of BLa across intervention assessed clearance kinetics and lactate half-life (½) in mL. Lactate clearance and TTF data were analysed using repeated measures ANOVA, post-hoc Tukey tests quantified differences, P<0.05 inferred statistical significance.

Pre-recovery BLa were not significantly different across modality, mean±SD BLa data were 10.8±1.5, 10.9±1.5 and 10.9±1.5 mmol.L-1 pre-recovery at 40, 24 and 0°C, respectively. Active recovery with thigh gel-packs at 0°C facilitated faster lactate kinetics, mean±SD 7% for BLa
Recovery following high-intensity exercise determines an individual’s capacity for subsequent supra-maximal performance. This study investigated the effects of environmental temperature (5 vs. 28°C) and recovery modality (active vs. passive) on post-exercise lactate clearance kinetics and subsequent supra-maximal (>100% VO2 max) performance.

Male club cyclists (n=12, mean ± SD, age 22±2 yr, mass 81±9 kg, height 1.82±0.04 m and Pmax 360±62 W) performed two intermittent sprint sessions separated by four different 30-min randomised recovery interventions (active at 5°C, passive at 28°C, active at 28°C, passive at 5°C). The intermittent sprint protocol was performed on an Excalibur cycle ergometer (Lode Ltd., The Netherlands), the initial intermittent sprint session (10 by repetitions of 30s at 40% Pmax followed by 30s at 120% Pmax) increased blood lactate, the post-intervention intermittent sprint session to failure (TTF) assessed supra-maximal performance capacity. Blood lactate (BLa) pre-recovery, every 3 min during recovery and post-recovery was recorded from finger-tip capillary samples using a YSI1500 sport lactate analyser (YSI Ltd., USA), heart rate was recorded at 1-min intervals and test sessions were separated by 3 to 4 days. Each individual's pre-recovery BLa data were within 0.5 mmol·L⁻¹ across intervention. Recovery was performed in a climatic chamber (Ta=5.0±0.5 or 28±0.5°C, RH 50±5%) on a Monarch cycle ergometer; recovery interventions were cycling (40% Pmax and cadence 60 rev·min⁻¹) or passive seated rest. Exponential curve fitting of BLa data across intervention assessed clearance kinetics and lactate half-life (?½) in min. Lactate clearance and TTF data were analysed using repeated measures ANOVA, post-hoc Tukey tests quantified differences and P<0.05 inferred statistical significance. Pre-recovery BLa were not significantly different across recovery modalities, mean±SEM BLa data were 9.9±0.3 and 9.5±0.4 mmol·L⁻¹ pre-active recovery and 10.0±0.3 and 9.9±0.3 mmol·L⁻¹ pre-passive recovery at 28 and 5°C, respectively. Active compared to passive recovery facilitated faster lactate kinetics, mean % for BLa in active at 28 and 5°C were 13.9 and 11.8 min, significantly shorter (P<0.001) than passive at the same temperatures, 26.2 and 22.1 min, respectively. Mean±SEM % of peak BLa remaining in the circulation at 30 min into recovery were 16.7±1.7 and 22.7±3.3% for active, and 34.9±2.8 and 42.2±2.7 % for passive modalities at 5 and 28°C, respectively. Application of thigh gel-packs at 0°C facilitated greater post-recovery performance, mean±SD cumulative work done (99±13.5 kJ) during intermittent sprint cycling was significantly greater (P<0.001) compared to 24°C (86±8±9.9 kJ) and 40°C (78±3±10.9 kJ), in addition, cumulative work done was significantly (P<0.01) greater post-recovery with thigh gel-packs at 24 compared to 40°C.

In conclusion, active recovery with thigh gel-packs at 0°C was the most efficient at lactate clearance and in maximising subsequent post-recovery performance. As recovery kinetics is determined by lactate efflux from active glycolytic fibres and uptake by oxidative tissues, we speculate that cold possibly increases uptake via MCT channels as inhibited efflux would attenuate post-recovery work capacity.

**EFFECT OF ENVIRONMENTAL TEMPERATURE AND RECOVERY MODALITY ON POST-EXERCISE LACTATE CLEARANCE AND SUBSEQUENT PERFORMANCE**

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Recovery following high-intensity exercise determines an individual’s capacity for subsequent supra-maximal performance. This study investigated the effects of environmental temperature (5 vs. 28°C) and recovery modality (active vs. passive) on post-exercise lactate clearance kinetics and subsequent supra-maximal (>100% VO2 max) performance.

Male club cyclists (n=12, mean ± SD, age 22±2 yr, mass 81±9 kg, height 1.82±0.04 m and Pmax 360±62 W) performed two intermittent sprint sessions separated by four different 30-min randomised recovery interventions (active at 5°C, passive at 28°C, active at 28°C, passive at 5°C). The intermittent sprint protocol was performed on an Excalibur cycle ergometer (Lode Ltd., The Netherlands), the initial intermittent sprint session (10 by repetitions of 30s at 40% Pmax followed by 30s at 120% Pmax) increased blood lactate, the post-intervention intermittent sprint session to failure (TTF) assessed supra-maximal performance capacity. Blood lactate (BLa) pre-recovery, every 3 min during recovery and post-recovery was recorded from finger-tip capillary samples using a YSI1500 sport lactate analyser (YSI Ltd., USA), heart rate was recorded at 1-min intervals and test sessions were separated by 3 to 4 days. Each individual's pre-recovery BLa data were within 0.5 mmol·L⁻¹ across intervention. Recovery was performed in a climatic chamber (Ta=5.0±0.5 or 28±0.5°C, RH 50±5%) on a Monarch cycle ergometer; recovery interventions were cycling (40% Pmax and cadence 60 rev·min⁻¹) or passive seated rest. Exponential curve fitting of BLa data across intervention assessed clearance kinetics and lactate half-life (?½) in min. Lactate clearance and TTF data were analysed using repeated measures ANOVA, post-hoc Tukey tests quantified differences and P<0.05 inferred statistical significance. Pre-recovery BLa were not significantly different across recovery modalities, mean±SEM BLa data were 9.9±0.3 and 9.5±0.4 mmol·L⁻¹ pre-active recovery and 10.0±0.3 and 9.9±0.3 mmol·L⁻¹ pre-passive recovery at 28 and 5°C, respectively. Active compared to passive recovery facilitated faster lactate kinetics, mean % for BLa in active at 28 and 5°C were 13.9 and 11.8 min, significantly shorter (P<0.001) than passive at the same temperatures, 26.2 and 22.1 min, respectively. Mean±SEM % of peak BLa remaining in the circulation at 30 min into recovery were 16.7±1.7 and 22.7±3.3% for active, and 34.9±2.8 and 42.2±2.7 % for passive modalities at 5 and 28°C, respectively. Active recovery at 5°C facilitated greater post-recovery performance, cyclists’ maintained intermittent supra-maximal performance significantly longer (P<0.001) compared to active recovery at 28°C and passive recovery at 5 and 28°C, mean±SEM TTF data were 477±29 vs. 360±32, 336±24 and 249±27, respectively.

In conclusion, an active recovery at 5°C was the most efficient at lactate clearance and in maintaining post-recovery supra-maximal performance capacity.

**THE EFFECTS OF CYCLE RESISTANCE TRAINING AT PEAK POWER USING DIFFERENT PEDALLING VELOCITIES ON MUSCLE POWER IN OLDER WOMEN**

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Older people crucially rely on their level of explosive muscle power to maintain functional independence. However, the training load that optimally enhances muscle power remains elusive. It has recently been shown that high-intensity training produces greater gains in older peoples’ explosive power than traditional heavy resistance training (Henwood et al., 2008). Nonetheless, these gains in muscle power may be explained through training at a higher power output hence, the optimal training stimulus could be peak power rather than movement velocity per se. Therefore, this study aims to determine the stimulus for optimal gains in older peoples’ muscle power through cycle resistance training. Uniquely, peak power generated from sprint cycling over 8 s against varying loads does not differ significantly (Pearson et al., 2004), enabling the comparison of two different training resistance methods that result in significantly different pedalling velocities, but with participants generating their peak power.

With University Ethical approval, 24 healthy female participants, aged 70-80 yrs, were matched for dynamic strength into 3 training groups; speed (SP), strength (ST) or control (CON). SP and ST performed 3 sets of 8 ‘all-out’ 8 s supervised sprint cycles, with rest periods of 3 min between sets and 1.5 min between each sprint, twice/week for 8 weeks. SP utilised a load 20% of the maximum load pedalled through 2 complete revolutions (2RM), allowing maximum pedal rate to be achieved. Whereas, ST utilised a 60% 2RM load, resulting in a significantly lower pedal rate. Training load was adjusted after the 4th week in accordance with participants’ 2RM. Conversely, CON carried on with their normal daily activities. After a familiarisation period all participants were tested pre and post-training for power output during a 6 s all-out sprint cycle, against loads of 20, 40, 60 and 80% 2RM (Watson et al., 2007). Statistical analysis was performed on the change (load-pre) in peak power (DP) and torque (DT) using one-way ANOVA followed by post-hoc Tukey tests. Significance was set at p < 0.05.

Pre-training peak power for each group was equivalent (p>0.2). The increase in peak power, measured during the first pedal stroke (average of all loads tested), was significantly greater in ST (DP = 106±59 W; mean±SD) compared to the non-significant change in SP (12±45 W) and CON (14±16 W) (p<0.005). ST increase in peak power was accompanied by a significant gain in torque (DT: 7.6±3.7 Nm, SP: 0.08±2.7 Nm and CON: 0.44±2.3 Nm, p<0.001).

As only ST improved explosive muscle power, accompanied by a greater torque, training at peak power cannot be regarded as the optimal training load, whilst the training stimulus appears to be the length of time exercised at higher torques.

References


BED REST ATTENUATES THE INITIAL VENTILATORY AND CIRCULATORY RESPONSES TO DYNAMIC EXERCISE

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It is well known that physical fitness level shows prominent decrease after deconditioning such as in the cases of space flight and bed rest, and that this should be attributed to physiological dysfunction due to inactivity. We previously proved that 20 days of head-down bed rest reduced leg muscle volume (1) and peak oxygen uptake (2). However, few attempts have been made to elucidate the effects of inactivity on cardio-respiratory responses during the transient phase of exercise. We observed that ventilatory and heart rate responses at the onset of exercise within 20 s were slowed in the elderly and this would be caused by aging dysfunction and/or lack of activity (3). Accordingly, we hypothesize that inactivity should induce attenuated initial ventilatory and circulatory responses at the onset of exercise. Therefore, the purpose of this study was to clarify this hypothesis.

11 healthy male subjects participated in -6 degree head-down bed rest (HDBR) for 20 days. Ventilatory and circulatory responses to brief (20 s) and light voluntary exercise (VOL) generated by bilateral legs extension-flexion movements were measured before (PRE) and after (POST) 20 days of HDBR. Similar movements and measurements were performed on the subjects passively by pulling ropes connected to the subject's ankle (PAS) by the experimenters. This method of PAS was utilized because central command, which is assumed to be one of the main mechanisms affecting ventilatory and heart rate increase during exercise, would be reduced to a minimum in PAS. Minute ventilation (VI), tidal volume (TV) and respiratory frequency (RF) were measured by breath-by-breath technique, and heart rate (HR) and blood pressure were also obtained by beat-to-beat.

VI increased rapidly at the start of exercise in both conditions while the rate of increase seemed to be attenuated after HDBR. The averages of the first 10 s value (T10) and that of the second 10 s value (T10) of VI and RF during VOL in POST were significantly lower than in PRE. During PAS, there were no significant differences in VI, RF and VT between PRE and POST, indicating a minor effect of the peripheral neural reflex mechanism for exercise hyperpnea on the attenuated ventilatory response in VOL during HDBR. HR at rest and during exercise (T10 and T10) at POST significantly increased as compared with at PRE. The extent of increase in HR between T10 and the resting value was significantly decreased after HDBR. From these results, we concluded that initial ventilatory and heart rate responses to exercise were attenuated by 20 days of HDBR. It is suggested that these attenuated responses would be derived from changes in the central neural system as a result of HDBR.

References.

EFFECT OF ADDING UPPER BODY MOVEMENT ON ISOMETRICALLY CONTRACTING QUADRICEPS OXYGEN ACCESSIBILITY DURING SIMULATED SAILING

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Rationale: It has been documented that the sustained isometric contraction of the lower limb muscles during simulated hiking in sailing significantly reduces quadriceps oxygen accessibility, thereby accelerating the rate of muscle fatigue (Vogiatzis et al. 2008). It is unknown, however, whether the addition of upper body dynamic muscle activity impacts on quadriceps oxygen accessibility during hiking. It was reasoned that competition for oxygenated blood would compromise quadriceps oxygen accessibility during simulated sailing when upper body movement was added to the isometrically contracting quadriceps.

Methods: Six Laser male sailors performed in a balanced ordering sequence two experimental simulated sailing tests with and without upper body movement (hike plus paddle and hike alone, respectively) each lasting for 10 minutes. Paddle was performed on a swimming bench comprising 60 strokes per minute. During each experiment sailors performed five 2-min hiking bouts interspersed with 5-s recovery periods. Quadriceps haemoglobin total volume (HbT) and tissue haemoglobin-myoglobin saturation (SO2) were measured by near-infrared spectroscopy. Oxygen uptake (VO2), heart rate (HR), blood lactate concentration and leg discomfort on the Borg (1-10) scale were also evaluated.

Results: HbT (an index of quadriceps blood flow) was significantly (p<0.05) higher during hike plus paddle compared to hike alone (29.6±6.0% and 26.9±5.0%, respectively). Similarly, quadriceps oxygen accessibility was significantly greater during hike plus paddle compared to hike alone (SO2: 71±15% and 63±20%, respectively). Furthermore, VO2 and oxygen pulse (VO2/HR: an index of stroke volume) were significantly higher during the combination of hiking and arm paddling (VO2: 14.1±2.2 and 9.7±1.42 ml/kg/min, respectively) and (VO2/HR: 9.4±2.5 and 6.6±1.0 ml/beat, respectively). End exercise leg discomfort was significantly higher during hiking alone compared to hiking plus paddle (7.5±1.5 versus 7.5±1.5), whereas blood lactate concentration three minutes into recovery did not differ between the two tests (3.8±0.8 mM in both tests).

Conclusion: Contrary to our original hypothesis, the addition of upper body movement significantly enhanced quadriceps oxygen accessibility during simulated hiking. Possible physiological mechanisms responsible for this finding may include an increase in cardiac output secondary to the increased muscle mass recruited during hiking and to the dynamic nature of the upper body movement. The increase in whole body VO2 and stroke volume during hike plus paddle supports this hypothesis.

References.

INFLUENCE OF BREATH-BY-BREATH DETERMINATION OF ALVEOLAR OXYGEN TRANSFER ON THE ESTIMATION OF THE KINETICS AT THE ONSET OF STEP EXERCISE

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The analysis of the dynamics of oxygen uptake during transients requires breath-by-breath measurements. Breath-by-breath determination includes a correction for the change in lung gas store considering end tidal measurements to assess the composition of alveolar gas and an effective end expiratory volume which was set originally to the functional residual capacity (IAU algorithm from Auchincloss et al. 1966). It has been proposed to neglect the variation in alveolar gas composition, which was mathematically equivalent to set end expira-
In conclusion, it is possible to use the BR algorithm to study the kinetics of oxygen uptake during moderate and heavy exercise.

References.


**ELECTROMYOGRAPHIC ANALYSIS OF MUSCLE RECRUTIMENT PATTERNS DURING THE ‘NORDIC’ HAMSTIRNS EXERCISE**

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The ‘Nordic’ hamstrings exercise (NHE) is a simple partner assisted exercise in which, from a knelt position, a trainee attempts to resist a forward fall by engaging their hamstrings. Although training using the NHE has been shown to improve factors that may help prevent hamstring injuries, including the eccentric strength of hamstrings (Mjølsnes et al., 2004) and the muscle groups’ working range of motion relative to its length-tension relation (Brockett et al., 2001), no research has examined the recruitment characteristics of the hamstrings muscles during this exercise. Consequently, the aims of the present investigation were to study the activity of the hamstrings muscles during the NHE. With institutional ethics approval, 6 male professional soccer players (mean ± SD; age, 22.2 ± 4.5 yrs) volunteered to participate. Delays bipolar surface electrodes IDE2 3 MA, Delsys Inc., Boston, MA, USA) were placed on the belly of the medial and lateral hamstrings of the dominant (DOM) and non-dominant limbs (NON-DOM). Participants performed 5 repetitions of the NHE at a standardized velocity. Angle specific (by a single axis electromiometer, DS-X04, Delsys Inc., Boston, MA, USA) Root Mean Square (RMS) amplitudes were recorded (Delsys Inc., Boston, MA, USA). Raw RMS data were normalised against the maximum RMS amplitude recorded in the same muscle over a 500 ms window during the 5 repetitions of the exercise. A paired sample t-test indicated no difference in the normalised RMS amplitude of the hamstrings between the limbs (P = 0.949). Two-way fully repeated measures ANOVA demonstrated the absence of an interaction between muscle region and joint angle for the RMS amplitude of the hamstrings in the DOM limb (P = 0.089; P = 0.912). Although no main effect for muscle region was observed (P = 0.781), main effects for angle on RMS amplitude were demonstrated (P = 0.002). Bonferroni corrected post-hoc tests indicated that the RMS amplitude was significantly higher at the more extended knee positions (90-61º, 60-31º, 30-0º, 51±18%). Results demonstrated the absence of an interaction between muscle region and joint angle for the RMS amplitude of the hamstrings in the DOM limb (P = 0.081). No difference was observed for the second component. But, between-subject variability in d1, d1u2 and G2 was much lower with the AU and BR algorithms than the other methods at PVT+15W. The second component was significant in a greater number of cases when using BR (7 vs 5 for the other methods at PVT+30W and 5 vs 2 or 3 at PVT+15W).

In conclusion, it is possible to use the BR algorithm to study the kinetics of oxygen uptake during moderate and heavy exercise.

**INFLUENCE OF PRIMING EXERCISE ON PULMONARY O2 UPTAKE KINETICS DURING TRANSITIONS TO HIGH-INTENSITY EXERCISE FROM AN ELEVATED BASELINE**

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The phase II VO2 kinetics are appreciably slower during a transition to a higher work-rate than when it is initiated from an elevated baseline. In particular, the slow VO2 delivery limitation is presently unclear. ‘Primed’ exercise is known to enhance muscle O2 delivery and to accelerate VO2 kinetics during subsequent high-intensity constant-work-rate exercise, predominantly by reducing the amplitude of the so-called VO2 slow component, possibly as a consequence of changes in muscle fibre recruitment. We therefore hypothesized that the performance of priming exercise would accelerate VO2 kinetics during a subsequent work-work transition by reducing the phase II VO2 time constant and the amplitude of the VO2 slow component, in association with a reduction in the change in VO2 which occurs between 2 and 6 minutes of exercise. Seven healthy men completed exercise transitions to 70% of the difference between gas exchange thresholds (GET) and peak VO2 from a moderate-intensity baseline (90% GET) in each of the ‘unprimed’ and ‘primed’ conditions. Three like-transitions were performed and pulmonary gas exchange, heart rate and the electromyogram of the m. vastus lateralis were measured during all tests. A nonlinear least-square algorithm was used to fit the breath-by-breath VO2 data to a biexponential model. Average iEMG was calculated for 15 s intervals throughout exercise with these values normalized to the average measured during unloaded cycling prior to the initial transition and the change in iEMG between 2 and 6 minutes of exercise was computed.
The phase II VO2 kinetics were slower when severe-intensity exercise was initiated from a baseline of moderate exercise compared to unloaded pedalling (mean ± SD time constant, 42 ± 15 vs. 33 ± 8 s; P<0.05) but these kinetics were not accelerated by priming exercise (42 ± 17 s; P>0.05). However, the VO2 mean response time was reduced from 80 ± 24 to 63 ± 18 s; P<0.05), primarily as a consequence of a reduction in the amplitude of the VO2 slow component (from 0.47 ± 0.09 to 0.27 ± 0.13 L/min·1; P<0.05). The change in EMG between 2 and 6 minutes of exercise was also significantly reduced after priming (from 51 ± 35 to 21 ± 42 % of baseline; P<0.05).

That priming exercise did not accelerate the phase II VO2 kinetics during exercise transitions performed from an elevated baseline indicates that the slow kinetics in this condition are not related to an O2 delivery limitation. However, the VO2 slow component during these work-work transitions is reduced by priming and iEMG data support the role of an altered muscle fibre activation pattern as a facilitator of this effect.

References:

NON-METABOLIC SPECIALISATION IN ELITE YOUTH FOOTBALL PLAYERS
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Previous studies that have examined the concept that young children are non-metabolic specialists have provided conflicting findings (Blockham et al. 2005, Falk and Bar Or, 1993). These data have been derived from laboratory based tests where metabolic cross-over in testing modality occurs, in particular the large aerobic contribution to the Wingate test in children. There are also issues relating to the ecological validity of laboratory tests and to date no studies appear to have examined the concept of metabolic specialisation from field based assessment and with elite performers. Therefore the purpose of this study was to examine the concept of non-metabolic specialisation in elite youth football players using field based tests. 126 participants were recruited for this study, all of who were academy players at a professional Spanish La Liga football club. Players were split into their respective teams consisting of U11 to U18. Fitness testing took place in the middle of the competitive football season (Dec-Jan) and all participants were familiar with the testing procedures. Sessions started with the assessment of players’ body mass, stature and sum of six skinfolds. With adequate rest periods between tests no significant correlations between anaerobic and aerobic parameters for each age group. There were no significant correlations between anaerobic and aerobic tests in any of the age groups. Despite not reaching significance there were more negative correlations in the older age groups 16y+ which could be interpreted as a trend towards metabolic specialisation. There were significant negative correlations (range r = 0.50 to 0.78) between aerobic performance and sum of skinfolds in the U11-U13 age groups that become non-significant after 14y. Significant correlations were found between body size and performance variables, especially in the U11 and U12 age groups. These data suggest that body size and composition play an important role in the ability to perform anaerobic and aerobic work. The lack of significant relationships between anaerobic and aerobic performance in any age group indicates that elite youth football players appear not to be non-metabolic specialists.

This may in part be attributed to the field tests not being discriminative, the use of age groups rather than maturational status and the relatively small sample size.

EFFECT OF ACTIVITY ON MUSCLE FIBER TYPE COMPOSITION AND MYOSIN HEAVY CHAIN MRNA EXPRESSION AFTER MUSCLE INJURY INDUCED BY ECCENTRIC CONTRACTION IN RAT SKELETAL MUSCLE
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The purpose of this study was to investigate the effect of muscle damage and activity on muscle fiber type composition and Myosin Heavy Chain/mRNA expression quantity. Our studies so far have reported that the muscle damage causes the temporary denervation in the regeneration processes of the muscle fiber, the innervation form becomes multiple innervation. Then, it removes the surplus nerve terminals from the muscle fiber, and it becomes the single innervation. It is considered that the selection and the elimination of the surplus nerve terminals affect the muscle fiber type. It may be presumed that the activity of the muscle plays pivotal roles in the selection and elimination of the surplus nerve terminals. And it is further estimated that the muscle fiber also interacts with functions and sends signal to the nerve terminal in the process of regeneration.

Female Fischer 344/Jcl rats ( 10 weeks old, body weight, 150–170 g) were used. All procedures in the animal experiments were performed in accordance with the guidelines. The rats were classified into 4 groups: control, endurance training (EL), endurance and downhill training (ED), endurance training addition in ED (EDE). Endurance training ran on the treadmill continuously for 60min at 40min/min, 6days/wk. The training period was 4weeks. Downhill training ran on the treadmill continuously for 5min running with 2min rest interval, 18 bouts at 40min/min and 16 degree decline. Downhill training carried out once. EDE group performed 2weeks endurance training continuously after downhill training. Single muscle fibers were dissected from the extensor digitorum longus and soleus muscles. Using the Real-time polymerase chain reaction, the measurement of the mRNA expression quantity measured expression level of MyHC type I, MyHC type Ila and MyHC type Iib. Three types of fibers were classified based on differences ATPase activity. The muscle fiber composition is shown at muscle fiber for different types the number ratio. The morphological observation of neuromuscular junction by optical microscope used cholinesterase and silver staining.

We observed the muscle damage and denervation in the ED group. In the EDE group, the regeneration muscles fiber such as matrix of the nucleus and small fiber was observed. In the regenerated muscles fibers, multiple innervation and inexperienced neuromuscular junction were observed. In the muscle fiber composition, there was the increase of Type Ila fiber. The relative expression level of MyHCtype Ila and MyHCtype Ila of mRNA were show the high value in the EDE group. The values from the group endurance-downhill-endurance training showed the increase from percentage of Type Ila fiber and MyHC type I and MyHC type Ila as the endurance training group. It is concluded that increase in muscle fiber type transformation promoted by after endurance training programmed after muscle injury. And damage and regeneration may have a role in the nerve conversion of the neuromuscu
OXYGEN DESATURATION AT THE END OF EXHAUSTIVE ROWING TESTS WITH AND WITHOUT WARM-UP: EFFECTS OF GENDER

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Exercise induced arterial hypoxemia (EIAH) has been reported in various endurance male and female sport specialists, including runners, cyclists, triathletes, swimmers and rowers. When EIAH is present, it usually peaks at or near maximal exercise intensity and during short-term or incremental exercise to exhaustion.

The purpose of the present study was to determine any possible sex differences in the frequency and degree of oxygen desaturation at the end of exhaustive rowing protocols with and without prior warm up.

Twenty male (M; n=20, age: 19.3±.64 years, training age: 5.6±.60 years, weight: 78.19±1.62 kg, height: 181.36±1.49 cm) and twenty female (F; n=20, age: 22.51±3.85 years, training age: 4.29±0.26 years, weight: 66.52±1.21 kg, height: 171.85±1.36 cm) highly-trained rowers, participated in the study. On three separate occasions both groups underwent: a) an incremental rowing ergometer test (Concept IIc, Nottingham, UK) b) a rowing ergometer 2000m all-out effort and c) a rowing ergometer 5 minute all-out effort without prior warm-up.

Rowing drag factor was set in 135 for M and 125 units for F. Arterial oxygen saturation (SaO2) was assessed non-invasively by ear oximetry for all measurement sessions (Nanox2-Medlab, Karsruhe, Germany). The minimum level of % SaO2 was determined using 15-s averages. Data are expressed as means (±SE).

Results showed that SaO2 was significantly lower in female compared to male at the end of the 2000m race (90.69 ± 0.94 vs 87.38 ± 0.84%, p<0.05) and the 5-minute all out without warm up test (90.61 ± 0.77 vs 87.18 ± 0.74%, p<0.001). No significant differences were observed between groups at the end of the incremental test. Severe hypoxemia appeared in 65% of the female and in 15% of the male athletes at the end of the 2000m race. Both male (45%) and female (70%) revealed highest frequency in mild type hypoxemia, at the end of the incremental test. At the end of the 5-min all out test, the highest frequency appeared at the severe (50%) for female and at the mild level hypoxemia for male (50%) athletes.

We conclude that female rowers are more hypoxic compared to male at the end of exhaustive efforts with and without warm-up. Moreover, incremental efforts seem to limit the prevalence of EIAH in female compared to male rowers.

FUNCTIONAL EVALUATION OF OXIDATIVE ENERGY METABOLISM IN MYOPATHIC PATIENTS

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Aim of the study

In patients affected by metabolic myopathies, such as mitochondrial myopathies (MM) and myophosphorylase deficiency (McArdle disease, McA), the impairment of aerobic metabolism is responsible of a reduced exercise tolerance, a typical and most relevant clinical observation. The aim of the present study was to evaluate two non-invasive methods of assessment of the aerobic metabolism in MM and McA patients:

1) Indexes of muscle oxygenation state during exercise, representing skeletal muscle O2 extraction capacity, measured by near-infrared spectroscopy (NIRS),

2) Kinetics of O2 uptake (VO2), measured at the lung during transients between rest and exercise.

Methods

Four groups of subjects were assessed: 13 MM, 7 McA, 37 patients with signs and symptoms of metabolic myopathy but with a negative biopptic result (control patients, P-CTRL) and 28 healthy untrained subjects (CTRL). Every subject completed a 5-minute constant-load-cyclogermometer exercise, followed by incremental exercise until exhaustion. The following variables were assessed: 1) heart rate (HR) by ECG,

2) pulmonary ventilation and breath-by-breath gaseous exchange (VO2, CO2 output, VCO2) using an open-circuit metabolograph, 3) peak VO2, Delta[deoxy(Hb+Mb)]peak (peak value of deoxygenated Hb and Mb concentration changes), an index of maximum O2 extraction capacity of the vastus lateralis muscle as assessed by NIRS, and 4) VO2 kinetics.

Results

Delta[deoxy(Hb+Mb)]peak was significantly lower in the MM (25.3 ±12.0%) and McA (18.7±7.3%) compared to the P-CTRL (62.4±3.9%) and to the CTRL (71.3±3.9%) subjects. The peak VO2 values obtained in the MM, McA and P-CTRL patients was significantly lower by ~ 40%, ~50%, and ~15% than in the healthy CTRL group. In the MM and McA patients, VO2 peak and Delta[deoxy(Hb+Mb)]peak were linearly correlated (R2= 0.83), that is to say: those patients with the lowest maximum extraction capacity, showed the lowest peak VO2 values.

The VO2 and HR kinetics of the patients were significantly longer in the MM and McA patients, compared to the P-CTRL and CTRL groups. The time constant of O2 uptake and HR were significantly longer in the MM and McA patients compared to the P-CTRL and CTRL groups.

The VO2 and HR kinetics of the patients were significantly longer in the MM and McA patients compared to the P-CTRL and CTRL groups.

Conclusions

The methods of functional evaluation proposed by this study, enable to identify and quantify the oxidative metabolism impairment of MM and McA patients. The advantage of monitoring this impairment non-invasively seems of considerable medical value when an objective, quantitative and longitudinal evaluation of these patients is needed in the follow-up or in the implementation of therapeutic i

CAN AN INTERRELATIONSHIP BETWEEN LACTATE AND CARBOHYDRATE UTILISATION EXPLAIN THE INTER-INDIVIDUAL VARIATIONS IN FATMAX?

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INTRODUCTION: High inter-individual variations in carbohydrate (CHO) and fat utilisation have frequently been reported during incremental exercise testing. Maximal oxygen uptake (VO2peak) is a determinant of maximal fat oxidation (Fatmax) levels (Venables et al. 2005). However, Fatmax often corresponds to a wide range of exercise intensities of approx. 30-75 %VO2peak and various blood lactate concentration (BLC) levels of 1-2.2 mmol.L-1 (Birch et al. 2005). An interrelationship between BLC and the relative rates of pyruvate combustion (RPY) has previously been proposed based on the idea that lactate may be used to indicate pyruvate availability, and shown to be independent of age and cycling cadence (Beneke et al. 2005, Alkhaltib and Beneke 2006). The latter interrelationship suggests that
RPP changes may be reflected by individual BLC levels, as indicated by a constant (kel) describing RPP as a function of the BLC. The present study investigates whether kel can serve as an independent factor to increase the explanation of the variance of Fatmax.

METHODS: 21 healthy males (Age 26.3 ± 6.0 years, Height 179.4 ± 8.1 cm, Body mass 74.9 ± 12.5 kg) completed an incremental cycling test at 50 rpm. The workload was initiated with 1 W/kg -body mass, and increased by 0.5 W/kg -body mass every 2 min stage. Capillary blood samples were drawn from the hyperaemic earlobe at rest and at the end of each stage. VO2 and carbon dioxide production (VCO2) were measured, and analysed for estimating CHO and fat oxidation using indirect calorimetry. RPP was calculated as a percentage of the full pyruvate combustion (when VO2 equals VCO2). Absolute CHO and fat combustion rates were calculated based on the O2 required to oxidise glycogen and fatty acid, and further used to determine Fatmax. kel was approximated based on the following interrelationship between RPP and BLC: RPP = 100 / (1+kel / BLC2). RESULTS: Fatmax was (Mean ± SD) 0.51 ± 0.14 g.min-1 corresponding to an intensity of 40.2 ± 9.4 % of peak power (293 ± 39.4 W) equivalent to 47.2 ± 9.7 %VO2peak (3885 ± 505 ml.min-1) at a BLC of 1.4 ± 0.04 mmol.l-1. Estimates of kel were 1.75 ± 1.10 mmol.l-1. kel and VO2peak were unrelated (r > 0.05). VO2peak explained 38.7% of the variance in Fatmax (Fatmax = 0.16 + 0.00017 VO2peak, p=0.003). Inclusion of kel as independent explanatory variable increased the explanation of the variance of Fatmax to 55.9% (Fatmax = 0.18 + 0.00015 VO2peak + 0.05 kel, p=0.001). CONCLUSION: Determination of kel increases the predictability of Fatmax. High kel values indicate lower reliance on CHO combustion at given levels of CHO availability, and higher Fatmax.

References.

INFLUENCE OF VO2MAX ON THE %VO2MAX ATTAINED AND VO2 KINETICS IN SHORT DURATION EXHAUSTIVE RUNNING

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It has been demonstrated that in aerobically trained subjects VO2 does not attain its maximum (IVO2max) during short duration exhaustive running. Rather VO2 reaches a plateau below VO2max, despite the response being fast enough to be complete (Draper and Wood, 2005a). Previous research has suggested that VO2max (ml.kg-1.min-1) is negatively correlated with the percentage (%VO2max) attained during exhaustive running (Draper and Wood, 2005b; James et al., 2007), however neither of these studies utilised a suitably heterogeneous sample for VO2max. The purpose of the present study was to examine the relationship between VO2max and the %VO2max attained in short duration exhaustive running.

Twenty subjects (10 male and 10 female; [mean (SD)] age 30 (7) years, height 1.72 (0.09) m, mass 68.0 (13.0) kg, VO2max 52.6 (11.0) ml.kg-1.min-1) completed the study. Following a familiarisation trial, each completed four exhaustive treadmill tests; two exhaustive ramp tests and two square wave tests of an intensity high enough to exhaust the subject in approximately 2 min. The order that these tests were completed was counterbalanced. Breath-by-breat VO2 was measured throughout each test; this was then interpolated and averaged across both transitions. VO2peak was defined as the highest 15 s moving average from the combined data and VO2peak from the ramp test was considered to be VO2max. Square wave data were modelled using a mono-exponential function having first removed phase-1 data points. Pearson Product Moment correlation was used to investigate the relationship between VO2max and outcome variables. VO2max (ml.kg-1.min-1) was found to be negatively correlated with %VO2max attained in the square wave test (r = -0.539, P = 0.014). There was no relationship however between VO2max (ml.kg-1.min-1) and either the time constant (tau) of the response (r = -0.136, P = 0.568), or mean response time (MRT) (r = -0.218, P = 0.356). This is the first study to examine exercise of this intensity using a sample that was heterogeneous for aerobic capability. Whilst supporting the notion that VO2max (ml.kg-1.min-1) and %VO2peak attained in exhaustive severe intensity running are correlated, the results suggest that VO2max is essentially unattainable in such exercise in any subjects capable of completing a two minute exhaustive run. The results also show that the positive relationship between VO2max and the speed of the VO2 response, which has been reported at lower exercise intensities (Powers et al., 1983), was not found for short duration exhaustive running in the present study.

References.

EFFECT OF TENDON VIBRATION DURING SUBMAXIMAL STATIC ELBOW FLEXION EXERCISE ON MUSCLE OXYGENATION

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Purpose: A recent study has reported that whole limb vibration stimulus induces a lower tissue oxygenation during submaximal dynamic exercise because of a greater recruitment of fast twitch motor units (Mileva et al. 2006). However, it remains unclear whether static exercise with direct vibration on the contracting muscles also produces the lower oxygenation as seen during dynamic exercise (Mileva et al. 2006). The purpose of this study was to investigate the influence of tendon vibration during submaximal static exercise on muscle oxygenation.

Methods: Nine healthy females (mean±SD: 23.8±4.1 years, 162.6±4.4cm, 56.6±4.2kg) participated in this study. All subjects completed two trials, non-vibrated exercise (Ex) and vibrated exercise trials (Vib+Ex). In both trials, the elbow flexion exercise was statically sustained for 2 minutes and the exercise intensity was kept at 30% of maximum voluntary contraction (MVCO) by a visual feedback system. In Vib+Ex, an oscillating stimulation by a vibrator (frequency 100Hz, amplitude 0.8mm) was applied to the distal tendon of the biceps brachii during exercise. Mean arterial pressure (MAP) and cardiac output (CO) were measured using photoplethysmometer. Heart rate (HR) was measured by ECG recordings. The changes in oxygenated hemoglobin (oxyHb), deoxygenated hemoglobin (deoxyHb) and total hemoglobin
MIF was reduced by 54% ± 2% immediately after B1 and stayed depressed for nine days (21% ± 3%; p < 0.01). REA decreased immediately (8° ± 1; p < 0.01) after exercise and returned to pre-exercise values within 96 hours (180° = extended elbow). The reduction in MIF correlates with the decrease in REA (r = 0.8 at 72 hours; p < 0.01). The training program was consisted of four leg-presses, bench-press, pull down curls and leg curls. During the first week, the training was done at 50% 1RM in two sets with 10 repetitions. The intensity of training was increased to 80% 1RM in 3 sets and 6 repetitions, during the 8th week. The training program was three days in a week for 8 weeks. End diastolic and systolic diameter, septum and post wall thickness, left ventricular mass (LVM) and LVM index as structural parameters, pre and post trainings measured by echocardiography with 2D and Doppler methods.

Results: The torque output of elbow flexion was identical between Ex and Vib+Ex. The increases in MAP, CO and HR during exercise were also similar in both trials. However, the decrease in oxyHb during exercise was greater in Vib+Ex than that in Ex whereas there were similar increases in deoxyHb and totalHb in both trials. In addition, the decrease in TOI during exercise was greater in Vib+Ex than that in Ex. Conclusions: This study suggested that the submaximal static exercise with tendon vibration reduces muscle oxygenation as similarly observed during dynamic exercise, probably due to a greater recruitment of fast twitch motor units resulting from the vibration stimulus.

References.

**EFFECT OF THE RESISTANCE TRAINING ON THE HEART MORPHOLOGY IN UNTRAINED FEMALE STUDENTS**

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Through regular and long-term Training, the heart encounters some changes, which make it different from the heart of one who doesn’t take physical Training. These alterations define as physiological adaptation in heart which is in response to Training. Indeed, this process is in contrast with pathological adaptation (2, 4).

These established alterations are different according to type, duration and intensity of training, primary physical fitness, heredity and sex (1).

Pluim (2000) found in (through studying Echocardiography in athletes who take resistance training) that internal diameter, posterior wall thickness of left ventricle, interventricular septum in athletes are more than control group (3).

With due attention to the new style of training among Iranian women is working with weights or lifting them, the aim of this study was to determine the effect of the resistance training on the heart morphology.

**CHANGES IN CALPAIN AND DESMIN AFTER TWO BOUTS OF ECCENTRIC EXERCISE IN HUMANS**

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The calpain system is involved in degradation and remodelling processes in skeletal muscle, and increased calpain-activity is reported in humans after eccentric exercise (1). Because calpains have high affinity for myofibrillar and cytoskeletal proteins, an accumulation of calpains could be expected in this compartment after muscle damaging exercise. Consequently, the aim of this study was to investigate changes in calpain content in the cytosol and the cytoskeleton after high-force eccentric exercise.

Twenty one healthy subjects (26 ± 3 years) performed 70 unilateral maximal eccentric actions with their arm flexors at two occasions (same arm) separated by three weeks. Changes in maximal isometric force (MIF) and resting elbow angle (REA) were monitored for nine days after each bout (B1 and B2). Biopsies were obtained from the exercised and the non-exercised biceps muscles one, 48, 96, 168 hours after B1 and one and 48 hours after B2. The biopsies were homogenized and fractionated to a cytosolic and a cytoskeleton/myofibrillar fraction. Micro-calpain and desmin content in both fractions were measured by western blotting.

MIF was reduced by 54% ± 2% immediately after B1 and stayed depressed for nine days (21% ± 3%; p < 0.01). REA decreased immediately (8° ± 1; p < 0.01) after exercise and returned to pre-exercise values within 96 hours (180° = extended elbow). The reduction in MIF correlated with the decrease in REA (r = 0.8 at 72 hours; p < 0.01). After B2, the MIF recovered within 96 hours, and the REA was slightly decreased immediately after and 24 hours after exercise. The cytosolic calpain content tended to be increased 48 hours after B1, whereas the calpain content in the cytoskeleton was increased after both B1 and B2 (p < 0.05). Desmin was found consistently only in the cytoskeleton fraction and the desmin content was elevated 168 hours after B1 and one and 48 hours after B2 (p < 0.05).

Faster recovery of MIF and the faster normalization of REA after B2 compared to B1, revealed a repeated bout effect. The prolonged depression of the force-generating capacity, especially after B1, was related to disturbances in force-generating and force-transmitting structures, as we have found disruptions of the myofibrillar structure. Ultrastructural changes may in turn be a consequence of increased Ca2+ levels, indicated by the increase in passive tension (decreased REA) and a concomitant activation of the calpain system. The delayed increase in desmin after B1 and elevated levels after B2 suggest that increased desmin expression is part of the adaptation to unaccustomed eccentric exercise. The accumulation of calpain in the cytoskeleton after both B1 and B2 indicates that calpain plays a role in the remodelling of the cytoskeletal structures. In conclusion, the changes observed in both calpain and desmin suggest that these proteins may be involved in the mechanism behind the repeated bout effect.

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EXERCISE INTENSITY PROFILE OF TCHOUKBALL MATCH-PLAY

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BACKGROUND: Tchoukball is a relative new sport developed in 1970 by the Swiss biologist Hermann Brandt. During matches physical contact between players is not allowed to reduce the risk of injuries and limit aggressive behaviors. Tchoukball is played by two teams of nine players on a rectangular field (usually 40x20 m) with one rebound frame placed at each end of the field. To score a player must bounce the ball off the frame such that no defending players can catch it before it falls on the field (rules available on www.tchoukball.org). Each match consists of three periods of 15 min with resting intervals of 5 min between periods. Tchoukball is widely-spread in some countries of Europe, America and Asia. However, to date, there are no studies on this sport. Therefore, to understand the physiological demands imposed by Tchoukball, we examined the exercise intensity by assessing the heart rate and the blood lactate ([BLa-]-) response during a match. METHODS: fourteen players (mean±SD: age 19.5±2.2 years, body mass 75±9 kg, height 1.79±0.07 m) participated to the study. They completed an incremental test for the determination of the lactate threshold (LT, 1 mmol/L above baseline) and that of blood lactate accumulation (OBLA, intensity at 4 mmol/L). Three intensity zones were determined: EASY (<LT), MODERATE (between LT and OBLA) and HIGH (>OBLA). During a friendly match, HR and [BLa-] after each period were measured. Exercise intensity was expressed as percent of individual maximal HR reached in the laboratory and as relative time spent in the three intensity zones. Exercise intensity was analyzed using two-way (period x intensity zones) and one-way (period) repeated measures ANOVAs. RESULTS: Exercise intensity was analyzed using a two-way (period x intensity zones) and one-way (period) repeated measures ANOVAs. RESULTS: players reached a HRmax of 191±8 bpm. The HR at LT and OBLA corresponded to 65±6 and 80±5% of HRmax, respectively. The average intensity during the match was 82±2% of HRmax, while the average HR values during the three periods were 85±5, 83±7, and 81±6% of maximal, respectively. A significant time effect was found for average HR (P=0.024). The time spent in the high, moderate and easy zones was 55±34, 37±27 and 8±13% of total match time. A significant period x intensity zones interaction was found (P=0.047), with the time spent at high intensity decreasing during the match: from 68±33 (first period), to 53±38 (second period) and 45±30% (third period). No differences between periods were found in [BLa-]. DISCUSSION: the average intensity during tchoukball matches is similar to that found in other team sports such as soccer and futsal. The high proportion of time spent in the high zone shows that tchoukball is high demanding sport. The decrease in intensity during the periods suggests the occurrence of fatigue throughout the match. The knowledge of the physiological demands of tchoukball can be useful for coaches and sport scientists attempting to clarify fitness objectives and to ascertain the physiological characteristics that are prerequisites for success.

NO CIRCADIAN RHYTHM OF EXTRACELLULAR HSP72 IN HEALTHY HUMANS

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Stressors such as exercise, trauma, hyperthermia, alterations in blood glucose and infection have all been shown to increase the concentration of extracellular (e) Hsp72 in humans. Research has focused on its potential immuno-stimulatory capability and the possibility that eHsp72 may aid cytoprotection of distal cells particularly with regard to exercise thermodurability. In addition, it has been proposed that eHsp72 may have diagnostic potential in a number of clinical conditions. Clearly, from a methodological and diagnostic perspective, it is important to investigate if concentrations of eHsp72 fluctuate throughout the day. Catecholamines, which have been shown to have a circadian variation of their own, are strong candidates for mediating the release of eHsp72. Therefore, the purpose of the study was to measure resting concentrations of plasma eHsp72 throughout a 24-hour period. With informed consent, 8 healthy recreationally active males were recruited for the study (age: 23.3 ± 3.7 yr, height: 1.83 ± 0.08 m, body mass: 77.9 ± 9.2 kg). Following a standardized breakfast on the morning of the trial, blood samples were taken every hour from an indwelling cannula from 12noon until 9pm and from 7am until 12noon the following day, and analysed for plasma (EDTA) Hsp72 concentration using a commercially available ELISA (Assay Designs, Michigan, USA, intra-assay CV = 1.4%). Participants remained in the laboratory throughout the trial, performed light sedentary activities, and were provided with standardized meals and fluids, which maintained body weight and euhydration. In addition to blood sampling, resting heart rate and blood pressure were recorded every hour. Physical activity was quantified throughout by the use of an accelerometer.

One-way repeated measures ANOVA revealed that heart rate (P = 0.083), systolic (P = 0.664) and diastolic (P = 0.254) blood pressure remained stable throughout the trial. Despite inter-subject variation, physical activity remained sedentary throughout the trial (mean activity energy expenditure above resting metabolic rate: 35.7 ± 10.0 Kcal/hr) and was matched by energy intake. It is therefore unlikely that the subjects were unduly stressed. Plasma Hsp72 concentration did not fluctuate significantly throughout the day and showed no apparent endogenous circadian rhythm in absolute (F = 1.14, P = 0.367) or plasma volume change corrected data (F = 1.04, P = 0.380). Individual-coefficient of variations ranged from 3.8-12.7% (mean 7.6%). Mean Hsp72 concentration across all subjects and time points was 1.85 ± 0.14 ng/ml. These data show that in a rested state, plasma eHsp72 concentrations remain stable throughout the day. However, the mean co-efficient of variation of ~8% suggests researchers and clinicians should be wary when anticipating small changes in response to an intervention.

MUSCLE COORDINATION DURING REPEATED SPRINTS IN WOMAN: A PILOT STUDY

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Few data are available on the woman’s neuromuscular function, especially during sprint exercise. The inter-muscle coordination is a primary determinant of power output production, and may therefore constitute a factor limiting the exercise tolerance. The aim of the current study was to examine the effect of fatigue induced by repeated sprints on the activation and deactivation dynamics in the healthy, active woman. Twelve women performed twenty, 5-s all-out sprints on a cycle ergometer, separated by 25-s rest. Surface EMG of the vastus lateralis (VL) and the biceps femoris (BF) was recorded, and two discrete events were computed from the raw-mean-square linear envelope of the raw EMG signal (i.e. onset and offset of EMG bursts) in sprints 1, 5, 10, 15, and 20. The time delay between VL and BF onsets, and the silence period (i.e. time period between BF offset and VL onset in the subsequent burst) were calculated. Results showed a significant mechanical work decrement from sprint 1 to 20 (20.2 ± 8.9%, p<0.05). The mechanical output alteration was accompanied by muscle coordination changes. The time delay between VL and BF onsets was reduced in sprints 15 (135.1 ± 123 ms, p<0.05) and 20 (133 ± 137 ms, p<0.05), compared with sprint 1 (1393 ± 152 ms). Moreover, the silent period within a given pedal stroke was found to increase (p<0.05) during these sprints (sprint 15: 12%, sprint 20: 18%). This study is the first to explore muscle coordination in woman during whole-body exercise. It is demonstrated that the alteration of the coordination timing between agonist and antagonist muscles may contribute
EFFECTS OF AGEING ON SOLEUS-EVOKED H-REFLEX AND V-WAVE RESPONSES
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The Hoffmann (H) reflex and the first volitional wave (V-wave), which is an electrophysiological variant of the H-reflex recorded during maximal voluntary effort, may be used to evaluate the modulation of the spinal loop (Ifton 1971). These two evoked responses are measures of motoneuron excitability and also reflect the magnitude of presynaptic inhibition on the afferent (mainly H-reflex) and the magnitude of the descending neural drive (mainly V-wave). The purpose of the present study was to combine measurements of soleus-evoked V-wave and H-reflex, recorded during maximal plantar-flexor contraction, in order to examine neural adaptive changes induced by ageing.

Experiments were performed on 10 young (25±5 yr) and 8 elderly males (76±2 yr). The maximal H-reflex and M-wave were evoked at rest (Hmax, Mmax) and during maximal voluntary contraction (MVC) (Hsup, Msup). During MVC, supra-maximal stimulus intensity was also used to evoke the V-wave.

No difference between Hsup/Msup and Hmax/Mmax was observed in the young men [0.49±0.16 vs.0.51±0.13], while in the elderly Hsup/Msup was significantly higher than Hmax/Mmax [0.47±0.21 vs.0.31±0.15, P<0.01]. The Hsup/Msup was similar for the young and elderly, whereas Hmax/Mmax was 39% lower in elderly men (n.s., P=0.08). The lack of statistical significance is probably due to the elevated inter-subject variability in Hmax/Mmax showed by the elderly (CV:50%). No difference in V/Msup was found between the young and elderly [0.23±0.17 vs.0.24±0.18].

This study confirms a trend towards a decrease in neural peripheral functionality with senescence. Nevertheless the age-related depression in reflex amplitude observed at rest, disappeared during muscle contraction. The lower reflex amplitude at rest reflects an alteration of the balance between spinal excitatory and inhibitory mechanisms. The similar reflex amplitude during contraction indicates that the depression in excitability and/or the rise in inhibition are compensated or removed during contraction. In other words the spinal excitatory and inhibitory pathways preserved their capacity to adapt to the contraction demands placed on the system. The preservation of the V-wave also suggests that ageing does not affect the central motor drive, as proven by the unchanged voluntary activation (Scaglioni et al. 2001). Collectively these findings support the notion that the age-related neural adaptation mainly occurs at spinal level. In conclusion the modulation in reflex response may be viewed as a compensatory adaptation of the peripheral neural system to preserve its efficiency during contraction despite the age-related impairment of the segmental reflex system observed at rest. These results also suggest that ageing-induced changes in neural function should be evaluated by using H-reflex recorded during muscle contraction and not merely in resting conditions.

References.

ROLE OF WARMING UP ON EXCITABILITY AND PERFORMANCE DURING MAXIMAL ISOMETRIC EXERCISE
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The mode of warming up before sport activities has been discussed for several years. A new perspective was added by Pedersen et al. (2005) showing that acidosis or high lactate concentration may be beneficial for the excitability of muscles and may reduce fatigue. Thus we compared 3 different protocols of “warming up” preceding a maximal isometric handgrip contraction lasting until the developed force decreased below 33% of maximum.

11 subjects not especially trained in forearm exercise participated in the study. In the first test a 2 minutes warm up on a cycle ergometer with maximum power reached in an incremental test preceded the isometric test (C). In the 2nd test the subjects had to perform dynamic handgrip exercise for 10 min at 50% of the maximal power reached in an incremental handgrip test as warming up (H). The control trial was performed with no warming up (CON). Maximum force and the time course of the force were recorded. When force dropped below 33 % of maximum the experiment was finished. Blood was taken from a cubital vein of the working arm. Lactate, plasma potassium and sodium concentration and pH were determined. M-wave was recorded via surface electrodes from forearm flexors. Therefore the motor point of the muscle was stimulated supra maximally with rectangle constant current pulses.

The maximum force was not different between the three conditions. However fatigue was greatest after H as performance time was significantly shorter (about 25%) compared to C and CON (p<0.005). The performance times under C and CON did not differ. After warming up on a cycle ergometer, lactate concentration was significantly higher (p<0.001) and the pH remained significantly lower in comparison to the other conditions during the whole experiment (p<0.01). After warming up with dynamically contracting forearm muscles, the isometric contraction started at lower Potassium concentration (P<0.05). At the end of exercise the difference between the conditions had vanished. The M-Wave area increased after H (p<0.01) and remained larger than CON (p<0.05) after the isometric exercise. The decrease in the M-Wave area in comparison with the resting value was most pronounced in CON. Also M-wave duration increased in comparison with other conditions in CON (p<0.05). Under the two other conditions the M-wave duration did not significantly differ from the initial value.

Active warming up did not improve maximal isometric force but reduced performance time. Passive warming up of the forearm muscles by cycling increased lactate concentration and decreased pH. In contrast to Pedersen et al. this did not increase M-wave and performance. Thus a performance enhancing effect on the excitability by lactate or pH seems to be improbable (Shushakov et al. 2007). However in contrast to the traditional view the acidosis did not decrease performance. However, active warming up may decrease muscular performance.

RELATION BETWEEN HEART RATE VARIABILITY AND SUBJECTIVE FEELING OF FATIGUE IN ELITE SPEED SKATERS
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Since it has been considered that fatigue has negative influence on performance in competitive sports, careful monitoring and controlling of the physical fatigue level might be essential for athletes to achieve good performance in competition. Although resting heart rate has
EFFECT OF POSTACTIVATION POTENTIATION ON ENDURANCE TIME IN THE DORSIFLEXORS

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Introduction: It is well known that after a brief maximum voluntary contraction (MVC), the force of a twitch contraction is increased as compared with the twitch force preceding the MVC (Shima et al. 2006). This enhancement is called twitch potentiation or postactivation potentiation (PAP) which may offset fatigue of endurance exercise. However, it is unknown whether PAP improves endurance time (the time to task failure) for submaximal contraction. The purpose of the present study was to examine the effect of postactivation potentiation on endurance time in the dorsiflexors. Methods: Nine men (23±1 years) were seated in a custom-built isometric dynamometer with their right ankle positioned at 20° of plantar flexion, and an angle of 90° at both the hip and knee joints, and performed intermittent (6s-on, 4s-off) isometric dorsiflexions at 60% of MVC until exhaustion. Evoked twitch torque (Pt) was obtained during each 4s rest period. With more than 3 days interval, these task performed after 30s later of 10s MVC (PAP condition) and without PAP condition (normal condition). The mechanomyographic (MMG) signal was detected by a uniaxial accelerometer which was 9 mm square with a thickness of 4.5 mm and a mass of 0.75 g. The accelerometer was secured to the skin with double-sided adhesive tape over the portion of the tibialis anterior muscle belly that yielded the minimum rise-time of the evoked MMG signal. The surface EMG signal was recorded using surface bipolar electrodes in the TA. Results: Subjects completed 18.8±2.5 and 15.5±1.8 contractions [means±SEM] before the target torque could no longer be attained at normal condition and PAP condition, respectively. Endurance time of PAP condition was longer than normal condition in 3 subjects, but not other 6 subjects who has smaller Pt at 20% of time-to-fatigue at PAP condition than normal condition. However, evoked MMG were no different between PAP condition and normal condition in 6 subjects. There is significant relationship between magnitude changes in Pt by PAP with 10s MVC and magnitude changes in endurance time from normal condition to PAP condition. Conclusion: The inconsistent effect of PAP on endurance performance in dorsiflexors would not be caused by muscle contractile properties.


EFFECTS OF VIGOROUS LATE-NIGHT EXERCISE ON CARDIOVASCULAR AUTONOMIC CONTROL AND SLEEP QUALITY

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Background
Physical exercise creates a great need for recovery, and sleep is the most important period for recovery. Heart rate variability (HRV) has been used to measure the autonomic nervous system function, which plays a central role in the recovery process. Previous studies assessing ANS function after exercise have mostly concentrated on acute post-exercise recovery. This study evaluated the effects of a vigorous late-night exercise on autonomic cardiovascular control and sleep quality during the subsequent night's sleep.

Methods
The sleeps of seven young subjects (3 males, 4 females, aged 24±4 yrs, VO2max 45±12 ml/kg/min) were monitored in a sleep laboratory in a counterbalanced order 1) after a day including vigorous late-night exercise and 2) after a control day without exercise. During the exercise day, the subjects performed an incremental cycle ergometer exercise until voluntary exhaustion. The exercise started at 21.19±0.20 hh min and lasted for 28±4 min. The time difference from the test termination to bed time was 2.16±0.21 hh min. During sleep, ECG RR-intervals [Alive Heart Monitor], actigraphy [Actiwatch Activity Monitoring system] and polysomnography [BrainVision Recorder] were recorded. The variables of autonomic cardiovascular control (heart rate [HR], HRV, as well as stress and relaxation vectors based on both HR and HRV) were analyzed with WinBeat PRO Heartbeat Analysis Software. The actigraphic sleep quality was analyzed with Actiwatch Sleep Analysis Software, and polysomnographic sleep quality from the sleep stages determined using a standardized scoring protocol. The analyses were performed for the whole sleep period, and variables of cardiovascular autonomic control were analyzed also hour by hour after being bed time. Statistical differences were examined using Wilcoxon signed ranks test.

Results
During the whole sleep, there was a tendency for higher HR as well as stress vector (p=0.075 and 0.063, respectively) after exercise compared to control condition. HRV as well as actigraphic and polysomnographic sleep quality did not differ between the two sleeps. When looking the cardiac autonomic control during the successive one-hour periods, it was found that HR and stress vector were significantly elevated for the first hour of sleep (p<0.05), and remained elevated (but not significantly) for the next three hours in exercise condition compared to control condition. No changes were found in HRV or relaxation vector during the one-hour periods between different conditions.
Discussion
The study showed that relatively short vigorous exercise 2-2.5 hours before bed time did not influence HRV or objective sleep quality but was sufficient to increase HR as well as stress vector (calculated from HR and HRV) during the first hour of sleep. Thus, our results are consistent with the general view that late-night exercise may impair sleep, and indicate that physiological stress reactions caused by exercise may be reflected in cardiac autonomic control.

IDENTIFYING THE ANGIOTENSIN-CONVERTING ENZYME GENE POLYMORPHISM IN TRAINED SUBJECTS BY CARDIO-RESPIRATORY RESPONSE

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Introduction.
The I allele of the angiotensin-converting enzyme (dipeptidyl carboxipeptidase II) I/D polymorphism has been found with increased frequency in cohorts of elite endurance athletes (I). The role of the I allele in improving endurance ability probably results from higher aerobic power but this relationship has not yet been clearly demonstrated in a group of endurance trained subjects.

Purpose.
To evaluate the effect of I allele in maximal aerobic power and other measures of endurance capacity in a group of endurance trained subjects.

Methods.
In this preliminary study, 42 endurance trained males (34.2±7.2 yrs) performed an incremental maximal exercise on a treadmill after an overnight fast. Respiratory data were recorded breath-by-breath (Quark b, COSMED, II) and averaged over 15 s intervals for measurement of maximal oxygen uptake, maximal rate of expired air, and maximal tidal volume. The anaerobic threshold was identified by the V-slope method and was expressed as percentage of maximal oxygen uptake. Blood pressure was measured at rest. The ACE genotype was determined by PCR amplification of DNA extracted from blood leukocytes.

Results.
The number of subjects of the DD, ID and II genotypes were respectively 25 (59.5%), 16 (38.0 %) and 1 (2.5%) thus deviating from Hardy-Weinberg equilibrium. Maximal oxygen uptake was 55.6±8.2 ml/(kg.min) and 58.6±9.3 ml/(kg.min) for DD and ID/II subjects, respectively (p=0.206). Maximal ventilation, tidal volume and anaerobic threshold were all similar between the ACE genotypes. Systolic blood pressure values were significantly higher in the DD genotype group (p=0.033). Stepwise discriminant analysis correctly classified 76.7% of the subjects on their ACE genotype based on values of systolic and mean blood pressure alone.

Discussion.
The I allele of the ACE gene is associated with lower activity of the respective enzyme and with lower levels of Angiotensin II. This allele has been found with higher frequency in elite endurance athletes and it might contribute to an endurance phenotype through different mechanisms (2). However, in our cohort the presence of the I allele did not mean higher maximal rate of oxygen uptake or differences in the anaerobic threshold an important marker of aerobic capacity. Higher systolic blood pressure was associated to the DD genotype and this is in line to effects of the renin-angiotensin system in the cardiovascular system and particularly with the vasoconstrictor action of Angiotensin II. It is interesting that simple blood pressure measurements quite accurately distinguish the DD genotype from the ID and II ones. A larger cohort of endurance trained subjects is needed to confirm the present results.

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BODY FAT IN ELITE ROCK CLIMBERS MEASURED BY ANTHROPOMETRY AND DUAL ENERGY X-RAY ABSORPTIOMETRY

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Body fat mass is an important marker of performance in many sports disciplines, and particularly in climbing. Body fat percentage (BF%) can be either estimated from skinfold thickness by using sex-specific equations, or by using more accurate methods such as dual-energy X-ray absorptiometry (DXA). Nowadays, there is no consensus about which of the 17 published equations (7 in males and 10 in females) is the most appropriate for estimate BF% in elite rock climbers.

PURPOSE: To compare the most commonly used equations to estimate BF% from skinfold thickness, in male and female rock climbers with DXA as a reference method of fatness measurement.

METHODS. A total 19 elite rock climbers (9 females and 10 males) volunteered to participate in the study. Skinfold thicknesses were measured at the triceps, biceps, subscapular, iliac crest, supraespinale, abdominal, front thigh, medial calf according to the criteria described by the ISAK, level 1. BF% was estimated from skinfold thickness using 17 different equations. BF% was also measured with dual-energy X-ray absorptiometry (DXA).

RESULTS. A systematic bias was found for all the equations studied, except for Durnin’s equations in males and females, and for Wilmore’s equation in females. In females, both bias and the limits of agreements were lower when using the Durnin’s equation compared with the Wilmore’s equation (bias: -0.67±1.97 vs -1.81±2.62, respectively, limits of agreements: 3.86 vs 5.13, respectively).

CONCLUSIONS. Out of the 17 equations tested, the Durnin’s equation seems to be the most accurate one, and the can be used in both males and females rock climbers until a more accurate prediction equation or other simple method of body composition estimation are developed.

This study was supported by the Spanish Ministry of Education (AP2003-2128, AP2004-2745, AP2005-4358 and AP2005-3827)
DEPLETION AND RESYNTHESIS OF GLYCOGEN IN ARM AND LEG MUSCLES AFTER A CLASSICAL 15-K CROSS-COUNTRY SKI RACE

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Introduction: Bicycle exercise or running has been most often used in studies of glycogen usage during exercise and the replenishment in the recovery afterwards. In cross-country skiing muscle glycogen is probably a dominant factor for maintaining speed and can be crucial in the finish. In this sport the arms may be more critical than the legs both for speed and finish, especially in the classical technique. Thus, in the present study we examined muscle glycogen content in arm and leg muscle in connection with a race and the first 24 hrs after the race with two specific aims. 1) Evaluate whether arm muscles use more glycogen than the leg muscles and whether there is a muscle fibre type specific glycogen depletion pattern for the type 2 fibres, 2) Evaluate whether water intake instead for carbohydrates during the first 4 hrs after the race affect the resynthesis of glycogen acutely and next morning.

Methods: Ten elite male competitive cross-country skiers (Age:22, Body height:182 cm; Body mass:80.8 kg; VO2max:72 ml kg-1 min-1) performed a 15K classical race in varying terrain. The subjects were placed into two groups, a H2O-group and a CHO-group. Directly after the race the H2O-group was only allowed to drink water whereas the CHO-group used a normal post-race strategy to refill CHO with sport drink and gel and thereafter a meal. After 4 hrs both groups had the same carbohydrate enriched food intake. Muscle biopsies were obtained from an arm (triceps brachii) and a leg (v. lateralis) muscle before, directly after, as well as 4 and 20 hrs after the race. Muscles samples were analyzed for fibre types and glycogen as well as glycogen depletion pattern. Results: Muscle glycogen measured directly after the race was reduced by 32 % [484.7 to 331.3 mmol kg-1dw] in the legs and 69 % [from 540.2 to 167.1 mmol kg-1dw] in the arms. Type 1 muscle fibre type depletion was the dominant finding for both arms and legs, with some type 2A fibres being partly depleted in the arms. After 4 hrs with water no elevation in neither arm nor leg muscle glycogen content was observed but with CHO the legs did increase with 80 and the arms with 110 mmol kg-1dw and significantly more in the legs compared to the arms (P<0.05). Next morning regardless of being in H2O- or the CHO group all subjects had returned to close to their pre-race muscle glycogen content in both arms and legs. Conclusion: The main findings were 1) in classical/diagonal skiing is the recruitment pattern of muscle fibre types the typical for prolonged exercise with primarily type 1 fibres being glycogen depleted but equally clear is that the arms are more used than the leg muscle as muscle glycogen stores were more markedly utilized in the arm as compared to the leg muscles 2) Restoration of the muscle glycogen stores are dependant of a carbohydrate intake but of note is that in only 20 hrs of recovery was the pre exercise glycogen level reached regardless of no carbohydrate intake for 4 hrs immediately after the race.

IMMUNOLOGICAL AND HORMONAL RESPONSES TO A FOUR-DAY COMPETITION PERIOD IN FEMALE SWIMMERS

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Introduction. Acute stress has been reported to increase the activity of the hypothalamus-pituitary adrenal (HPA) axis. Near or during competitions, both muscular and metabolic fatigue and anxiety and arousal typical of these situations can influence salivary cortisol (C) and testosterone (T) levels as well as mucosal immunity, reflected by salivary immunoglobulin A (IgA) levels. Conversely, the ratio T/C has been considered as an index of fatigue and readiness to perform.

The main objective of this study was to examine the salivary IgA, testosterone (T) and cortisol (C) and their ratio (T/C) responses to the proximity and participation in season major competitions in a group of national level female swimmers.

Methods. Saliva samples were collected from 9 female swimmers (age: 16.87±2.32 years, height: 168.10±3.25 cm, body mass: 62.40±3.28 kg), in a fast state, between 7:00 and 7:30 am, during the three days preceding the National Championships and the four days of its duration.

Every subject swam at least one event in the morning (heats) and other in the afternoon (finals). Salivary IgA (mg/l) and T (pg/ml) concentration was determined using the BN2 Analyser (Dade Behring, USA). C (g/dl) and T (pg/ml) concentrations were determined using ELISA kits (Salimetrics, USA). Self-ratings questionnaires of well-being were applied every day after breakfast.

Results. IgA concentrations were relatively stable through the days before the competition and then increased significantly to the second day of the competition (66.87%, p<0.01), remaining at high levels until the last day. C showed a pattern of variation similar but with a significant increase the day before the beginning of the championships (61.65%, p<0.05) with highest values in the last day of competitions. T increased gradually during the days of competition, showing no significant variation between the day before and the third day of competition. Psychometric evaluation and T/C showed no significant variations.

Conclusions. The accumulated fatigue induced by consecutive racing days did not hinder the immune response in this group of female swimmers. The increasing levels of C during the competition days may be the effect of both psychological and metabolic stressors. The increase in T, however, means that a functional balance between catabolic and anabolic processes is in place. Nevertheless, pre-competitive psychological stress did not seem to influence the adrenocortical activity of these athletes.

LACTATE CHARACTERISTICS IN CYCLISTS OF DIFFERENT AGE AFTER MAXIMAL CYCLING EFFORT

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Introduction. Several studies show that, in terms of maximal lactate concentration, children have a lower anaerobic capacity than adolescents and adults. The higher absolute maximal blood lactate values of youth and adults are taken to confirm this statement. Studies investigating athletes of different ages only compared maximal lactate values. In this study the time course of blood lactate after a maximal cycling test was measured, furthermore all subjects had a common training situation, so that they are highly comparable.

Methods. 10 boys (13±0.4years) and 13 male adolescents (17±0.9years) participated in the study. The subjects performed a 30 sec lasting maximal sprint test on a cycle ergometer. The cycle ergometer was adjusted to an isokinetic mode regulating the cadence to 120 rpm. The subjects were instructed to perform the test only in a sitting position on the ergometer.
Blood samples were taken pre, 0min, 1min, until the 10th min, every minute to determine lactate concentrations in whole blood. After the test, the subjects recovered ten minutes passive in a sedentary position, to keep lactate elimination as low as possible.

Results
The adolescent group had a significantly higher mean Peak Power (PP) in the 30 sec trial than the boys (976.1±101.5 Watt [W] vs. 600.3±168.0 W). The relative PP (rePP) reached by the adolescents (14.0±1.4 W/kg) was also significantly higher compared with the boys (rePP 11.4±1.8 W/kg).

During the 30sec a mean power output of 445.4±104.0 W was reached by the boys and 697.4±62.6 W by the adolescents. The relative mean power reached by the adolescents was 10.0±0.7 W/kg bodyweight and the boys reached 8.5±1.2 W/kg bodyweight.

The adolescent group reached a significant higher peak lactate level of 11.5±1.3 mmol/l in the 6th minute of recovery. The boys reached their peak lactate level of 9.4±1.6 mmol/l in the 4th minute. In contrast to the absolute lactate values, rel. lactate values were significantly higher for the boys. The values were 0.18±0.02 mmol/l/kg for the boys and 0.16±0.02 mmol/l/kg for the adolescents.

Discussion
Adolescents reached higher absolute lactate values, but related to the bodyweight, boys even showed significantly higher lactate values, which might be hint for similar anaerobic energy production. Shorter circulation and diffusion distances in boys might be responsible for the earlier peak in absolute lactate values, compared with adolescents. This is in line with findinds from literature (Beneke, R., Hüttler M., Jung M., Leithauser R. M. Modeling the blood lactate kinetics at maximal short-term exercise conditions in children, adolescents, and adults. J. Appl. Physiol. 99:499-504, 2005).

Comparing the PP of the two groups, the adolescents achieved a significantly higher mean PP, a significantly higher relPP and a significantly higher mean power output over the 30sec than the boys. This is likely due to the more limited ability of younger athletes to recruit and use higher-hierarchy motor units.

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HARDINESS AND PERFORMANCE-INDUCED EMOTIONS IN FIELD HOCKEY
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This study examined the influence of hardiness upon the intensity and direction of competitive emotions and performance during critical events in sporting competition. Participants were 40 female field hockey players (M=21.67, SD=2.34) ranging from regional (equivalent to state honors) to national standard. Each performer completed a modified version of the Sport Emotion Questionnaire (SEQ; Jones, Lane, Bray, Uphill, & Catlin, 2005) when undergoing retrospective video-stimulated recall procedures (Sève, Ria, Poizat, Saury, & Durand, 2007) in relation to their performance during critical incidents in field hockey matches (i.e., offensive and defensive short corners). Performance was recorded via objective ratings from expert field hockey coaches and subjective ratings from the participants. Significant differences were observed in the direction and intensity of emotions experienced between high and low hardy groups. Specifically, high hardy individuals reported lower anxiety and greater excitement and happiness symptoms than their low hardy counterparts, which were reported to be more facilitative to performance during the critical incident. The high hardy group also scored higher on both objective and subjective measures of performance than the low hardy performers. Additional qualitative analysis revealed match importance, fatigue, social facilitation and expectation concerns, and previous poor performances during the match as antecedents of the performer’s emotional experiences. High hardy individuals suggested the emotions influenced performance via increases in focus and activation while low hardy performers indicated low self-confidence, concentration disruption, and negative thinking as factors contributing to poor performance. The findings support theory and previous research that suggest high hardy individuals not only appraise the demands encountered as less threatening in high-pressure situations (competitive sport) but interpret the subsequent emotional symptoms experienced as more facilitative to performance and are, consequently, more successful in these situations than their low hardy counterparts (Hanton, Evans, & Neil, 2003). Hardiness training may therefore offer practitioners with a realistic procedure with which to alter the performer’s meaning of the stressor and/or their subsequent emotional response in relation to the stressor, thereby maintaining or enhancing performance.

References.

WHAT REASONS YOUTH INDICATE TO DROPOUT SPORT?
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It is consensual that the practice of sports activities by children and youngsters assumes a significant meaning in certain moments of their lives. Therefore it is not at all strange that millions of people around the world join organised sport (Knop, Engstrom, Skirdstad & Weissl. However, paradoxically, many decide to quit sports practice too (Gould, 1987). Due to the lack of investigation in Sport Psychology area, we tried to find out if what Dan Gould designated as Surface Motives to dropout of Sport have remained immutable in the course of time. The sample was composed by 727 young people aged between 12 and 18, athletes from several individual and team sports. 62.6% were male and 37.4% were female. To access the intended information an inventory was built, having as a starting point an exhaustive literature revision on the sport drop-out theme and a pre-study done to individuals with the same characteristics of our sample. They were asked to indicate if they had already quit sport practice and why.

Saturday, July 12th, 2008
In general the results indicated that the main reasons for the dropout were: the lack of family/friends’ support (2.62±1.52), the parents’ pressure towards successful education (2.58±1.45) and the coaches’ lack of ambition (2.53±1.40).

In the gender analyses, boys pointed out the motives referred by the general sample (2.72±1.50, 2.70±1.45; 2.69±1.38) in the same order, whereas girls pointed out the conflict of interests regarding other activities (2.69±1.53) and the lack of family/friends’ support (2.56±1.58), as being the strongest motives to the dropout. Contrarily to boys, girls did not make any reference to the coaches’ lack of ambition, and the allusion to the parents’ pressure towards successful education appeared only in the 8th position (2.41±1.59).

The comparative analyses between the two genders statistically stressed significant differences in 16 of the aimed motives, with boys registering superior medium results in every one of them when compared to girls. The most important were: the parents’ pressure towards successful education (t= 2.03, p<.043), the coaches’ lack of ambition (t= 2.95, p=.003), the coaches’ bad training methods (p=.001), and the bad relationship with the coach (t= 2.64, p<008).

Notwithstanding the fact that some of this results have pointed to previously obtained ones, conflicts regarding education, mentioned in our study through the parents’ pressure towards successful education, levelled with the lack of family/friends’ support, they appear to be, at least, two of the growing motives which lead Portuguese young athletes to quit.

References.

THE EFFECT OF EXPERIMENTALLY PROVIDED SOCIAL SUPPORT ON GOLF-PUTTING PERFORMANCE
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There is considerable evidence to suggest that individuals who perceive their relationships as supportive experience a range of favorable outcomes, and recent studies in sport have demonstrated links between social support and performance in tennis and golf (e.g., Rees & Hardy, 2004; Rees, Hardy, & Freeman, 2007). For researchers and practitioners alike, given this evidence, knowledge is needed about the impact upon performance of providing individuals with social support. Furthermore, it would be important to attempt to elucidate whether the impact of support provision is the same for all individuals, or whether the impact may differ dependent on whether individuals perceive themselves to have high or low levels of support available to them. With this in mind, the present study examined in a laboratory environment the impact of a simple support manipulation on objective task performance. Participants (N = 100) were administered a 20-item measure of perceived support. Of these participants, those with the highest (N = 18) and lowest (N = 18) support scores were subsequently requested to participate in the experimental task. These participants were further sub-divided into the experimental support and control conditions. The task involved 10 golf putts from a 10-foot distance to a target of 10 evenly spaced concentric circles, with the innermost circle denoting a value of 10 points, and the outermost circle denoting a value of 1 point. A 2 (perceived support: high, low) by 2 (manipulation: support, control) ANOVA was performed on the scores in the putting task. There was no difference in the scores of participants rated as high or low on perceived support.

The support manipulation was led to feel more secure and thereby reported less frequent and distracting task-irrelevant thoughts, and this facilitated better performance scores.

References.

WHY DO YOUNG PEOPLE THINK OF DROPPING OUT FROM ORGANIZED SPORT
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Notwithstanding the range of reasons given by youngsters to justify their drop out of sports, some studies have highlighted the role given to practice intentions as predictors of the real behaviour (Down & Hausenblas, 2005). In this matter we intend with this study to identify the subjacent motives to the dropout intention, so as to try to take action before it really happens.

3178 individuals have participated, aged 12-18 (1749 boys and 784 girls), all of them being organized sports athletes.

In general, the results showed the club change associated to the wish of improving (20.9%), the conflict with other activities/interests (18.2%) and the bad relationship with the coach (27.7%) as the main reasons indicated by youngsters to a possible dropout. Contrarily to boys, girls did not make any reference to the coaches’ lack of ambition, and the allusion to the parents’ pressure towards successful education appeared only in the 6th position (26.1%).

3178 individuals have participated, aged 12-18 (1749 boys and 784 girls), all of them being organized sports athletes.

Regarding the age, we verified that athletes aged 12-14 (749 boys and 784 girls) all of them being organized sports athletes.

Globally, the results showed the club change associated to the wish of improving (20.9%), the conflict with other activities/interests (18.2%) and the bad relationship with the coach (27.7%) as the main reasons indicated by youngsters to a possible dropout. Contrarily to boys, girls did not make any reference to the coaches’ lack of ambition, and the allusion to the parents’ pressure towards successful education appeared only in the 6th position (26.1%).

For the boys, the conflict with other activities (35.4%) was highlighted as the main reason for a possible dropout, followed by the education conflict (27.7%) and the lack of interest/motivation (17.7%).

The boys’ first motive was only pointed out in the 6th position by the girls (3.1%), therefore it is not strange to find statistically significant differences between the two genders (X2=19.07, p=0.001). These differences were also registered in the other two motives in which girls had higher levels: education conflicts (X2=7.86, p=0.005) and conflicts with other activities/interests (X2=17.82, p=0.001).

Regarding the age, we verified that athletes aged 12-14 gave a bigger importance to the conflicts with other activities (32.4%) with education (27.7%) and to the lack of interest/motivation. The ones aged 15-16 mentioned the club change associated to the wish of improving in the first place (26.1%), the conflicts with other activities (13.1%) and education conflicts (8.7%). The older, aged 17-18 also mentioned the club change associated to the wish of improving as the most important one (25.9%), followed by the education conflict (24.1%) and the conflicts with other activities (17.2%). Therefore it is not strange to find statistically significant differences between the 3 groups when the motives related to the education (X2=9.17, p=0.010) and the club change associated to the wish of improving (X2=12.15, p=0.002) are mentioned.

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In view of the results, it seems that the motives which are subjacent to the dropout intention are globally coincident to the ones enumerated before the actual dropout. (see Butcher, Johns & Linder, 2002).

References.

THE ANALYSIS OF AUDITORY EVOKED BRAIN POTENTIALS DURING SUCCESSFUL AND UNSUCCESSFUL SHOTS IN RECURVE ARCHERY

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Archery can be described as a static sport requiring strength and endurance of the upper body, in particular the shoulder girdle. The bowstring is released when audible impetus is received from a device called clicker. As the fall of the clicker is an acoustic stimulus, it may evoke a sequence of electrical potentials that can be recorded from the scalp of an archer. These Auditory Evoked Potential (AEP) components occur at different latencies and with various relations to the auditory stimuli. Therefore, the present study aims to investigate the long-latency responses in relation with successful and unsuccessful shots in Recurve archery.

The subjects were 15 archers (9 males) for archery shooting experiments. All subjects reported normal hearing, had medical histories free of significant neurological problems, and were not taking medication known to affect brain activity. The mean age was 22.8 years (range 16 yrs - 31 yrs) and the mean years of archery experience and the highest FITA scores were 5.8 years (range 2 yrs - 14 yrs) and 1120 (range 1050-1313) FITA score, respectively. Each archer shot 72 arrows from 18 m after completing twelve trial shots to acquaint with the measurement conditions. Hits of an archer were recorded by placing the hits on a coordinate system for further analysis. All these hits were matched with the single sweeps of EEG recordings. Finally, hits were grouped as falling into the hit-area and miss-area with their corresponding EEG recordings. Mean amplitude (iV) and latency (msec) values of N100 and P200 components corresponding to hit and miss areas during archery shooting were calculated separately.

Vertex-recorded AEPs consisted of 200 ms pre- and 800 ms post-stimulus (fall of the clicker) periods. EEG was continuously recorded between the earlobe and vertex (Cz) and stored for off-line analysis. AEPs were band pass filtered (112 Hz). The peak amplitudes and latencies of the auditory N100 and P200 waves were measured. Latencies were measured relative to the stimulus onset and amplitudes measured relative to the mean value in the 200 ms preceding stimulus onset. N100 amplitude and latency were measured at the maximum negativity between 50 and 150 ms, and P200 amplitude and latency at the maximum positivity between 150 and 250 ms, respectively. Grand-average waveforms did not reveal consistent components with latencies longer than 200 ms (e.g. N200, P300 etc.).

It was observed that the fall of the clicker in archery shooting increases the amplitude of NI component. However, no difference was noted between successful and unsuccessful shots in terms of NI-P2 amplitude and latency. Thus, both successful and unsuccessful shots have the same effect on the brain evoked potentials in archery shooting.

GOAL STRIVING AND WELL-BEING IN SPORT: A PROSPECTIVE INVESTIGATION OF THE ROLE OF COACH BEHAVIORS

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In sport, anecdotal and empirical evidence supports the role of goal setting in the mobilization and direction of resources toward desired objectives. Previous cross-sectional research (Smith, Ntoumanis, & Duda, 2007) identified support for the self-concordance model (Sheldon & Elliot, 1999) as a framework for investigating personal goal striving in sport. Grounded in self-determination theory (Deci & Ryan, 1985), the model advocates the benefits of striving for goals with relatively autonomous motives for goal attainment and resultant changes in psychological well-being. In addition, Smith et al. identified coach autonomy-support and social-contextual predictors of athletes’ autonomous goal motives. Developing upon these findings, the present study further examined athletes’ goal striving using a prospective design and assessed the impact of controlling, in addition to autonomy-supportive, coach behaviors.

At the start of the sport season, 108 athletes (63 male, 45 female) nominated personal goals that they would be pursuing during the season and completed self-report measures of coach behaviors and goal motives. At the approximate mid-point of the season participants were reminded of their goals and completed measures of perceived goal progress and relative well-being.

Contrary to our expectations, goal progress mid-way through the season was not predicted by goal motives and did not predict well-being. Structural equation modeling analysis supported a model (scaled 2 (6) = 6.30, p > .05, CFI = .99, NNFI = .98, RMSEA = .02 (CI = .00, .14), SRMR = .07) in which coaches’ autonomy-supportive and controlling behaviors at the start of the season were positively linked to autonomous and controlled goal motives, respectively. In turn, autonomous and controlled motives positively and negatively predicted mid-season relative well-being (created by subtracting summed negative affect and emotional/physical exhaustion from summed positive affect and life satisfaction).

The present study supports the role of the coach in fostering autonomous goal motives and the benefits of such motives for psychological well-being. Furthermore, the study highlights the detrimental implications of controlling coach behaviors. Non-significant links to goal progress may be attributable to the use of mid-season measures which reflect perceived progress relative to future expectations. Future research further examining links to progress and later attainment is warranted.

References.
PERFORMANCE STRATEGIES ON ADAPTED SPORTS IN ELITE AND AMATEUR ATHLETES

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Introduction: Lately, the increasing attention given to paralympic sports makes psychological preparation even more important, acquiring a key role in preparing athletes. Psychological preparation includes the performance strategies training (concentration, confidence, motivation, relaxation, activation control, mental preparation, ...) that can be taught, practiced and improved like any other motor skill, and just like the motor skills, psychological skills are closely related to sports performance.

Purpose: The purpose of this study is to compare the performance strategies, during training and competition, on both elite and amateur athletes.

Methods: 14 motor disable adapted swimming athletes served as subjects: 8 amateur athletes members of Futebol Clube do Porto (FCP) and 6 elite athletes members of the Portuguese National Team (PNT). FCP athletes have been participating of official competitions for 4.5 ± 3.7 years, training 2.6 ± 0.7 hours per week and participating of 3 national competitions per year. PNT athletes have been participating of offical competitions for 8.2 ± 3.9 years, training 17 ± 5.9 hours per week and participating of 9 ± 3 national competitions and 3 international competitions per year. TOPS (Test of Performance Strategies) questionnaire was applied in order to measure the psychological skills and strategies used by the athletes in competition and during practice, analysing nine psychological variables: Goal-setting, Emotional Control, Automaticity, Relaxation, Self-talk, Imagery, Activation, Attentional Control and Negative Thinking. Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) and was made the following statistical procedures: - Descriptive Statistics: mean, standard deviation; - Statistical Inference: T-test of independent measures.

Results: In practice, only the Emotional Control variable (FCP=3.13 ; PNT=2.54) showed statistically significant differences (p=0.05). In competition the following variables showed statistically significant differences: Goal-setting (FCP=3.47 , PNT=4.58), Emotional Control (FCP=2.69 ; PNT=2.04), Self-Talk (FCP=3.28 , PNT=4.46), Imagery (FCP=3.22 ; PNT=4.33) and Activation (FCP=3.44 ; PNT=4.46).

Conclusions: elite athletes, compared with amateurs, have specific psychological skills that enable them to overcome psychological barriers imposed by the competition stress. The number of hours of training and the participation in competitions has a positive impact on the psychological development of these athletes.

THE SIGNIFICANCE OF MOTIVATIONAL STYLES AND RESISTANCE TRAINING IN ELITE JUNIOR CROSS-COUNTRY SKI PERFORMANCE

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Fifteen females and 13 males, all elite junior cross-country skiers, took part in a resistance training program to test effects on ski performance. They were randomized to a maximal versus endurance resistance program, with half of the participants training for 9 weeks and the rest for 5 month, and all completed survey measures on motivational styles supposed to be of importance for coping with stresses of sport participation. These surveys included the Sport Orientation Questionnaire with measures of goal-, win-, and competition-orientation, as well as the Telic Dominance Scale with measures of planning orientation, serious mindedness, and arousal avoidance. Other measures included negativism, optimism and sensation seeking. Survey results were tested in multiple regression analyses as predictors of racing scores in the season following the training intervention. Results supported the conclusion that optimism and the sport-specific measure of competitiveness predicted excellence when effects of type of resistance training, length of intervention and gender were eliminated.

COHESION, PHYSICAL SELF-PERCEPTION IN A COMMUNITY FITNESS PROGRAM

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The postive role exercise can play in promotion physical wellbeing has received a great deal of attention over the last decades. Recent public policy reports such the Portuguese, urge all people to be active on a regular basis. Although the physical benefits of exercise are well document and promoted, evidence for similar relationship between exercise and psychological benefits is less clear.

In the field of sport, more precisely in the area of fitness, the adherence in the first month of the sport season it’s high but as time goes by, in the winter months there is an increase of absenteeism, taken some people to drop-out from exercise. Authors like Spink and Carron (1993) point out that in US they have a 20% to 50% drop-outs in the first 5 to 6 months of exercise fitness program. Since there is a consensus amongst theorist that the self is socially construct, and exercise research by its very nature, has studied groups of individuals exercising together, our propose is to analyse the relation between group cohesion and physical self perception, and how this to concepts behaviour in function to age, time practice and assiduity in context of exercise.

This study was accomplished with 103 individuals, from a community program were assessed for cohesiveness with Portuguese version of the Group Environment Questionnaire -GEG (Widmeyer, Brawley, & Carron, 1985, Mendes, Serpa and Bartolo, 1993)adapted to the context of exercise, and the Portuguese version of the Physical Self Perception Profile PSPP (Fox, 1990, Fonseca, Fox and Almeida, 1995).

The assiduity was analyse by the self perception of the participants in the study

We use the statistical parametric technique, Spearman to analyse the correlations between depended variables, and ANOVA One Way and the test of H.S.D of Tukey, to compare independent variables.

The main conclusions regarding Physical Self Perceptions, were that the middle-aged (19-40 years) persons have highest values in all dimensions, except for global self-esteem (Rosenberg Self-Esteem Scale); the persons with less time to practice (less than 1 year) presented the highest in Body Appearance, Physical Strength, and global Self Esteem, and the lowest values in Sport Competence and Physical Condition. Only in the Sport Competence dimension the persons with more 3 years of practice have the higher values. Examining the self perceptions on the basis of attendance, we verify that are the subject with less assistance (25%), that have higher values in all dimensions. These results can be justified with the fact that more assiduity person has with themselves a degree of demand higher than less assistance. We find significant correlation between ATG-1 dimension of cohesion and global self-esteem

References.
Mental Toughness: The Processes Involved in Its Development and Maintenance

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Jones, Hanton, and Connaughton (2002) initiated the process of investigating mental toughness, proposing a definition of mental toughness and twelve characteristics that were perceived essential to its make-up. Jones, Hanton, and Connaughton, (2007) furthered mental toughness research by developing a framework of mental toughness, comprised of thirty attributes which clustered under thirteen subcomponents and four overall dimensions. This study examined the processes involved in the development and maintenance of the thirteen subcomponents of Jones et al’s (2007) framework. Researchers interviewed eleven participants (7 Olympic/World Champions, 2 coaches and 2 sport psychologists), and revealed that subcomponents were developed in the sequence order of belief and focus (attitude/mindset dimension); using long-term goals as the source of motivation, controlling the environment, and pushing yourself to the limit (training dimension); belief, staying focused, regulating performance, handling pressure, awareness and control of thoughts and feelings, and controlling the environment (competition dimension); and, handling failures and handling successes (post-competition dimension). The processes of subcomponents and maintenance evolved through the development and maintenance of the performer’s capabilities in training, with attributions of success in competitions contributing to increased self-belief and focus. Effective goals setting strategies and education programs enhanced motivation levels and the performer’s awareness of what was required to succeed, thereby encouraging greater personal responsibility in training. Once developed, the subcomponents within the attitude/mindset and training dimensions were adopted to increase perceptions of control over thoughts and feelings, and the development of a killer instinct in competition. Reflective practice played a vital role in developing the post-competition subcomponents. Specifically, this provided an understanding as to why successes and failures occurred and how to use this knowledge to further enhance performance. Practical implications indicate the importance of creating the correct mindset in developing mental toughness and challenging performers with difficult but achievable goals. Finally, mental toughness development appears to be assisted by enhancing successful achievements to increase belief, while rationalizing failures to a lack of preparation.

References.


The Experience of International Competition and Its Affect on the Development of Mental Toughness

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Connaughton, Wadey, Hanton, and Jones (2008) identified the underlying mechanisms accountable for the development and maintenance of mental toughness. Findings revealed that the development of mental toughness is a long-term process, influenced by a number of factors. Both, positive and negative, perceived critical incidents were identified as important influences in the development of mental toughness. Examples of negative incidents included: disruptions at school, loss of a peer, and parental divorce; and positive critical incidents such as, being selected for national squads/teams, competing at international competitions/games, and beating respected opponents. This study aimed to explain how one such positive critical incident, namely, the experience of competing at an international competition, affected the development of mental toughness. Six elite male athletes were interviewed regarding their perceptions of competing at their first international competition, and how this experience influenced mental toughness development. Findings revealed that the selection for, and participation in, their first international event resulted in a perceived increase of mental toughness levels. An increase in belief, focus, perceptions of control and personal responsibility, and coach/athlete communication positively impact on the development of mental toughness. Specifically, being surrounded by, and competing against, elite athletes increased the athletes’ belief in their ability and potential to become Olympic/World Champions. This increased belief, in addition to the knowledge gained from the experience of international competition, resulted in a greater focus in training and understanding of what was required to be Olympic Champion. Consequently, this enhanced the athletes’ perception of control and personal responsibility for his actions in training and competition. The resulting increase in personal responsibility required the athlete to form a closer relationship with his coach. This enhanced communication between coach and athlete encouraged a more formalized approach to competitive analysis and reflective practice, resulting in a greater belief in the training program, their coach, and potential to achieve their ultimate goal (i.e., Olympic gold). The practical implications highlight the importance for sport governing bodies to create the correct environment for young talented athletes to develop mental toughness. Specifically, allowing junior athletes to train, compete, and travel with elite performers and to experience international level competition in order to develop mental toughness.

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Attributional Reasons for Success and Failure in Different Types of Sports

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Based on Weiner’s attributitional model of motivation and emotion (1979) and using a sample of several sports activities we have analysed the systematic existence of differences in causal attributions in sporting successes and failures according to the types of sport. A total of 338 athletes, aged from 16 to 38 (M= 23.73, SD= 5.86), took part in this study; all were involved in federated sports competitions, in the Olympic events of football (n=193); athletics (n=100) and fencing (n=46). Causal attributions were evaluated using the Causal Dimension Scale II (CDSII: McAuley, Duncan & Russell, 1992), translated and adapted for the Portuguese population by Fonseca (1993). In general, data suggested that all respondents attributed their successes to more internal, less unstable, personally-controllable causes, whilst there was a marked tendency to attribute sporting failures to less internal, more unstable, externally-controlled causes. The results of the present study suggested a clear tendency among team players to attribute successes to more internal, less unstable and more personally-controllable causes than would
runners. These data on perceptions of sporting success and failure suggest a relationship between the type of sport engaged in and the perceived causality of major positive and negative outcomes.

RELATIONS BETWEEN PERSONALITY DISPOSITIONS AND CAUSAL ATTRIBUTION IN SPORT ContextS

Sousa, P., Rosado, A., Cabrita, T., Lancho, J.

In recent years, there has emerged a limited, but growing, research literature on personality dispositions in relation to causal attributions. In this study it was intended to analyze the influence of personality dispositions (extraversion, anxiety, tough-mindedness, independence and self-control) on causal attributions based on the dimensions of the Weiner’s (1979) attributional model of motivation and emotion (locus of causality, stability, and controllability). Subjects completed the revised Causal Dimension Scale (CDS-II: McAuley, Duncan & Russell, 1992). This scale assesses the causal dimensions of locus of causality, stability, and controllability for the open-ended causal attributions that subjects assign to a particular outcome. Based on a sample of 192 federated football players, this study presents results that show, in sport success situations, a relation between self-control and causal dimensions of the Weiner’s model. In other hand, the dispositional personality dimensions of tough-mindedness and independence seem to be related to the causal dimension of stability. On the contrary, in failure situations, it was verified a total homogeneity in the variation of the causal attributions in function of the personality dispositions. Overall, the results of the present investigation have demonstrated the relationship of selected personality dispositions to the contrary, in failure situations, it was verified a total homogeneity in the variation of the causal attributions in function of the personality dispositions. Overall, the results of the present investigation have demonstrated the relationship of selected personality dispositions to causal attribution. At present, researchers in this area may well choose to study diverse personality dispositions, because different results may emerge in different research contexts and because we need to understanding personality dynamics across a wide range of settings.

SCHOOLYARDS AFFORDANCES

Mourão-Carvalhal, I., Ferreira, I., Larangeiro, H.

Environment should offer experiencing and allow action for children, and playground in the schoolyards must be designed and structured to provide children more possibilities to motion. Children use their environment for physical challenges and play, therefore environmental affordances are what the environment permits or provides for the interaction. Playground equipment affords possibilities for physical activity. It is important to realize that perceived affordances and demands are not universal. The physical outdoor environment and the natural environment in particular, as a play habitat for children, has been a topic of low priority in child research. The aim of this study is to focus on the affordances of schoolyards environment which apply physical activity and versatile play in order to consider as an obesogenic environment. The study included 58 Portuguese elementary schools schoolyards. Data were collected with a checklist in order to check: area, type and the number of playground equipment, as well as the ground surface. The safety of the equipment was evaluated according to the APSI Portuguese norms. In what concerns the area, the results pointed out that 48% of the schoolyards were classified as medium and 35% as good and 17% as bad. According to the ground surface 50% of the schools are made by sandpit. The most popular play structures were the swing (41,38%) and the slide (32,76%). The game equipment, 39,66% of the school yards had a post-goal and 20,69% a basketball table. 50% of the schoolyards don’t have any kind of game equipment or playground structure. 50% of the equipment was considered safe. One challenge in studying the effects of contextual affordances understands the individual’s perception of the object, person or activity. Recess provides a daily opportunity for children to engage in moderate-to-vigorous and vigorous physical activity therefore playground design is very important in order to combat obesity. This study points out that the playground equipment of the schoolyards is poor, not safe, with a very little variety of equipment. Schoolyard as learning environment affords limited possibilities for motion and for physical activity.

THE INDIVIDUALISATION AND MULTI-FACETED NATURE OF PRE-PERFORMANCE ROUTINES IN ELITE TRACK ATHLETES

Swindells, M., Dutton, D., Thombs, M., Lovell, G.

An elite athlete’s capacity to effectively prepare mentally for competition can be seen to be as equally important as their level of physiologic preparation and training. Much of the previous research in the area of pre-performance routines has focused on a unidimensional approach; investigating the individual roles of the mental skills applied within. The aim of the present study was to investigate the multi-faceted nature of pre-performance routines and their effect on the cognitive and emotional states of elite performers.

Participants were four elite track athletes who were interviewed in-depth as to their experiences of the use of pre-performance routines. Participants all competed in the same events at a similar elite level, to factor out inter-sport and inter-skill level differences as identified by previous research, and to highlight how the individual demands of a given sport can influence psychological skill use. Their responses were transcribed verbatim and put through a procedure of thematic analysis, yielding a series of common themes.

Results demonstrated that extensive use was made of pre-performance routines before both training and competitive situations, and the athlete’s individual feelings on the usefulness of routines were highlighted through paraphrased excerpts from their transcriptions. Participants utilised the psychological skills of imagery, self-talk, arousal management, relaxation strategies, and attention cues to varying degrees. Participants also identified a myriad of key factors identified as being distracting to effective preparation and concentration before performance. The actual content of participant’s pre-performance routines was investigated with applied examples being given. The temporal nature of routines were also acknowledged, with any psychological routines that performers carry out during performance examined. Finally, the role of pre-performance routines as an antecedent to consistency of performance and flow state were also investigated.

In conclusion, this investigation highlights the importance of the individualisation of pre-performance routines, and future research directions are suggested. Strategies for applied practitioners and interventions are considered, with a key recommendation being that sport psychologists acknowledge the importance of individualising pre-performance scripts to specific athletes’ requirements. These should be conducive to the athletes’ own prior experience, individual preparation, and sport-specific demands.
THE COMPARISON OF MEMORY IN ACTIVE AND INACTIVE ELDER MEN

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Abstract:
Purpose: The aim of the present study was to investigate and compare the memory quotient of active and inactive elder men (60-75) in Arak.

Methods: This research is Ex post facto type and 76 old men participated in the study. The data was obtained through: Wechsler memory scale (W.M.S) was including 7 subscales. General memory, orientation, Mind control, Logical memory, Repeating the numbers, Visual memory, Associational learning.

Researcher-built personal data and state physical activity questionnaire. The validity was confirmed by experts and its Cornbach alpha reliability was 0.751. For Data gathering, the researcher gave 105 questionnaires to volunteer elder men and 76 questionnaires were completed. Subjects were divided into two active and inactive groups using physical activity questionnaire. To evaluate the memory, W.M.S was used. After gathering and collecting the data, the independent-sample t-test with 0.05 as the level of significance was used to test the hypothesis.

Result: The results showed that with certainty of 95% and p<0/05, the Memory Quotient for the older that are active is more than those who are inactive (T=3/90), also in 4 subscales, that is, orientation, logical memory, mind control and associational learning the active older were better than the inactive older, and in 3 subscales of general memory, repeating the numbers and visual memory, we couldn’t get any result.

Conclusion: The result of the present study suggests that participation in regular physical activity may be due to maintenance of memory performance in aging.

PHYSICAL ACTIVITY, WELL-BEING AND COGNITIVE FUNCTION IN ELDERLY

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This investigation had the purpose to compare the levels of psychological well-being and cognitive function between elderly with practice (more than twice/week and at least 30’/day) or not practice physical activity, and male and female.

The sample consisted of 110 elderly residents in Viseu Portugal (51 male and 59 female; age 72,85±5,57 yrs), with 55 with physical activity and 55 without. The instruments used were: Inventory of Psychological Well-Being (Memorial University of Newfoundland Scale of Happiness) and Mini-Mental State Examination. T-test was used to compare groups.

Main results demonstrated differences between elderly who practiced and not practice physical activity in all the variables (p=0,000). Higher values were obtained by elderly with physical activity in cognitive function (27,79±1,84 vrs. 24,47±1,77), positive affects (20,27±2,71 vrs. 15,75±3,57) and positive experiences (26,20±3,79 vrs. 19,67±4,55); whereby in negative affects (13,44±3,57 vrs. 8,75±2,70) and negative experiences (20,55±4,76 vrs. 12,6±2,96), the group without physical activity presented greater scores. No significant differences were found in all the variables when we compared males and females.

The results of the present study are in agreement with the literature; physical activity promotes positive changes in affective states and produces beneficial effects on cognition. In conclusion, physical activity offers one of the greatest opportunities to reduced disability and improves the quality of life for older persons.

Key-Words: physical activity, cognitive function and well-being, elderly

NARRATIVE PATTERNS FOR TEAM’S BEST GAME AND TEAM’S WORST GAME: THE HANDBALL COACHES’ INDIVIDUAL EXPERIENCES

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It is not linear the correspondence between the objective situation of a victory and the subjective perception of success neither between the objective defeat and the perceived failure (Duda & Allison, 1989). Qualitative research in this domain would give us a better understanding of coaches’ views on their complex experiences and it would help to clarify findings from quantitative studies in the field of achievement motivation in sport competition. Life is a story and every coach has his autobiographical small stories about good and bad games. This study seeks to identify the narrative pattern of handball coaches from their personal experience in non-shared and particular past events: the prototypical narrative for coaches’ Team’s Best Game and Team’s Worst Game. This dichotomised approach in the evaluation of their own team performance suggests our intentional option for the so-called critical incidents approach focussing on coaches’ experiences characterized by high emotional involvement. The sampling and analysis methodology draws on Grounded Theory (Glaser & Strauss, 1967). The sample includes 81 handball coaches aged 23 to 55 (mean +/- SD age; 36 +/- 8 years, 90% men). Each coach was invited to be a story-teller based on his team’s best game and worst game experiences and to post personal statement in the online forum or sending it by email. Participants were grouped according to their current ground reality and life experience (identified and reported by them): 51 as the team coach and 30 as an athlete of the team. Data was coded using MAXQDA2007, software for qualitative analysis, and is currently being analysed and interpreted. The results of the characterization process and construction of the prototypical narratives will be presented and their relevance to psychological practice discussed.
ORDER EFFECTS IN SPORT: THE INFLUENCE OF AN INTERPOLATED ACTIVITY AND DELAY ON JUDGEMENTS OF FOOTBALL PLAYER'S ABILITY

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Recently, Greenlees, Dicks, Thelwell & Holder (2007) found that coaches’ judgments concerning the ability of an athlete may be unduly biased by the quality of the initial performance of that athlete (defined by Asch (1946) as a primacy effect). If such biases are a consistent part of sport it is imperative for researchers to examine strategies designed to reduce order effects and promote unbiased information processing. Research in general psychology has shown that asking participants to delay their judgments or perform interpolated activities between viewing targets and providing judgments of them can eliminate order effects (Luchins, 1957). However, no research has examined the influence of delays or interpolated activities when perceivers make attributions of ability. The aim of the present study was thus to examine the impact of the order in which information about a performer is received and the influence of an interpolated activity in judgments of ability. Soccer coaches (N=60) viewed footage of 2 soccer players performing a simple soccer skill 8 times and then rated them on 5 attributes describing the ability of the players. Coaches were randomly allocated to one of 6 groups in a 3 (delay of judgment: no delay, 1 minute delay, 1 minute delay with an interpolated activity) x 2 (order of presentation: poor to good skill execution, good to poor skill execution) between-groups design. A univariate ANOVA conducted on the ratings of the target player demonstrated a significant main effect for order (F(10, 50) = 6.8, p = .011, effect size 2 = .11, estimated power at 5% probability = .73), with higher judgments of ability being made in the good-poor performance condition than in the poor-good condition. This indicated a primacy effect. No significant effect was demonstrated for condition of rating (F(10, 50) = 0.1, p = .941, effect size 2 = .002, estimated power at 5% probability = .06) and no significant interaction effect was observed (F(10, 50) = 2.87, p = .066, effect size 2 = .10, estimated power at 5% probability = .54). Thus, the results indicate that primacy effects are not reduced by the introduction of a delay or an interpolated activity between observing and rating a player.

References.

THE RELATIONSHIP BETWEEN TRANSFORMATIONAL LEADERSHIP BEHAVIOURS AND PERCEPTIONS OF ROLE VALUE IN INTERACTIVE SPORTS TEAMS

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Recently leadership research has identified a new type of leader, described as transformational, who is capable of transforming followers’ attitudes, beliefs and values as opposed to simply gaining compliance (Bass, 1985). Transformational leadership (TL) behaviours have been shown to impact a wide range of individual and organisational outcomes including self efficacy, commitment, satisfaction, group cohesion, and performance. However, currently there is very little evidence of the effect of TL behaviours in a sporting context. Furthermore, TL research has typically examined main effect relationships between the sub-dimensions of TL behaviours and the outcome variables of choice. As such the present study aimed to investigate main and interactive relationships between coaches’ TL behaviours and team members’ perceptions of the value of their interdependent role responsibilities. Male and female collegiate athletes (N=155) completed a TL measure developed by Hardy et al. (in press) and a measure of perceived role value constructed specifically for this investigation. Regression analyses revealed that only one leadership behaviour, High Performance Expectations (HPE), R2 = 0.13, p = 0.000, positively predicted perceived role value, such that increases in HPE were associated with increases in perceptions of role value. Moderated hierarchical regression analyses examined the interactive effects of challenge behaviours such as HPE and Intellectual Stimulation (IS) with the supportive behaviours Individual Consideration (IC), Contingent Reward (CR), Appropriate Role Model (ARM) and Creating and Articulating a Positive Vision (PV). All but two of these hypothesised interactions were found to be significant. The significant interactions between HPE and ARM, R2 change = 0.063; p = 0.007, and between IS and CR, R2 change = 0.063; p = 0.009, typified the general trend whereby a reduction in HPE or IS was associated with a reduction in perceptions of role value with low levels of support behaviours. In contrast, when support behaviours were higher perceptions of role value were mostly maintained. From an applied perspective results suggest that some TL behaviours can affect team members’ perceptions of their role related responsibilities in both a positive and a negative manner. Furthermore, coaches who do not express high performance expectations or do not encourage athletes to solve problems independently should anticipate that this could reduce perceptions of role value if not accompanied by supportive behaviours.

References.

ELITE RUGBY COACHES’ COMMUNICATIONS IN MATCH

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This research is organised with the National Technical Direction of the French Union in Rugby. The problematic consists in informing the private and public facets of the coaches’ communications with players during the match. We try to characterize communications by different aspects: intention, frequency, object, modalities, and their impact on the game production. The theoretical frame aims to encircle the implicit and tacit competences constituents. Coaching process is complex, dynamic and depending from the context (Lyle, 2002).

The methodology has for ambition to supply a detailed and ecologically valid portrait about coaches and about the coaching process (Gilbert & Trudel, 2004). We study all the technical staff members involved in the coaching process, using case studies with methods triangulation (Mouchet, 2005). We articulate:
- interviews before the match about coaches conceptions,
- behaviors and communications recording during contest,
- explicitation interviews (Vermersch, 2002) after the match about coaches' subjective lived,
- analysis of game evolution. We use for this last aspect the video of the game and an observation tool.
Results are in the course of treatment. The first elements about coaches’ conceptions put in evidence:
- The main addressees of orders: numbers 9 and 10 for the strategic aspects; the captain if he’s a different player, for aspects relative to
  the group management;
- The variety of used distribution channels, according to the opportunities of meeting with the players during the game, or the use of
  persons authorized to enter on the ground (for example medical staff).
On the other hand it is surprising to notice the absence of elements strongly shared in coach’s’s conceptions about the nature of com-
munications. The only element quoted explicitly by 50 % of the coaches concerns ‘ strategy ’. But the optimal use of these strategic regula-
tions seems to require from coaches a fine analysis of events and the necessity of developing two aspects:
- functional modalities of communications distribution in the course of contest,
- Players’ responsibility and self-sufficiency in the management of the game.
Data treatment of the communications in game is in course at this moment. The first elements seem to indicate preferential modes used
by coaches depending on their own experiences and characteristics as coach or player. But also depending from the local context of the
match.
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AVOIDANCE MOTIVATION AND CHOKING UNDER PRESSURE IN SOCCER PENALTY SHOOTOUTS

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Choking under pressure can be defined as performing worse than expected in situations with a high degree of perceived importance (Baumeister, 1984). Although previously not directly tested, researchers (e.g., Wallace, Baumeister, & Vohs, 2005) have argued that moti-
vation to avoid failure may predict choking under pressure. In achievement motivation theories, avoidance motivation refers to behavior
directed by negatively valenced events, while approach motivation refers to behavior directed by positively valenced events (Elliot, 1999).
The purpose of our study was to examine the relationships between shot valence, avoidance behavior, and performance in a high-
pressure real world sport task.

Video analyses were conducted with all penalty shootouts ever held in the World Cup, the European Championships and the UEFA
Champions League (n = 36 shootouts/359 kicks). Shot valence was assessed from the potential consequences of a shot outcome: shots
where a goal instantly leads to victory were classified as positive valence shots and shots where a miss instantly leads to loss as negative
valence shots. Avoidance behavior was defined as looking away from the goalkeeper or preparing the shot quickly (thus speeding up the
wait, possibly to get it over with). We used logistic regression analyses (for avoidance looking and performance) and ANOVA (for prepara-
tion speed).

The results showed that the players did more avoidance looking on negative valence shots (44%, OR = 4.7, p = .029) than on positive
shots (14%, OR = 1, reference category) and prepared their shots quicker on negative shots (M = 1.1 s) compared to the positive shots (M =
2.0 s) (F = 4.13, p = .017). Moreover, performance was significantly better on the positive valence shots (92% goals, OR = 1, reference
category) than on the negative shots (62%, OR = 7.1, p <= .016).
In conclusion, the results provide direct-observation support for theories of valence based achievement motivation in real world high-
pressure sport tasks. The study also gives an alternative explanation for the previous finding that soccer penalty shooters perform worse
with higher kick-importance (Jordet, Hartman, Visscher, & Lemmink, 2007). In general, we suggest that avoidance motivation may help
explain why professional athletes occasionally choke under pressure.

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THE DEVELOPMENT OF A QUALITY DECISIONAL INDEX FOR THE MATCH ANALYSIS OF OFFENSIVE ONE-ON-ONE
SITUATIONS IN BASKETBALL

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INTRODUCTION: In order to reach a better understanding of the game dynamics, sport performance analysis, is nowadays branded by a
multidisciplinary nature of contributes (Reilly & Gilbourne, 2003). However, much of the match analysis does not explain the continuous
explain why professional athletes occasionally choke under pressure.

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INTRODUCTION: In order to reach a better understanding of the game dynamics, sport performance analysis, is nowadays branded by a
multidisciplinary nature of contributes (Reilly & Gilbourne, 2003). However, much of the match analysis does not explain the continuous
interaction between the player and the competition environment. Decision-making behaviour is usually not included in these match anal-
yses. In this work we consider the 1 vs 1 situations that finished with an attempt to shot. In order to analyze the dyad we considered
the interaction between players as a symmetric relation defined for the distance between the basket and both players and their interper-
sonal distance (Araújo et al., 2006). The aim of this paper is to provide a match analysis tool for decision-making behaviour in basketball.
To achieve this goal, we present a quality decisional index (QDI) (Esteves, Araújo & Barreto, in press) which allows the measuring of the
temporal course of this behaviour in a one-on-one situation in basketball.

METHOD: In order to show that it is an accurate and reliable tool for analyzing information regarding players’ behaviour in the game, we
used notational analysis data from one-on-one situations that occurred in a basketball game (Portuguese main league). This notational
procedure allowed us to gather the needed variables for the quality decisional index [QDI = 0.7 (SS/SA) 0.1 LB/nLtv) + 0.2 (IF? nLtv), where
SA is the number of shots attempts, SS is the number of shots scored, LB is the number of lost balls, nLtv is the number of occurrences of
Identifying talent for sports at an early age has become one of the major issues in many highly competitive sports. The talent identification process is largely based on systematic expert observation that raises an important question: what is if that coaches and scouts see as early talent? The present study examined the contribution of one important characteristic that may relate to the process of talent identification and selection, that is, the role of physical precocity associated with the relative age effect. The study focused on the relation of the month of birth to sustained participation in youth ice hockey. It was hypothesized that the players with a greater relative age would be more likely to be identified as talented, and consequently, they were expected to sustain their participation in competitive ice hockey. In the first phase of data collection, a questionnaire, including items on date of birth, height, and weight, was administered to 2,806 Finnish male ice hockey players whose fifteenth birthday fell during the year 1987. The number of respondents was 1,712, representing 61 percent of the Finnish youth players in that age group. Data of the licence holders was obtained one, two and three years later. The month of birth distribution of the respondents differed statistically significantly from that of the general Finnish male population for the year 1987 (Chi square = 21.087, df = 11, p = .032). The data concerning the first five months (January to May) highlighted an over-presentation of the players, whereas a decreasing number of players were born in the subsequent months except December. In the following phase of data analysis, the month of birth variable (MB) was recoded in two categories: January to June and July to December (MB2). The MB2 variable appeared to be statistically significantly associated with continued participation one year (p = .003) and two years later (p = .003). Finally, as the month of birth was correlated with height and weight, forward stepwise logistic regression analyses were carried out with participation as dependent variable and MB2, height and weight as independent variables. When predicting participation one or two years later, regression coefficients for MB2 and weight at the age of 15 had statistically significant regression weights. When predicting participation three years later, only weight had statistically significant regression coefficient. The fit of model was statistically significant for all three regression models. Taken together, the data suggested that much of what coaches see as early talent may be explained by physical maturation associated with a relative age advantage. The present study addresses an important issue concerning the role of physical precocity in the talent identification and selection process in highly competitive sports like ice hockey.

THE EMOTIONAL ASPECTS OF COACHING CHILDREN IN TENNIS

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Introduction

The coach-athlete relationship plays a significant role in the player’s development at the early stages of practice (Côtè et al, 1995) but few researches investigated the emotional aspects involved in this relationship at a very young age. The psychodynamic approach introduces the concept of transference to explain that an athlete may direct affection, feelings to a coach (Strean & Strean, 1998), thus transferring experiences lived with significant others (parents, siblings) from the past.

Methods

14 tennis players were interviewed 3-4 times. All interviews were transcribed verbatim and direct interpretation was used to create case studies. We cannot develop all but we can comment on 3 aspects: the inner drive, narcissistic play and emotional bonds with the coach.

Results - Discussion

The child’s inner drive family often imposed on the player to practice tennis because somebody was already involved in tennis. Tennis becomes a narcissistic transaction between parents and players as winning increases parent’s self-esteem and thus there is an unconscious demand of being loved by parents through their success. This inner drive is important as a child who has not been able to achieve his parent’s expectations will have difficulties to take ownership of his/her professional career. The narcissist practice Enjoyment is a distinctive factor of sport participation (Scanlan et al., 1993). Players demonstrated a need to experience enjoyment in their practice at an early age. There are no thoughts of the future and tennis remains a pleasing activity. Emotional bonds with the coach and parents. There is a difference between conscious and unconscious wishes made towards the coach. If the inner drive is based upon the parent’s wishes, the coach does not play a major role in the emotional affects on the player. But if the parents fails to fill out these emotional aspects, then it is transferred to the coach. Communication is important as children seek out a coach that is able to discuss and listen to their needs.

Conclusion

This research shows that coaching a child is specific regarding the emotional aspects and needs. Playing tennis at an early age is essentially based on pleasure to play and compete and coaches encourage these aspects at early age and not focusing on performance.

References

WHEN BODY TALKS: AN EXPLORATORY CASE STUDY ON PSYCHOSOMATIC ASPECTS OF INJURIES

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Introduction
Injury is a complex phenomenon a lot more than physical. While individual factors such as age, previous injury, body type, fitness level, personality have often been discussed (Andersen & Williams, 1998), there are few in-depth researches on the meaning of injury and psychosomatics aspects that would explain why some athlete get repetitive injuries. The psychodynamic approach considers injury as a symptom, which acts as evidence that unacceptable wishes, thoughts and fantasies will reach consciousness (Freud, 1961). McDougall (1989) presented psychosomatic illness as a deflection in the development, especially in the bodily representation, and a failure of emotional and physical pain to gain mental representation.

Methods
Participant is a 19 years old female tennis player. Four interviews were carried out with a clinical method and were transcribed verbatim.

Data were analysed inductively using direct interpretation to create the case study. Interpretations were discussed with a fellow researcher who acted as a peer reviewer.

Results
Elisa has started tennis at 5 years old and became quickly one the best of her age. She started questioning her interest for tennis at 14 years old. Describing an ambivalent relationship with a mother, she had to face strong parent’s expectations towards tennis. Every time she had to take a decision, she found a way to escape and being injured to express doubt about a tennis career. Then, she became anorexic. It was a way to express to her parent’s that she no longer wanted to be trained and be a tennis player.

Discussion
Injury occurs when the athlete’s failed to find expression in the language, there are directed to bodily action. This can be seen as somatization, which is explained by discharged affects diversified inadequately into somatic channels without any psychic processing. Injury often occurs when an athlete realises that playing sport was to fulfill parental expectations.

Conclusion
Investigating somatic aspects of injury could help to provide insight about the meaning of an injury. There is a need to develop this research further to understand injury and help preventing them by dealing with the unconscious process behind.

References

RECORDING EYE MOVEMENTS DURING FENCING BOUTS: PILOT STUDY ON REFEREES’ BEHAVIOUR

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The aim of this study was to highlight the characteristics of visual exploration strategies in referees during fencing competition, comparing them to fencers and non-experts. In this study both conventional (foil) and non-conventional (épée) weapons were used.

Three groups of subjects were studied. Seven fencing referees (2 females, mean age 31.4, SD=7.9), 7 fencers (5 females, mean age 21.8, SD=1.9) and 7 non-experts (5 females, mean age 23.0, SD=2.5).

Eye-track 6000 instruments at the Applied Science Laboratories (ASL) were used. Participants wore a helmet with a camera and an infra-red apparatus attached and sat on chairs 3 metres from the screen. The apparatus was regulated to record the pupil’s movements in relation to the corneal reflex and videos of foil and épée bouts were projected onto the screen, while participants were requested to register each hit assigning it to one of the fencers, using a remote-control button provided.

We used Gaze-Tracker software for data analysis identifying the specific areas of interest of each video, defining the ‘look zone’ (the rectangular area of variable dimensions that defines the video zone from which the desired information is recorded). The electronic equipment that recorded the hits and the central zone (the space between the fencers including the fencers’ armed limbs) only fixations lasting more than 100 ms were considered.

ANOVA were performed for each condition (‘look zones’ focused on: hit recording equipment, the central zone between the fencers; the remainder of the observed area) while the group (referees, fencers, and non-experts) was employed as independent factor, and the fixation number percentage related to the weapon (foil and épée) as dependent variable. We included age and gender as covariate.

The weapon factor [F(1,18)=9.88, p<0.01] was significant in relation to the fixations recorded by the equipment for the hits. During foil bouts, the equipment was more frequently observed (18.5) than it was during épée bouts (13.2).

Considering the fixations relative to the remainder of the observed area, the weapon factor [F(1,18)=6.20, p<0.05, foil=29.53 épée=37.47] and the interaction group x weapon [F(2,18)=4.17, p<0.05] proved significant. While fencers [foil=29.1; épée=34.9] and non-experts [foil=31.2; épée=29.1] showed a similar fixation percentage irrespective of the weapon observed, the referees [foil=28.3; épée=48.8] showed a significantly greater fixation number outside the central zone area during the observation of épée bouts. This behaviour can be explained by the fact that the épée, being a so-called non-conventional weapon, does not require interpretation in order for a hit to be assigned - the visual strategies referees use are less action focused compared to the ones they use for the foil.

THE DEVELOPMENT OF A QUESTIONNAIRE SPECIFICALLY FOR EXERCISE INTERVENTIONS

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Purpose of the Research
Qualitative data has been used to develop an initial pool of questions for an exercise referral specific test questionnaire. It is intended that a series of reliability and validation procedures will give rise to an instrument suitable for use by exercise and health professionals working within exercise referral.

Participants
23 participants (F=15, M=8) attended the initial pilot and four subsequent focus groups between the ages of 33 and 78 (M = 60, SD = 10). Health difficulties for which participants were referred were typical of exercise referral populations.

Procedure
Focus group data was transcribed verbatim and the interview scripts were coded with QSR NVIVO software. The value of enhancing data auditing and transparency of analysis via the use of QSR NVIVO has been recognised (Bringer, Johnston, & Brackenridge, 2004, 2006).

Instrument Analysis (Phase Two)
Necessary amendments will be made to the instrument. This process will continue until revisions are no longer necessary.

Instrument Pre-Testing (Phase One)
Item-analytic methods of test construction will be used to reduce the number of test items that will be included in the final measure. Internal consistency of items (item-total correlations, inter-item correlations, and Cronbach’s Alpha), and test-retest reliability of items and item groups (kappa values, intraclass correlation coefficients, and mean difference in scores), will be examined.

Results
The qualitative data has given rise to nine common themes that are subject to consensus validation. An initial pool of items will be tested. The questionnaire will be subject to Phase one (cognitive pre-testing) of validation procedures and Phase two (instrument analysis) will follow.

Conclusions
The availability of a validated evaluation tool for use by exercise professionals will provide an important opportunity to assess the wider outcomes of exercise referral, and in particular beyond those that fall within physiological parameters, thus enabling a greater understanding of the contribution of exercise interventions to holistic health improvement.

References

KNEE INJURIES IN FORMER FEMALE HANDBALL PLAYERS
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Introduction.
The knee joint is an anatomic region with a high injury incidence in handball players (1). The female handball players have a higher risk for knee injuries than males (2). Previous knee joint injury has been pointed out like risk factor for developing knee osteoarthritis (OA) (3). The most typical OA symptoms are pain and stiffness leading to a decline in physical function (4). This retrospective study analysed sports injuries during practice and competition, namely, type of injury, injury severity, mechanism of injury and treatment after surgery in former female handball players, who had suffered knee injury for at least 4 years. Relation between injury severity and handball exposure with pain, joint stiffness and physical function was also investigated.

Methods.
The sample was composed by 27 former handball players that played in the highest handball Portuguese league. Data was obtained by using two types of questionnaires. The first was designed especially for this study and the second was Western Ontario and McMaster Universities Osteoarthritis (WOMAC®). Injury definition used was adapted from Baltzer et al. (5). Chi-Square test and Spearman’s correlation coefficient were used to assess statistical significance level, p<0,05.

Results.
Handball players had mean age of 38.7 years (24-48 yrs.), mean weight of 64.6 kg (53-85 kg), mean height of 1.67 m (1.52-1.80 m) and mean body mass index 23.1 kg/m2 (19.03-28.4 kg/m2) and played during an average of 15.7 years (4-25 yrs.). The former players suffered a total of 45 knee injuries; six were classified as minor, nineteen has severe and twenty has catastrophic injury. The most common injury situation was competition and the offensive phase (48.9% and 84.4% respectively), and most typical game situation at the point of injury was side-cutting maneuver (28.9%). Surgical treatment of knee injuries was predominant (64.4%) to the conservative one. Association between the severity of knee injury pain (r=0.310), joint stiffness (r=0.083), physical funcion (r=0.176) and Womac index (r=0.174) were not found, neither between handball exposure and pain (r=-0.205), joint stiffness (r=-0.020), physical function (r=-0.103) and Womac index (r=-0.100).

Conclusion.
Although this study is limited by the low number of former injured players, and the lack of a control group the results are nevertheless similar to aetiology studies with knee injured handball players. Besides clinical criteria for knee OA radiological criteria should be considered as well as better understanding the influence previous injury for developing knee OA.

References.
STRENGTH AND BALANCE CHANGES IN FEMALE SOCCER PLAYER MEASURES BETWEEN PRE AND OFF-SEASON

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Physical changes that occur to athletes in balance and strength following completion of a sport season are of interest to sports medicine clinicians. Purpose: The purpose of this study was to determine if there were any differences in strength and balance measures in female National Collegiate Athletic Association (NCAA) soccer athletes following a season of play. We hypothesize that a significant loss of strength and balance will occur following a season of play. Methods: Participants consisted of eighteen female (19.67 ± 8.85 yrs, 63.97 ± 8.24 kg). 1.69 ± 0.04 m) NCAA soccer players that attended both pre- and off-season assessment sessions. Static balance was assessed using a modified Balance Error Scoring System (BESS) consisting of one trial for each of the 4 stances (double leg, single [R/L], tandem) using two surfaces (firm and foam). BESS error scores were recorded and total error score for 8 conditions was used for analysis. Dynamic balance was assessed using the Star Excursion Balance Test (SEBT) in three directions anterior (ANT), posterior medial (PM), and posterior lateral (PL). All subjects performed 3 trials of each SEBT assessment measure. Average of 3 reach distances were normalized to percent leg length (reach distance/leg length *100) to determine SEBT scores used for analysis. Strength measures consisted of a 5 second maximal effort with a 10 second rest period between trials. Movements assessed were hip abduction (AB), hip adduction (AD), hip internal rotation (IR), hip external rotation (ER), hip flexion (HF), hip extension (HE), knee extension (KE), and knee flexion (KF) using a portable fixed dynamometer (Evaluator, BTE, Hanover, MD). Strength measures were normalized to percent bodyweight [(F[N]/BW[N]) * 100]. A 10% coefficient of variance (CV) was set to ensure a consistent effort by subjects across each trial. Paired samples t-tests (p<0.05) were performed on all variables pre vs. off measurement scores. Results: There was a significant reduction in [177] 7.25, p< 0.01] between pre (29.89 ± 4.88) vs. off (17 83 ± 4.80) season BESS scores and all SEBT reach directions, ANF [177]= 4.32, p<0.01], pre (69.48 ± 5.30) vs. off (78.97 ± 5.77), PM, PM [17]= 8.41, p= 0.00], pret (105.40 ± 5.39) vs. off (122.59 ± 7.23) and PL, PL [17]= 7.64, p<0.01], pre (98.01 ± 6.54) vs. off (115.52 ± 8.64). There were no significant differences found between any of the eight strength dependent variables (hip AB, AD, IR, ER, HF, HE, KE, and KE, p<0.05). Conclusions: The results of this study indicate that there was an improvement in both static and dynamic balance measures between pre-season and off-season assessments in female collegiate soccer athletes as measured by the BESS and SEBT. There were no changes in lower extremity strength measures. Future studies are necessary to evaluate balance and strength across different time frames (e.g. mid-season and immediate post-season).

INTEGRATED COMPRESSION ZONE SOCK THERAPY IN PATIENTS WITH NON-INSERTIONAL ACHILLES TENDINOPATHY - RESULTS OF A FOUR WEEKS PILOT STUDY

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BACKGROUND: In patients with chronic Achilles tendinopathy (AT) pain is usually the limiting factor for returning to sports. High resolution color Doppler ultrasound shows intratendinous edema and hyperemia in the painful area. Treatment of the condition is difficult and a multi orientated approach is often necessary. Eccentric rehabilitation and therapies aiming of reducing the edema and hyperemia has demonstrated good results on pain relief (Alfredson 1998, Ohberg L 2004, Boesen 2007). Hypothesis: It was hypothesized that increased peri tendinous pressure around the Achilles tendon induced by a specially designed integrated compression zone sock (Csock®) in patients with chronic tendinopathy could reduced symptoms and reduce hyperemia.

METHODS: Color Doppler ultrasound was performed on 11 patients (nine men, two women, mean age 37 years) with painful chronic mid-portion Achilles tendinosis. The mean length of problems was 17 month (range 1 to 48 month). The mean weight and height were 85.5 kg (range 71 to 108 kg) and 180 cm. (range 164 to 193 cm), respectively. Five of the patients were professional athletes (three soccer players and two long distance runners). All patients were given a Csock® and ask to wear it all time during the day for a period of at least 3 weeks. Pain was measured on a visual analog scale (VAS-score) before and after the period.

RESULTS: All patients had grey scale changes (thickening and irregular fiber structure) and intratendinous Doppler activity (vascularisation) in the mid-tendon area before treatment. The patients used the sock for a mean of 4.3 weeks (range X to X). All patients were satisfied with the sock and had no discomfort using it. There was a significant reduction in pain during activity, from a mean VAS of 33.8 (SD ± 19.6) at baseline to 20.4 (SD ± 19.6) at follow up (P =0.04). One patient had no effect on pain in the 4 weeks period but found it comfortable and wore it through out the study. In all patients, vascularisation and grey scale findings were unchanged at 4 weeks follow up, with no significant change in semi quantitative or quantitative color scoring.

CONCLUSIONS: Use of a specially designed compression zone sock (Csock) reduces pain in patients with chronic Achilles tendinopathy determined by VAS. Thus use of local compression (Csock) during normal daily activities seems to be an effective supplement in the treatment for painful chronic mid-Achilles tendinopathy. No effect on the intratendinous Doppler activity or grey scale changes could be detected, suggesting that the effect is independent of structural changes in the tendon. Localization of hyperemia appears to be the key to the pathology and the target for the compression treatment. Csock is an excellent supplement in combination of multiorientated treatment in chronic Achilles tendinopathy.

SERUM CARTILAGE OLIGOMERIC MATRIX PROTEIN (COMP) AND INFLAMMATORY RESPONSE DURING AND AFTER A MARATHON RACE

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Background
Numerous studies have been reported that long distance running is associated with muscle fiber damage but, little information is available on exercise-mediated prolonged impact-stress on cartilage integrity. Marathon running is increasingly popular with the general population but as an exercise imposes high levels of stress on the musculo-skeletal system, causing numerous cellular changes. These include deterioration in the structure and function of muscle, in particular sarcomeric Z-disc stripuation, as well as damage to cartilage and liver. Whilst the effects on muscle have been extensively investigated, little or no information is currently available on the effects of exercise-mediated prolonged impact-stress on cartilage integrity.
Purpose
This study was performed to evaluate the biochemical responses related to muscle and cartilage damage during and after a marathon race. We considered that damage to both muscle and cartilage would be related to the distance of the race.

Methods
Blood samples were obtained before, midway (i.e., after 10, 20, 30 km) and at the end of a 42.195 km race, as well as after 1 h recovery and on every day following the marathon race until the 7th day. However, the full compliment of twelve blood samples was obtained from only 7 subjects due to the difficulties of contacting subjects during the post-race period. Mean body weight and height were 70 kg (64-84) and 170 cm (164-175) and all subjects had been training for more than 2 years (2.4-7.0). The mean running-time of the runners was 4:02 (ranging from 3:10-4:55).

Plasma CPK and hs-CRP activities were measured as markers of muscle damage. The serum level of cartilage oligomeric matrix protein (COMP) was measured as a marker of joint metabolism and/or damage.

Results
The COMP concentration was increased 30-35% by the end of 10K running, but showed no further change in this by end of the race or after 1h recovery. The COMP concentration had declined back to the pre-race level within 24h. At the end of 10K running serum CPK was increased significantly 120% in subjects running at 70-80% of VO2 max, and 400% in those running at 80-90% of VO2 max. Plasma CPK activity had returned to pre-race levels after 4 to 5 days of recovery. No alteration occurred in hs-CRP throughout the race but this markedly increased during the first day of recovery. Hs-CRP returned to the pre-race level after 5 days of rest.

Discussion and Conclusion
The present study demonstrated that marathon running has a major impact on muscle and cartilage structures. Despite this the COMP concentration had fallen to the pre-race level within 24h of recovery (and CPK within 4 to 5 days).

INCIDENCE OF INJURIES IN LADIES GAEIC FOOTBALL OVER TWO COMPETITIVE SEASONS

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The Ladies Gaelic Football Association was founded in 1974 and since then has progressed to being one of the fastest growing female sports in Europe with approximately 1,000 clubs registered in Ireland alone. The high participation rates and the competitive nature of Ladies Gaelic Football results in numerous competitive injuries in similarity with other female field-based sports. The present observational study assessed the incidence of injuries in amateur Ladies Gaelic Football over 2 competitive seasons.

The data presented relates to all injuries reported and processed in the injury scheme for players, mentors and referees. All reported injuries were collated and categorised according to age: Adult or Juvenile (under 18) and site of injury.

In 2007, in total 837 injuries were reported: comprising of 544 adult (A) and 303 juvenile (J), this equated to an increase of 31 injuries (1%) compared to the previous season. The frequency of injuries at the different sites was unaffected by age. The greatest number of injuries occurred at the leg (207; 138A, 69J), knee (194; 134A, 70J), ankle (113; 72A, 41J), hand (97; 58A, 39J) and back (85; 53A, 30J). As a percentage of the total number of injuries reported these sites represent 25, 23, 14, 11 and 10%, respectively. Hamstring injuries represent 43% of the total number of leg injuries reported while injuries to the finger account for 47% of all hand injuries. In relation to the costs associated with the treatment of these injuries, hospital treatment was highest followed by physiotherapy and doctors expenses. In total, 21 Cruciate ligament injuries were reported in 2007 (11% of total knee injuries), however this equated to 36% of the cost associated with knee injuries in the same year. In total 286,000 (A) and 98,000 (J) was reimbursed to players to cover treatment of injuries sustained during Ladies Gaelic Football activities. Incidence of injuries is highly correlated with regional areas with the greatest playing population. In comparison with 2006 the total number of registered players has increased by approximately 5-10,000, however, the incidence of injuries has not changed significantly (Chi squared test, P>0.05) across the two playing seasons despite increased participation.

In conclusion the incidence of injuries sustained in Ladies Gaelic Football across two playing seasons are representative of those expected for a highly competitive field-based sport. However the increase in the number of players from one season to the next is not reflected in the number of injuries reported.

This study was funded by the Ladies Gaelic Football Association, Ireland.

THE EFFECT OF HONEY DRINK WITH ROSE WATER FLAVOURS AND GLUCOSE DRINK AND DURING ENDURANCE CYCLING ON PERFORMANCE, RPE, HR AND BLOOD (GLU), (INS), (COR) OF TRAINED YOUNG MEN

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Purpose: Determine the effect honey and Glucose drinks ingestion before and during endurance cycling on performance, rate of perceived exertion (RPE), heart rate, Glucose (Glu), insulin (Ins), Cortisol (Cort).

Methods: 16 trained men (Age 23 ± 2, weight 68 ± 3) 3 phase per week every 48h, cycling 50km. At first phase 13 ml/kg drink with %10 honey a %3 rose water, 40c was given to athletes. was given to subjects during 120 min, 100 min, 80 min before race and other half of total drink was given during 20 min, 40 min and 60 min after start of race. Honey composition %35 glucose, %38 fructose, %3%15 water, %8g wax) was determined in laboratory. In second phase %10 glucose drink was given, at third phase, placebo drink that was sweet but has not any energy been given. Blood glucose 2h before race measured that was normal 60 ±1 mmol/dL. 5h before drinking any drinks a standard meal %55 CHO, %20 Pro, % 25 fats and 80 Kcal/kg was given to subjects. During race temperature was 25-27oc, humidity %50, and % 52. Total time average speed, heart rate was taking with polar watch. A questionnaire was given about metabolic, gastro intestinal and heart disease and use drugs.

Result: Was shown that in honey drink. Group glucose was higher and performance (total time, average speed, RPE, HR) was significantly better than glucose drink group and water group insulin was higher in Glucose drink group.

Conclusion: Honey drink has fructose and lower glycaemic index and desirable taste for Iranian athletes and cause lower insulin and high blood glucose during exercise. These can preserve liver and muscle glycogen and delay fatigue and improve performance.
THE EFFECT OF A DEEP WATER RUNNING TRAINING AND APPLE VINEGAR INGESTION ON SOME BLOOD COAGULATION FACTORS, BLOOD PRESSURE AND HR AMONG 58-68 YEARS OLD MEN

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Increasing blood homocysteine and coagulation speed increasing lead to arteries blockages and heart stroke in old men. Positive effects of exercise and apple vinegar on prevention of arteries blockages and decrease blood pressure is reported but effects of these factors altogether are unknown.

Purpose: To determined the effect of a deep water running training and apple vinegar ingestion on some blood coagulation factors, Blood pressure and HR among 58 + 68 years old men.

Methods: 24 men age = 63 ± 4y ± SD, weight = 10 ± 4kg body fat, %30 ± 5.5 with out acute heart and cardiovascular or gastro-intestinal problem, no smoking and no use alcoholic dink and any drugs randomly divided to low experimental and control groups. 16 week, 3 sessions per week and 1h per session water running training was done %45 to %55 from max heart rat. Apple Vinegar (5 ml/kg). Bw was ingested every day. Before and 24h after last session homocysteine, RBC, Hb, Hct, Fibrinogen, Plt, PT, PTT, BP and HR was measured.

Results: Was shown that after 16 week in experimental group fibrinogen, homocysteine, Hp, HR was significantly decreased but PT, PTT, was significantly increased and other factors have no significant change. (Table 1)

Table 1. Comparison between mean values of experimental and control groups before and after 16 week training and apple vinegar was ingested every day. Before and 24h after last session homocysteine, RBC, Hb, Hct, Fibrinogen, Plt, PT, PTT, BP and HR was measured.

Conclusion: Deep water training and apple vinegar ingestion can reduce homocysteine and decrease blood coagulation speed. These may be prevent arteries blockages and improve BP and cardiovascular system function in old men.

DIFFERENTIAL ADAPTATION OF MOLECULAR SIGNALING IN MITOCHONDRIAL BIOGENESIS UNDER EXTENSIVE ENDURANCE TRAINING WORKLOAD

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Exercise-induced adaptation of mitochondrial density depends on various molecular signaling pathways, which are singularly well described. A multifactorial investigation in a practical training regimen, however, is rarely seen. Therefore, we investigated parameters involved in skeletal muscle mitochondrial adaptation in two extensive cycling training groups with a constant but different workload determined as higher and lower percentual usage of VO2max. Before and at the end as well as after 9 days during the training, VO2max was determined and a muscle biopsy was taken (M. vastus lateralis). Mitochondrial adaptation was determined by immunohistochemical measurement of the protein expression of NRF-1, PGC-1alpha and superoxide dismutase 2 (SOD). Functional mitochondrial adaptation was determined by measuring cytochrome C oxidase (COX)-activity. VO2max increased over the time period slightly but not significantly in the high intensity group but not in the low intensity group. There could be seen a significant relationship between SOD2 and PGC-1alpha. NRF-1 expression did not change significant during the training intervention in both groups. Skeletal mitochondrial COX activity increased in all participants however at different time points during the training intervention.

Conclusions: This study provides evidence for a differential molecular mitochondrial adaptation towards training stimuli which also is dependent on the respective individual. Moreover it was suspected that altered adaptational sensitivity might occur over the time course. An alteration of VO2max seems not to be a representative marker of mitochondrial adaptations in skeletal muscle. To date, defined adaptations as result of practical training approaches are difficult to forecast. However, further gathering of relevant data might contribute in creating future, highly effective training stimuli in clinical and sports applications.

COMBINING TWO HYALURONIC ACIDS IN OSTEOARTHRITIS OF THE KNEE. A RANDOMIZED, DOUBLE-BLIND, PLACEBO CONTROLLED TRIAL

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Background: Synovial fluid in patients may differ in molecular weight depending on the presence and degree of osteoarthritis. Treatment is not directed at this relationship.

Participants: Patients with osteoarthritis of the knee with resting visual analogue scale (VAS) pain of >45 mm.

Design: Randomized, prospective, double blind cohort followed for 16 weeks.

Intervention: Patients were randomised at baseline to receive a three intra-articular injection series with one of: DMW (Dual molecular weight 580-780kDa + 1.2 to 2.0 million); LMW (Low molecular weight) (500-730kDa); HMW (High molecular weight) (6 million); or saline placebo over 3 weeks.

Methods: Patients completed baseline assessment of rest and walking VAS pain (primary efficacy variable), collection of a 5-point categorical global satisfaction score and record of adverse events.

Results: Two-hundred and twenty-five patients (age 68±8y) were screened and two hundred were randomized to one of the four groups. There were no differences at baseline between groups. At 4, 12 and 16 weeks respectively, walking VAS pain was significantly improved in all treatment groups vs Placebo. DMW (79.6%, p<0.001; 85.6, p<0.001; 89.3%, p<0.001), LMW (73.6%, p<0.001; 76.4, p<0.001; 81.3%, p<0.001) and HMW (69.1%, p<0.001, 81.0, p<0.001; 79.1%, p<0.001). Patients in the DMW group had significantly greater improvement.
ankles (2) and feet (4). Ground reaction forces (GRFs) were recorded by means of two Kistler® force platforms working at 960Hz. Each test session consisted in 3 different tests: a static test (to measure the GRFs distribution between the two legs), a gait test (to study kinematics and kinetics of the stride cycle during the rehabilitation steps) and squat tests with/without overload (to quantify differences between athletic groups). Kinetics data allowed to quantitatively describe GRFs with specific attention to vertical force. In this way it was possible to control the player’s condition during the rehabilitation program in order to refine the rehabilitation activities and to reduce the time of recovery. Results showed an increase of the injured leg ankle vertical excursion of 30% after 3 weeks and a progressive recovery of symmetry between the two legs in squat exercise.

Results: About 30% of the ankle sprains were first events and no differences in clinical assessments with those presenting but not volunteering for the study (N=341) was observed. Time to intervention was 39 ± 4 hours with no difference between groups. A significant reduction in VAS pain on both weight bearing and walking was observed at Day 8 for HA compared to PL (p<0.05). There was a significant difference in VAS pain on weight bearing at 18 months favoring the HA group (p<0.05). No serious adverse events were recorded during the 8-day treatment period to 90 days followup. At 18 months, in the PL versus HA group, there were 2 versus 0 lower limb fractures, 16 versus 8 second ankle sprains (p<0.05), 3 versus 1 third ankle sprains, and a significantly greater number of days missing primary sport activity. Differences between groups were determined using an intent-to-treat ANOVA.

Conclusions: Greater improvement in patients who received the DMW product was achieved by the second injection persistent at 16 weeks.

Key words: Hyaluronic acid, knee osteoarthritis, molecular weight composition, activity concentrations

Registered Clinical trial number: ISRCTN98630331

PERI-ARTICULAR HYALURONIC ACID IN ACUTE ANKLE SPRAIN: 18 MONTHS FOLLOWUP

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Objectives: To determine the long-term efficacy and safety of peri-articular hyaluronic acid injections in acute lateral ankle sprain.

Design: Randomized controlled prospective trial.

Setting: Primary sport medicine and emergency practice.

Patients: One hundred and fifty-eight consecutive competitive athletes who suffered an acute Grade 1 or 2 lateral ankle sprain were randomized within 48 hours of injury.

Interventions: Patients were randomized at baseline to peri-articular injection with hyaluronic acid (HA) + standard of care (RICE) or placebo injection (PL) + standard of care (RICE) treatment at baseline assessment and Day 4 post injury. This report describes the 18 month followup results of this cohort.

Outcomes measures: Assessments at baseline and Days 4, 8, 30, 90 and 18 months included VAS (0-10 cm) pain on weight bearing and walking 20 m, patient global assessment of ankle injury (5-point categorical scale), patient satisfaction with treatment (5-point categorical scale), time to return to pain-free and disability-free sport, adverse events; recurrent ankle sprain and total number of days missing primary sport activity. Differences between groups were determined using an intent-to-treat ANOVA.

Results: About 30% of the ankle sprains were first events and no differences in clinical assessments with those presenting but not volunteering for the study (N=341) was observed. Time to intervention was 39 ± 4 hours with no difference between groups. A significant reduction in VAS pain on both weight bearing and walking was observed at Day 8 for HA compared to PL (p<0.05). There was a significant difference in VAS pain on weight bearing at 18 months favoring the HA group (p<0.05). No serious adverse events were recorded during the 8-day treatment period to 90 days followup. At 18 months, in the PL versus HA group, there were 2 versus 0 lower limb fractures, 16 versus 8 second ankle sprains (p<0.05), 3 versus 1 third ankle sprains, and a significantly greater number of days missing primary sport activity (43 versus 21, p<0.002). An increased number of concomitant treatment was observed in the PL vs the HA group at 18 months. This included greater external ankle bracing (61 versus 28, p<0.02) and orthotics (21 versus 11, p<0.05). Significantly greater patient satisfaction was observed for HA vs PL at Days 4 (p<0.05), 8 (<0.001), 30 (<0.001), 90 (p<0.05) and 18 months (p<0.05). Time to pain-free and disability-free return to sport was 11 ±8 vs 17 ±8 days for HA and PL respectively (p<0.05).

Conclusion: Peri-articular HA treatment for acute ankle sprain was highly satisfactory in the short and long term versus PL. This was associated with reduced pain, more rapid return to sport, fewer recurrent ankle sprains, fewer missed days from sport with fewer associated adverse events.

EVALUATION OF A REHABILITATION PROTOCOL BY REPEATED MOTION CAPTURE ANALYSIS AFTER ACL RECONSTRUCTION: A SINGLE SUBJECT STUDY IN RUGBY

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Rugby players are often prone to several types of injuries occurring at different body locations, in particular at head, neck, knee and ankle [1-2]. ACL injury is very common and usually leads to a reconstruction surgery; a quick rehabilitation program is crucial for the full recovery of elite players as they are fundamental to their teams. So it is very important to define an individual rehabilitative program and to monitor periodically its effects in order to apply possible adjustments during its development and to speed up the full recovery process. Moreover, individualized protocols allow to maintain and often increase the strength of the injured body segments. Aim of the present work was to evaluate how repeated motion capture analysis applied to a combination of gait tests (kinematics and kinetics) and specific training exercises could objectively identify and quantify the recovery progresses of an elite rugby player after ACL reconstruction.

A professional rugby player volunteered for 5 test sessions: the first was with the left knee injured, the following 4 sessions started 4 weeks after the surgery with intervals of 1 week. A motion capture system (BTS®-Italy) with six infrared cameras was employed to record kinematics data at 60Hz on each session. Reflective markers were placed on trunk (4), arms (4), hands (2), pelvis (2 at PSIS), great trochanters (2), knees (4), ankles (2) and feet (4). Ground reaction forces (GRFs) were recorded by means of two Kistler® force platforms working at 960Hz. Each test session consisted in 3 different tests: a static test (to measure the GRFs distribution between the two legs), a gait test (to study kinematics and kinetics of the stride cycle during the rehabilitation steps) and squat tests with/without overload (to quantify differences between eccentric and concentric phase). Kinematics data allowed to objectively quantify parameters such as vertical excursion of great trochanters and ankles during gait and squat. Kinetics data allowed to quantitatively describe GRFs with specific attention to vertical force. In this way it was possible to control the player’s condition during the rehabilitation program in order to refine the rehabilitation activities and to reduce the time of recovery. Results showed an increase of the injured leg ankle vertical excursion of 30% after 3 weeks and a progressive recovery of symmetry between the two legs in squat exercise.

References.
EFFECT OF INTERMITTENT SPRINT CYCLE EXERCISE ON OXIDATIVE DNA DAMAGE AND SERUM ANTIOXIDANT CAPACITY

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Purpose: It is reported that aerobic energy supply plays an important role in exerting higher power output during intermittent sprint cycle exercise (4). Little has been known about biomarkers of oxidative stress and antioxidant status following intermittent sprint cycle exercise although such type of exercise induces significant elevation of antioxidant enzyme activities (3). The purpose of this study was to examine effect of high-intensity intermittent sprint cycle exercise on oxidative DNA damage and serum antioxidant capacity. Methods: Prior to participation in this study, all subjects provided both verbal and written consent. Twenty-four male students belonging to the physical education course in the University (age 20.1±0.4 yr, height 173.4±1.0 cm, weight 65.8±2.1 kg) performed intermittent sprint cycle exercise for 20 sets. Each set consisted of 7-second maximal pedaling resistance was set at 8% of body weight and 53-second recovery (unloaded pedaling by 60 rpm) (4). The decline rate of power output as the following equation, [P(1-3)-P(17-19)]/P(1-3)*100, where P(1-3) and P(17-19) were averaged power output from 1st to 3rd and from 17th to 19th, was used as performance index in each subject. Urine samples were collected at Pre (Pre) and after 1 hour exercise (Post-1h) for the detection of 8-hydroxydeoxyguanosine (8-OHdG) in urine. Enzyme-linked Immunosorbent Assay (ELISA) was used for analyzing urinary 8-OHdG concentration (1). Blood samples were also collected at Pre, immediately after exercise (Post) and Post-1h for serum antioxidant capacity. Serum antioxidant capacity was measured by ESR spin-trapping method. Superoxide radical (O2-) was produced by in hypoxanthine/xanthine oxidase system, and its scavenging activity by the serum was measured by ESR spin-trapping method with 5,5-dimethyl-1,3-propanediyl-5-methyl-1-pyrroline N-oxide (CYP-MPO) as spin-trapping reagents (2). Results: Mean heart rate during exercise (20-min) was 160±4.2 bpm. Urinary 8-OHdG content significantly increased after exercise (6.62±1.16 ng/kg/h Pre vs. 27.92±2.40 ng/kg/h Post-1h). O2- scavenging activity significantly decreased at Post (61.3±0.9%) compared to Pre (71.0±1.1%) and Post-1h (71.9±0.8%). Performance index was significantly related to urinary 8-OHdG content at Post-1h (r=0.707, p<0.001) and O2- scavenging activity at Post (r=0.540, p=0.031), respectively. Conclusion: It is clear that high-intensity intermittent sprint cycle exercise induces oxidative DNA damage and transient change of serum antioxidant capacity. Results also suggest that urinary 8-OHdG content may be useful for fatigue indices after high-intensity exercise. References.

RISK FOR THE FEMALE ATHLETE TRIAD IN ADOLESCENT SYNCHRONIZED SWIMMERS

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Objectives: The aim of the study was to examine adolescent synchronized swimmers for risk factors of the Female Athlete Triad and to investigate correlations between menstrual disorders (MD) and energy balance (EB) on the one hand, and anthropometric parameters on the other hand.

Relevance: Until now only two surveys in connection with the risk for the Female Athlete Triad in synchronized swimmers have been carried out, although prevalence has increased in aesthetic sports (1, 2, 3). Early recognition is of high importance.

Methods: 20 juniors of the Swiss Synchronized Swimming National Team (SY) (Mean age±SD = 16.4±1.2 years) were tested. Examination included anamnesis of menstrual cycles by questionnaires, determination of EB during a practice camp, measurements of 8 skin folds (SKF) and calculations of body fat percentage (%BF) and somatotype (S). MD were defined as polyMenorrhea (cycle length ≤15 days), oligomenorrhea (CL >35 <90 days) and amenorrhea (no menstruation >3-6 months). Subjects were divided into athletes with eumenorrhea (ATHLEu; n=9) and athletes with MD (ATHLMD; n=11). For statistics p<0.05 was fixed.

Results. Athletes were 164.3±5.3 (M±SD) cm tall, weighed 51.8±6.3 (M±SD) kg and had 22.1±3.7 (M±SD) % body fat. Altogether 55% of SY showed MD, distribution of 10% polyMenorrhea, 30% oligomenorrhea and 15% amenorrhea. Mean EB was -1132±607.9 (M±SD) kcal/day, mean EB of ATHLMD -1259.5±663.5 (M±SD) kcal/day was lower than mean EB of ATHLEU -976.1±527 (M±SD) kcal/day. There was no correlation between MD and EB (rPbis=0.230). Significant correlations were found between MD and SKF(biceps rPbis=0.524, MD and SKFpectoral (rPbis=0.452), and MD and S (rPbis=0.454), but not between MD and %BF (rPbis=0.415). Conclusion: The prevalence of MD found in SY is higher than that found in the literature (3). The conclusion may be drawn that adolescent synchronized swimmers show an elevated risk for MD and the Female Athlete Triad.

Keywords: synchronized swimming, Female Athlete Triad, energy balance, menstrual disorders, amenorrhea

References.

PHYSICAL ACTIVITY PRESCRIPTION IN THE COMMUNITY; CORONARY RISK ESTIMATION IN SPAIN USING A CALIBRATED FRAMINGHAM FUNCTION

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Introduction: Physical activity has a role in disease prevention and is recommended to achieve good health. Coordination between family physicians, sports physicians, physical educators is also essential to promote physical activity in the population. Objective: We start a physical activity program in a family physician department in Terrassa (Barcelona) 6 years ago. We studied a sedentary group middle aged with chronic pathologies (coronary heart disease (CHD) risk factors, musculoskeletal and neuromuscular disorders. In this study we compare physical parameters and health autoperception in the CHD risk factors group, after the practise of supervised exercise during one year. Methods: We studied a group 45-65 years old with medical history in the familiar health department with CHD risk factors of hypertension, dyslipidaemia, obesity, diabetes. Calibrated Framingham function charts of CHD risk for the spanish population
are used. We did a medical evaluation before participation and after the completion of the exercise program, that includes a blood profile (blood glucose, total cholesterol, HDL-c, LDL-c, triglycerides), rest electrocardiogram, monitored quantized exercise test, kineanthropometry, and Nottingham test. For ethical and legal reasons, all programs required an informed consent. This group practise supervised physical exercise twice per week, 1h/session. They play a weight training circuit, moderate intensity aerobic activity, muscle strengthening activity and balance exercises as recommended by the ACSM and the AHA (2007). Results: The group was composed by 109 patients, BMI>30, that represents a moderate risk of morbidity. Only 70 patients finished the study (adherence to the protocol was 64%). The probability of CHD in 10 years before the program was 8.9% (the drop out group probability was 5.1%). After finishing the program the probability was 7.4%. Significant reductions in 10 years risk of CHD were observed (a=0.005). None of the subjects changed his/their habitual habits, so that the probability change was because of the effect of the controlled variables (total cholesterol, HDL-c, diabetes, repos systolic and diastolic blood pressure). Nottingham test increased significantly in emotional reactions. Conclusions: The study provides evidence for the benefit to CHD risk factors and mental health after one year of supervised physical exercise, in a sedentary group middle-aged.

References:

THE EFFECT OF ENDURANCE TRAINING PROGRAM AND L-ARGININE SUPPLEMENTATION ON PLASMA NITRIC OXIDE CONTENT IN RATS

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Abstract

The purpose of this study was to investigate the effect of endurance training program and L-Arginine supplementation on plasma Nitric Oxide content in rats.

Method: Eight-week-old male wistar rats (n=40) were divided into four groups. 1) The Exercise group, 2) The Exercise + the L-arginine group, 3) The L-arginine intake group, which was given L-Arginine supplementation (5g/kg body weight per day, in drinking water); 4) The control, sedentary group. The train groups (1,2) exercised for 9 week 5 day/week on a treadmill. The running time and speed of the treadmill were increased gradually. The mean of endurance training program was (50 min, 30 min, 0% grade). After the animals were anesthetized with Diethyl ether, blood samples for analysis of NO metabolites and Arginase enzyme and Total CK were collected after 24 hours from exercise and for NO metabolites after a recovery period of 48 hours and 72 hours. Results: Plasma NO level was higher in the trained rats than in the exercise + L-arginine and control groups (1.59 μmol/L vs 1.46 μmol/L and 0.39 μmol/L, p<0.05) and there was a significant decrease in plasma NO after exercise and after a recovery period of 48 hours and 72 hours (1.59 μmol/L, 1.08 μmol/L, 0.54 μmol/L vs 0.39 μmol/L). Plasma Arginase enzyme was higher in the L-arginine supplementation group than in three groups. Conclusion: The results indicated that oral supplementation of L-arginine, the precursor of NO, during an endurance training (9week, 5 day/week) caused an increase plasma NO concentration, but this increase is less than exercise alone. NO is an important mediator of homeostatic processes and changes in its generation contribute to pathologic states, some of which have been described in this research. Thus this study proposes a role for L-arginine as a dietary supplementation for endurance athlete.

Key Words: Endurance Training, Nitric Oxide, L-arginine, Sedentary, Exercise, Intervention.

TRAINING TIME AND ADAPTATION TO LACK OF DAY LIGHT - A PILOT STUDY

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It is found that training done at different times synchronizes the HR circadian rhythm (1). Athletes in Northern Norway claim it is hard to achieve an optimal training effect during the darkness period. Knowledge about the effect of light conditions upon training response seems to be missing. As a start we did a pilot study to describe the reaction to lack of daylight and different training-time on circadian rhythms and nocturnal sleep in a 26 year old healthy, trained female arriving Northern Norway from Italy in the darkness period.

Monitoring Sessions (MS) were carried out in four experimental conditions: MS1 - no training in light-darkness periodicity (Italy), MS2 - no training in lack of daylight (Norway), MS3 - evening training (18.00-19.30) in daylight-dark, MS4 - morning training (9.00-10.30) in daylight-lack. Each monitoring session (that started in the last training-day) was composed by: questionnaire (analogue scale) to fill in every morning during the sessions, three-days continuous monitoring by heart rate (HR) monitor (IS810, Polar) and actigraph (Actiwatch, Cambridge Neurotechnology). Each training period was four consecutive sessions of outdoor fast-walking (63%HRmax, 43%VO2max) with backpacking during the sessions, three-days continuous monitoring by heart rate (HR) monitor (S810, Polar) and actigraph (Actiwatch, Cambridge Neurotechnology). Each training period was four consecutive sessions of outdoor fast-walking (63%HRmax, 43%VO2max) with backpacking during the sessions. The Circadian Rhythms (Single Cosinor Method) of HR and Rest Activity (RA) were compared with sleep analysis results and subjective perception expressed in the questionnaire. The HR and RA circadian rhythms were statistically significant (p<0.0001). MESOR values were lower in MS2 than in MS1, 3 and 4 for the Activity, while it was progressively lower for the HR. Acrophase was advanced in MS2 and 4 compared to MS1 and 3 for both Activity and HR. Sleep Analyses show higher values of Sleep Efficiency in MS 2, 3 and, especially, 4 than in MS 1, that correspond to low values in Mean Activity Score and Movement and Fragmentation Index. The questionnaires showed that the subjective perception of sleep and concentration ability were pretty close to the normality. It was also observed that the rest-HR decreased through the 3 monitoring weeks, even if the subject was already well trained. It seems as if the light-lack condition induced a bradycardial stimulus in addition to the training. This pilot study suggests that lack of daylight and no training condition induce an activity decrease, advance Acrophase (2,5h for the activity and 3h for HR), and enhance sleep. The training increased the activity MESOR, but influenced the circadian structure in different way according to the time in which it was carried out. The training time influenced the circadian parameters for both HR and RA. The evening session the Acrophase was postponed, whilst it was advanced after the morning session. The sleep quality seems to benefit the best from the morning training.

References:
The purpose of this study is to determine the limits of safe displacement of the tibia in respect to anatomical variations of the insertions of the knee ligaments. 17 individuals underwent MRI scan (knee in full extension) after an acute injury. The mean length and the angles...
Injury Pattern in Portuguese Female Handball Players

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Background: Handball is the sport with more federated females in Portugal. Its injury incidence pattern is, however, poorly characterised. To know the magnitude of the problem and its causes is essential to adopt efforts to reduce the risk of injury.

Objective: To describe the injury profile of Portuguese players of different competitive levels and ages.

Design: Descriptive epidemiologic study performed between 2003 and 2007 using a custom made questionnaire. A sub-sample of players (8%) was also examined by an orthopaedic surgeon for consistency check.

Setting: Four year long retrospective and prospective cohort study.

Participants: 804 subjects, from infants (10-12 years old) to adults, sampled from the major national competitions, regional handball associations and the national and regional selection teams.

Results: In the first two full seasons (2003-04 and 2004-05) we computed an overall incidence of 3.0 injuries per 1000 player-hour of handball practice. From these, almost 72% were acute injuries. A Kruskall-Wallis analysis and corresponding post-hoc analysis revealed that the injury incidence followed exactly the increasing age categories (p<0.1%). Considering all the reported injuries (N=1227), the lower extremity was the most commonly injured body region, with 680 injuries (55.4% of all injuries), followed by the upper extremity, 403 injuries (32.8% of all injuries). The most injured sites were the ankle (28%, of which 94% were acute), knee (20%, of which 68% were acute, shoulder (10%, of which 66% were from overuse), finger (9%, of which 99% were acute), back (6%, of which 79% are from overuse) and elbow (8%, of which 78% were from overuse). About 27.5% of the injuries demanded an absence from practice of more than 4 weeks (82% of these were acute). Of these severe injuries, 50% were in the knee and 25% were in the ankle. A total of more than 28% of all the knee injuries demanded a surgical intervention. In the ankle the surgical intervention rate was only 6%. Of the severe injuries, the majority (57%) were sprains with ligament rupture and/or meniscal tears. The main structures affected in these severe injuries were the anterior cruciate ligament (28%), the meniscus (22%) and the collateral ligaments (11%). The majority of these severe, acute, injuries on the knee and ankle joints occurred during a match (75%), in the offensive phase (64%) and in the back players (73%).

Conclusions: In female handball players, the knee is the structure with most risk of severe injury and is strongly associated with the game structure and function.

Poster Presentations (PP)

PP-SO02 Sociology 2

Family Social Dynamics. A Parents’ Vision of Their Children’s Free Time

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Young people’s free time is important in determining their identity, education and development. (Munson & Savickas, 1998, Piko & Vazsonyi, 2004). The family, namely parents exerts a great influence on young people, providing them with many values and norms which are character forming (Caldwell & Darling, 1999, Fletcher, Nickerson & Wright, 2003).

The present study aimed to identify parents’ representations of their children’s free time and to know their aspirations at this level. The study was carried out on 90 parents of young people attending 9th year in state schools in Coimbra and Leiria using semi-structured interviews. The technique used for data analysis was content analysis (Miles & Huberman, 1994). The elaboration of the categories had been defined a priori and a posteriori (Bardin, 1977). The computer programme of qualitative data analysis QSR NVivo 7 was used in coding the transcripts of the interviews.

The categories found were «opportunities for development», «role models» and «sport». Children’s free time represents an opportunity for development, giving them a wide variety of experiences directed by guiding and vocational principles for their development as a whole.

Parents understand they should be role models and therefore develop qualities, ways of conduct, attitudes and initiatives capable of influencing their children’s choices and behaviour.

Most parents would like their children to do sport in their free time, which promotes health and is supervised by adults.

References.


AN EMPIRICAL STUDY ON THE ROLES OF PHYSICAL ACTIVITIES IN IMPROVING THE DAILY LIVING FROM THE EXPERIENCES OF JAPANESE FEMALE ELDERLIES WHO LIVE ON THEIR OWN

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Introduction
The size of the national population aged 65 or over in Japan has been on a rapid increase (Ishizawa, 2000). Among this ageing population has been witnessed a growing number of eldery who live on their own. It accounts for as many as 3,860,000 (The National Census, 2000). This figure indicates an approximately 30% increase from the previous (2000) census record. This paper aims at examining the effects of physical activities on the daily life of the elderly population through an empirical survey in Japan.

Methodology
The author of this paper conducted a questionnaire (self-administered questionnaire) survey on a group of elderly females who live on their own at home in Kobe, in April 2004. Of the 60 copies distributed, 52 completed questionnaires were returned (Response rate: 86.7%). The respondents are divided into two groups, (1) 26 ‘actives’ who enjoy physical activities on a regular basis, and (2) 26 ‘inactives’ who have not been involved with any physical activities for the past six months. The former is defined as an individual who ‘performs physical activities for at least twenty minutes, three times or more a week’ (ACSM, 1998). For the purpose of the data analysis, T-tests are employed in order to measure the gap in the following attributes among the ‘actives’ and the ‘inactives’ in the sample population: (1) past medical records, (2) current medical status, (3) average monthly medical expenses, (4) existence of close friends, (5) degree of life satisfaction, (6) degree of well-being, and (7) ADL performance ability. Findings:
The average score in ‘life satisfaction’ is 30.0 in the ‘actives’ and 27.1 points in the ‘inactives’ group (Full score=35 points). This indicates a statistically significant differential (p<.01). The average ‘well-being’ is 28.9 points for the ‘actives’ and 24.7 points for ‘inactives’ (Full score=34 points), and the difference was statistically significant (p<.01). The average ‘ADL score’ accounts for 26.5 points among the ‘actives’ and 21.3 points among the ‘inactives’ (Full score=36 points), which shows another statistically significant gap between the two groups (p<.001). The result of this study has an implication that an active participation in leisure activities such as sports would have a positive impact upon the degree of their life satisfaction, well-being and ADL performance ability.

References.

RETHINKING THE RELATIONSHIP BETWEEN SPORT AND ETHNICITY

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Baseball has not only shared the important position as national sport in Taiwan, it also created many sports stars who enjoy fame and fortune, thus considered to be one of the stepping-stones that help the aborigine peoples of Taiwan to get away from the injustice of social stratification. Nonetheless, the belief that sports is beneficial for racial minority has clouded the fact of enshrined inequality of resources and power distribution in sports. On one hand, Sport is given with positive significance and chance of survival; on the other hand, it has also further reproduced the current status of inequality as well as racial ideology. Since aboriginal athletes are members living in wider social structure and will continuously exposed to the shaping power of kinds of social force. As such, this article will base on the position of social structure would, through the intervention of social factor and kinds of capital/resources, remain to affect the sports career development of aboriginal baseball player so that they can, as exposed to the rather unfavorable ethnicity and social stratification and inequality in wider social structure, still be reproduced in sports field.

YOUNG NATIONAL TEAM FOOTBALL PLAYERS- COMMON CHARACTERISTICS OR NOT?

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In order to develop football players’ skills, possessing more knowledge about elite players’ backgrounds, lifestyles, activities and motivation may be important. The aim of this study is to describe some characteristics regarding to family backgrounds and motivation. 45 male football players in three National teams of Norway, U17, U19 and U21, participated in the study. Among these players, two thirds reported they were part of big families. Two thirds were three or more siblings and more than 20% reported they were four or more siblings. More than two thirds reported that they have older siblings. Furthermore, they reported about athletically active families; all of their siblings, more than fifty percent of their mothers and seventy five percent of their fathers had been athletically active. 35% of their siblings, 20% of their fathers and about 10% of their mothers had played sport at a high level. All of the players reported about a very high activity level in their childhoods, at age six, 65% and at age eight, more than 90% had been members of an athletics club. Moreover, most of the players also reported about a diversified involvement in a number of sport activities. From the ages of six until fourteen, more than 70% participated in one or more athletic activities in addition to football. The players’ ambitions were high; more than 75% wanted to be National team players or players on the international level.
FEMALE RIDERS’ PERCEPTIONS OF GENDER RELATIONS IN SNOWBOARDING

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This paper will focus upon gender relations in snowboarding based on the meanings and experiences articulated by participants of the sport. Snowboarding has been characterized by male domination in quantitative terms as well as masculine connotations which both reflects sport as traditionally being a male domain, and snowboarding's relatedness to alternative youth cultures, which in general excel masculinity in style and behavior. Snowboarding along with surfing and skateboarding developed in a different social context relative to modern organized sports. The informal structure has an impact on the participants' position and status in the culture. Previous research on alternative sports has examined subculture characteristics and the insider outsider dimension has been given particular attention in descriptions of the core members' prestige versus more peripheral participants. In terms of gender relations most studies have explored females' position in a male-dominated context. The present study will examine gender relations in snowboarding by focusing upon relations between female and male snowboarders as well as between different groups of females.

The paper is based on a study of female snowboarders in the Norwegian Snowboard Federation (NSBF). Education about gender issues is a central part of the NSBF’s working programme and one sub-group, PowderPuff Girls (PPGirls), works on the recruitment of girls and women to snowboarding, and promoting females’ participation at various levels in the organisation. The study was made in connection with a workshop organized by the PPGirls in October 2004. Methods of the study were participant observation and qualitative interviews with six participants, aged 18 to 28 years.

The results show that the female riders' experiences of gender relation reflect inferiority versus male riders on a group level. Some of them expressed that they felt inclusion from the males’ side, but the males are the rulers of the pipe and parks. In terms of gender relations among female riders three different typologies or femininities were identified; babes, fast-girls, or invisible girls. The babes were described as passive, wanna-be’s and primarily attracted to snowboarding by male riders, whereas the fast-girls were active, striving for performance enhancement and challenging the male domination. They are the closest to the core snowboarders among the females. The invisible girls compose a variety of performance levels, aspirations, as well as snowboarding styles. The results are discussed in relation to Bourdieu’s concepts of capital, field and masculine domination.

BRAZILIAN ELDERLY: PERCEPTION THE BENEFITS OF THE PRACTICE OF PHYSICAL EXERCISE

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An active life can minimize the deleterious effects of ageing. Shephard (2003). The purpose of this study was to verify the benefits, perceived by elderly women from the practice of gymnastics. The sample was composed of 68 elderly women, aged above 60 years, participants of gymnastics three times a week in Maceio / Brazil. The instrument used a semi-structured interview. Composed of questions seeking to verify perceived benefits from the exercises practice. The data was interpreted through the Content Analysis, Bardin (1994). The elderly women reported that from the physical exercise realized: an increase the network of friends; increased autonomy, feel more secure, decreased anxiety, increased self-esteem. The answers confirm that physical activity may influence changes and provide improvement in the quality of life. It is concluded that the participation of the elderly in a regular physical activity influences them to develop a positive attitude in relations to life, which can contribute to the development of a new identity.

References.

BODY IMAGE AMONGST ADOLESCENTS A SOCIOLOGICAL ANALYSIS

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The adolescence is a period marked by important physical, physiological, psychological and social transformations being the body aspect one of the most relevant transformations (Jacob, 1994). Such body changes may bring about problems altering the body image of boys and girls. Because individuals, as members of large networks of interdependencies, are continually judged by their appearance, adolescent boys and girls become highly concerned with their physical appearance. However, girls seem to be more concerned with their physical appearance than boys mainly because they learn, from a very early age, that a slim body and a beautiful appearance is more likely to be valued by others than a body that does not fit in such ideal (Barbosa, 2001). Girls are bombarded with idealized images of a certain type of a female body that it is almost impossible to ignore. The effects, as Hargreaves (1994) points out, are dangerous. Adolescent girls rarely feel at ease with or proud of their bodies unless they conform to some notional ideal (Hargreaves, 1994; 156).

This study had as its main goal, to analyze and to interpret the concept of body in the adolescent boy and girl. The question Are male and female adolescents satisfied with their body image? was the starting point for this research. In this process we attempted to analyze and to interpret the way adolescents see their bodies. Our research was carried out in the school EB 2/3 D. Pedro IV - Mindelo, with students of the 9th year of schooling. Of the 123 students studied, 67 were males and 56 were females. To collect the data we used the Body Image Satisfaction Questionnaire, developed by Luther et al. (1990). This questionnaire is composed by twenty two items. For each item, concerning each part of the body, the person is asked to rate the way he/she feels about each part of his/her body. There are five possibilities of answer: 1 Have strong negative feelings and wish change could somehow be made; 2 Do not like but can put up with; 3 Have no particular feelings one way or the other; 4 Am satisfied; 5 Consider myself fortunate. The information that was gathered was then submitted to a statistical analysis. In the analysis we compared both genders.

This study revealed that girls are more critical of their body image than boys. Girls are more likely to value their bodies and an ideal type of body than boys. This shows that a human being is, without a doubt, carrier of an identity and self-esteem entailed to the corporal conscience.

References.
The participation in institutionalized sporting activity by children is point in the literature as a way that contributes for the increase of the energy expenditure, equally favoring the motor, social and cognitive development. It is also associated with the adoption of an active lifestyle. The objective of this study was to analyze practical of institutionalized sporting by children from Florianópolis, S.C., Brazil, in the working days. 180 children selected from schools (16) had participated of the study. The participants within schools informed consent from parents/guardians. This research is part of an extensive study concerning the identification of the life’s routines, independent mobility and perception of the physical space, using some suitable instruments of reference studies (questionnaire, interview, drawing, diary and production of texts). The data referring to this study were extracted from diary and the interviews and they had considered the age (10 and 12 years), the gender (masculine and femininel) and the social-economic status (high and low). The results were present in simple frequency, percentage and mean. The differences had been computed through test ‘U’ of Mann-Whitney and test ‘T’ of Student, both with level of significance of p < 0.05, in accordance with the nature of the variable. The general results had indicated that 40.0% of the children practice some sporting modality in the working days and that this practical is not related to the age, the gender or the social-economic status. Between the 12 mentioned modalities, the most practiced had been the soccer (25.0%), swimming (25.0%), dance (23.6%) and fights (15.3%). The soccer (p=0.000) and the fights (p=0.039) are more practiced by boys and the dance (p=0.037) is more practiced by girls. Volleyball (p=0.024) and swimming (p=0.013) are more practiced by the children with 10 years old and the athletics (p=0.050) is practiced for children with 12 years. Athletics (p=0.036) is also a most common practical between children of social-economic status. The great majority (82.6%) practices only one modality, 15.3% practice two modalities and the remains practice three or more modalities. The frequency with that they realize these activities in the working days varies from one until more than three times, with predominance of two times (41.7%) and only one time (33.3%). The variable that more influence the choice of the children are thus the gender and the age. The average time dedicated to these activities is of 00:33.32 hours, without significant difference between the groups. Our results are in intermediate position in relation to the studies realized with other national and international samples. As far to the practiced modalities, the small differences found, mainly in relation the international samples can be attributed to the cultural questions, that define among others, the offer of adequate spaces.

THE VOLTA A PORTUGAL CYCLING RACE: ITINERARIES, NARRATIVES, AND IDENTITIES

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The Volta a Portugal is a cycling race with a eighty year-long historical narrative. The first full-scale cycling circuit of Portugal was run in April 1927. In the beginning of the 20th Century, machines that started out as rich folks’ playthings were being reassessed as poor men’s horses. Indoor and outdoor races had popularized their possibilities for decades. The time had come to link technology and trade, speed and entertainment, to spur broadsheet circulation and cycle sales. The Volta a Portugal’s popularity, comparing with other cycling races, was its compromised boundary itinerary that embraces all territory as a big bow. The success of that boundary formula itinerary, beloved by all folks, will be the reason to disapprove and criticize all other itineraries that go far from the initial model. How have the Volta’s itineraries served as a means for constructing, and contesting, local, regional and national identities?

The territorial boundary is more than an imaginary line, it is also a relational process, it divides people in groups, in communities, promotes processes of internal and external definition and a sense of shared belonging within their group, or community. The Volta’s itinerary maps turned the sport event into an annual lesson in Portuguese geography, featuring topographical profiles, and detailed schedules of racers’ expected times of arrival in communities along the itinerary. During the first two decades these maps emphasized a traditional Portugal, following the ideas of Antônio Ferro (the ideologist spirit politic of Salazar’s regime) published in Panorama magazine. By the end of the fifth decade, the maps show a modern leisure tourist country, which combines beach, mountain and bullfighting. After the Revolution (1974) the maps lost these folk motives and explores new design’s formats, some of them tied to sponsors symbols. Based on folklore symbols they reinforce models of politic control about what must be defined as national identity. Based on commercial symbols they offer a counter narrative beyond territorial identities, and they went to global consumer space. What they have repeatedly taken for granted, however, is the tensions that existed, and exist, between competing narratives about what’s the meaning of us (Portuguese people).

In spite of the extension of the Volta’s itinerary, and its commercials motivations, eighty years on, I could notice the enduring power of the event to carry meanings that transcend the sport competition.

PRINCIPAL PROFESSIONAL DEVELOPMENT METHODS FOR EXPERTS BASKETBALL COACHES

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The aim of this study is to analyze the process followed in the development of the coaching knowledge by expert basketball coaches in Spain. The researchers (Irwin, Hanton & Kervin, 2004; Jones, Armour, & Potrac, 2004) have been able to identify a number of specific events or situations use to develop coaching knowledge as mentoring, interactions with other coaches, reflection and playing experience. Therefore, we used a qualitative methodology (Patton, 2002) from a biographical point of view. In - depth interviews were carried out in order to analyze the vital itinerary of 16 expert basketball coaches, who develop their activity in ACB league or the Spanish national selection, using for their selection the criteria used in specific literature as: a) have been coaching at the national or international level for at least ten years; b) have been coaching at international player level; and c) have won a professional basketball competition. The results shows that the coaches do not follow a specific pattern for training in conjunction with various studies of the literature (Irwin et al 2004, Jones et al. 2004), and the importance that some coaches give to formal versus informal education received. The informal learning have been more important for our coaches education.
The principal methods have been the situated learning or learning every day (Lave & Wenger, 1991), mentoring (Irwin et al., 2004), and informal knowledge network (Culver & Trudel, 2006) with other coaches. Finally, all coaches stress the continuing practice reflective everything they saw and learned related to basketball (Irwin et al., 2004).

This indicates that the education of the coach does not have to be a rigid schedule of courses and systematic official. But a deliberate preparation can be developed from a large number of ways that highlights the coaches interviewed and make us raise the present formication to us that is being made with the future coaches.

References


Poster presentations (PP)

PP-TT04 Training and Testing 4

BODY COMPOSITION ASSESSMENT IN YOUNG MEN; COMPARISON BETWEEN SEGMENTAL MULTIFREQUENCY BIOIMPEDANCE METHOD AND DEUTERIUM DILUTION METHOD

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Introduction

Stable hydration is important in reliable body composition assessment. Hence, body water content plays an important role in assessing total body composition. Deuterium dilution method (DDM) has been demonstrated to be a gold standard for total body water (TBW) assessment (Watson et al. 1980). Also, the often used bioimpedance method primarily assesses the body water amount. Other body compartments are then further calculated from these TBW values. The accuracy of body composition estimation depends on the equation used and constant measurement conditions. The objective for this study was to validate segmental multifrequency bioimpedance (SMFBIA) method against DDM for body composition assessment in young male subjects.

Methods

Body composition from twenty-four 19.0 years old young men, participating in military service, was assessed by DDM and SMFBIA methods. The DDM method was conducted as described earlier by Westerterp et al. (1995) and SMFBIA by InBody 720 device (Biospace Co. Ltd, Seoul, South-Korea) according to Bedogni et al. (2002). SMFBIA measurement was also conducted for twenty-two subjects on a two consecutive days to assess the repeatability of the method.

Results

Mean (+/-SD) height and weight for the study subjects were 178.5 cm (+/-7.5) and 77.6 kg (+/-14.9), respectively. The mean (+/-SD) TBW, FFM, and FM by DDM and SMFBIA were 43.6 l (+/-5.89) vs. 46.2 l (+/-6.85) (p <.001), 59.5 kg (+/-8.05) vs. 63.0 kg (+/-9.42) (p <.001), and 18.1 kg (+/-9.68) vs. 14.6 kg (+/-8.31) (p <.001), respectively. The correlations between the methods for TBW, FFM, and FM were r=0.977, r=0.995, r=-0.23 kg, r=0.995 and, r=0.15 kg, r=0.994, respectively. The mean day-by-day differences and correlations from SMFBIA for TBW, FFM, and FM were -0.23 l, -0.04 kg, r=0.995, -0.23 kg, r=0.995 and, 0.15 kg, r=0.994, respectively.

Conclusion

There was a good association between methods of DDM and SMFBIA to assess TBW, FFM, and FM. On the other hand, there was a significant systematic bias between the methods with SMFBIA overestimating the total body water and fat free mass. This bias was, however, relatively constant over the range of measurement scale and, therefore, can be corrected by improving the assessment equation in SMFBIA method. Due to the military environment, the measurement conditions were constant and SMFBIA method showed high repeatability in the day-by-day measurement.

References


UNEXPECTED SEASONAL VARIATION OF VO2MAX IN ELITE ALPINE SKIERS

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Introduction

Elite athletes in competitive alpine skiing are characterized by high leg strength and endurance capacities (Neumayr et al. 2003). Only before the introduction of carving skis, a few studies evaluated the development of endurance and strength performance during the competitive season (Bosco et al. 1994, Koutedakis et al. 1992). We measured anthropometric, endurance and leg strength variables during a competitive season in elite alpine skiers to evaluate the impact on physiological demand of modern alpine skiing.

Methods

On 16 elite alpine skiers (age: 20.3 +/- 2.9 years, body weight: 80.6 +/- 8.7, body fat content: 8.1 +/- 2.7%) competing at international level (IF races and European Cup), performance testing was executed immediately pre- and post-season. Muscle leg strength was evaluated by performing counter movement and squat jumps on a force plate. Endurance performance (VO2max, maximal power output and ventilatory thresholds) was measured by an incremental ramp test protocol to voluntary exhaustion. Training was recorded throughout the entire season and training load was quantified.

Results

The principal methods have been the situated learning or learning every day (Lave & Wenger, 1991), mentoring (Irwin et al., 2004), and informal knowledge network (Culver & Trudel, 2006) with other coaches. Finally, all coaches stress the continuing practice reflective everything they saw and learned related to basketball (Irwin et al., 2004). This indicates that the education of the coach does not have to be a rigid schedule of courses and systematic official. But a deliberate preparation can be developed from a large number of ways that highlights the coaches interviewed and make us raise the present formation to us that is being made with the future coaches.

References


Body weight and percent body fat were not different between pre- and post season measurement. VO2max (+5.1%, pre season: 52.8 +/- 3.6 ml/min/kg, post season: 55.6 +/- 5.3 ml/min/kg; p = 0.001) but not maximal power output (+1.7%, pre season: 5.4 +/- 0.3 watts/kg, post season: 5.5 +/- 0.4 watts/kg; p = 0.17) increased during the competitive season. Power output at ventilatory thresholds were not different between pre- and post season but heart rate was significantly lower post season at both thresholds. The slope of the submaximal VO2-curve was steeper at post season measurements. Jump performance testing showed a tendency for increased maximal power output in counter movement jump (+2.8%, p = 0.09) but in squat jump (+0.8%, p = 0.35). During the season, athletes performed 83 minutes/week endurance training and 132 minutes/week strength training.

Discussion:

It is shown that VO2max was increased within a competitive season with very low amounts of endurance type training. Differences in threshold heart rate and slope of submaximal VO2-curve point to some unexpected physiological disturbance. High training impact and overload during pre-season might have been led to a fatigue related lowering of physical performance which became restored during a less demanding competitive season.

References:


INFLUENCE OF EVENT DISTANCE SPECIALISATION ON PERFORMANCE WITHIN A SEQUENTIAL RUNNING-CYCLING-RUNNING TEST IN AGE-GROUP TRIATHLETES

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The Millet sports specific run-bike-run (RBR) test (Millet, Dreano and Bentley, 2003; Millet and Bentley 2004) was first used to predict performance and examine ability to run after cycling (Millet and Veick 2000) in ‘elite’ triathletes. This study compared performance on a modified version of the original RBR test (Bentley et al., 2005) between ‘age-groupers’ specialising in ‘Olympic distance’ (OD) or ‘long distance’ (LD) competition.

Eight OD- and eight LD specialists [mean ± SD age 30 ± 6 vs. yrs; run maximum oxygen uptake [VO2max] 64 ± 5 vs. 64 ± 9ml/kg·min−1; mass 74 ± 4 vs. 69 ± 9 kg, all NS] provided informed voluntary consent to participate in 3 tests over 10 days. Test 1 was an incremental running VO2max test (starting at 8 km/h, with increments of 1 km/h·min−1). Test 2 -the RBR- consisted of 4 stages. The first and fourth stages were a 7 min run at 15 kph. The second was an incremental cycling test (starting at 2 W/kg−1, with 30 W/min−1 increments) for peak power output (PO) and VO2max. The third was 10 min cycling at 3 W/kg−1. Test 3 was a laboratory distance (30 min cycle, 20-min treadmill) time-trial (TT).

Ventilatory and (fingertip) blood lactate ([BLa], and speed/power output (PO)/distance data for TT. One way ANOVAs and Pearsons product moment coefficients were used to assess inter- and intra-test relationships between groups.

The OD and LD athletes differed as regards RBR bike ventilatory threshold (VT) as a percentage of bike peak PO (78.7±5.0 vs. 62.1±8.5, p<0.05) or bike VO2max (77.1±8.7 vs. 91.1±5.6, p<0.01), RBR bike VO2max (56 ± 5.1 vs. 53.9±5.3, p<0.05), RBR bike PO (332.4±33.6 vs. 313.2±12.3, respectively, all NS). RBR R2 VO2 as a percent of RBR R1 VO2 (100.6±4.9 vs. 98.7±16.1), RBR power to weight ratio at VTbike (r= -0.86, p<0.05 vs. 0.17, NS). The extent to which differences between OD and LD age groupers on the modified Millet RBR test reflect training differences deserves investigation.

THE INFLUENCE OF WATER EXERCISE TRAINING ON BLOOD PRESSURE AND CENTRAL ARTERIAL STIFFNESS IN THE ELDERLY

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It is well known that water exercise (swimming, aquabics, walking) is useful for keeping or improving health and fitness level of people, especially of elderly people. This is because of the physical characteristics of water which have buoyancy, viscous drag. Therefore, elderly people can do exercise or movement with varied posture (e.g. stretching), and can continue those with proper duration and without injury. These advantages bring in improvements of balance ability, flexibility, and muscle strength. But it is more important to keep appropriate level of resting blood pressure (BP) or to normalize BP by exercise training in the elderly. It has been reported that endurance training on land reduces central arterial stiffness and BP. On the other hand, muscular strength training on land increases the stiffness and BP. However, there have been few studies of the effects of water exercise training on blood pressure or central arterial stiffness. Water exercise seems to have both endurance and muscular strength training effects.

We investigated the effects of water exercise training on resting blood pressure and central arterial stiffness. One hundred fifty three elderly registered for the water exercise training class. The training class was held on a weekly basis, and totally 32 times from April to December in 2006. In the 76 elderly out of 153, resting BP and central arterial stiffness were measured both in the middle of April (before the middle of November) and the middle of November (after the middle of November) period using a method of brachial-ankle pulse wave velocity (baPWV) by BP-203RE/OMRON COLIN Co.). Mean systolic BP was significantly decreased (p < 0.05) at P2(134 +/- 16 mmHg) compared to P1(139 +/- 21 mmHg). Mean diastolic BP was also significantly decreased (p < 0.05) at P2(77 +/- 9 mmHg) compared to P1(80 +/- 12 mmHg). Mean baPWV did not show significant difference between P1(1174 +/- 329 cm/sec) and P2(1172 +/- 343 cm/sec). But, in the elderly who participated in the exercise class more than 20 times, 66% of them showed decreased baPWV at P2 compared to P1, in contrast, 47% as for under 20 times elderly. Based on these results, it was suggested that water exercise training held on a weekly basis is useful in improving resting BP.
Further, proper volume of water exercise training seemed to be needed to improve baPWV which gives an indication of central arterial stiffness.

HEART RATE AND RPE RESPONSE TO VARIATIONS IN BALL SIZE AND COACH INTERVENTION IN 3-A-SIDE SPECIFIC HANDBALL DRILLS

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Introduction: Sport specific drills are constantly used in Handball training sessions, with intuitive coach variations. However, the knowledge about the real impact of these variations on drill intensity is very insufficient. Therefore, this study aimed to measure the effects of ball size and coach intervention variations in 3-a-side specific handball drill by the elicited percentage of maximal Heart Rate (HRmax%) and Ratings of Perceived Exertion (RPE).

Methods: The studied sample was constituted by six players from a Portuguese Second Division team (meanSD age: 24.3±1.1 years; weight: 83.0±15.5 kg; height: 1.80±1.11 m; bone mass index: 26.3±3.1). The exercise testing consists in a 3-a-side, played in 20x20 meters with dimension areas of 4 meters and with the official rules. The protocol consist in repeat and collect data of each exercise in different practice conditions, in the same day of two consecutive weeks, in the competition period (Week 1: ball size 3, without intervention, with specific feedbacks and with encouragement; Week 2: ball size 2, without intervention, with specific feedbacks and with encouragement). Every exercise was preceded by the teams’ usual warm-up. Every condition of the exercise lasted for 8 minutes, followed with an active break of 4 minutes during which the players carried out continuous running with low intensity and filled the original Borg scale.

Results: In ball size variation statistical differences were found in HRmax% without coach intervention (size three 86.3±8.0) to size two 83.6±6.2, p=0.021), with coach feedbacks (size three 87.9±5.6) to size two 83.5±5.0, p=0.001) and with coach encouragement (size three 87.7±5.3) to size two 84.0±4.8, p=0.001). In coach intervention statistically significant differences were found only in RPE with ball size three (without coach intervention 10.3±2.4) to coach encouragement 13.7±1.6, p=0.017).

Conclusions: In every coach intervention conditions, the decrease in the ball size resulted in a significant similar intensity decrease, probably due to the most regular practice with the third ball size. These findings suggest that the traditional use of a small ball associated to coach intervention however only coach encouragement was demonstrate significant increase. The use of verbal motivation and encouragement can be useful to coaches increase training intensity during small-sided games. On the other hand, there is no evidence that using coach specific feedback during the exercise decrease players’ intensity.

ENERGY COST OF WINGATE ANAEROBIC TEST IN PARALYMPIC SUMMER ATHLETES WITH LOCOMOTOR DISABILITY

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All out exercise tests, performed following methods of Wingate Anaerobic test (WAnT), have been used since the ‘70s for evaluating anaerobic fitness (1,2). Recently, repeated bouts of lower limb WAnTs have been used as an effective modality of exercise training in able-bodied individuals (3). Series of arm cranking WAnTs (AC-WAnT) can be hypothesized as effective modality of training also in athletes with locomotor disability (LDA). To investigate this topic, we studied, in Paralympic Athletes with different levels of both physical fitness and disability, energy cost of AC-WAnT evaluating its energetic sources (aerobic -Eaer-, anaerobialactic -EalAn- and anaerobic lactic acid -ElAn- energies).

Forty-seven male LDA (6 amputees, 6 with tetraplegia, 24 with paraplegia, 4 with poliomyelitis, 1 with spina bifida, 2 with orthopedic disorders; 4 with cerebral palsy, campeling in 11 summer sports disciplines (Athens 2004 Paralympic Games) and with a functional class (International Paralympic Committee swimming) ranging between 2 and 10 (6.3±2.2), participated in the present study after a comprehensive health and fitness evaluation. Under metabolic monitoring, they underwent an AC-WAnT carried out through an electronically braked constant torque cycle-ergometer (Ecalibur, Lode, NL) equipped for upper limb evaluation. Oxygen uptake was measured through a breath by breath metabolimeter (Quark b2, Cosmed, Il). Earlobe blood samples were collected before and at the end of the AC-WAnT to evaluate blood lactate peak and to estimate ElAn (4). Eaer and EalAn were estimated respectively from oxygen uptake during the WAnT and fast component of post-exercise oxygen uptake during recovery (4,5).

MP of AC-WAnT was equal to 289±110 watt with a range from 77 (in a tetraplegic track athlete) to 525 watt (in a wheelchair basketball leg amputee), being significantly related to the functional class (r²=0.62). AC-WAnT total energy expenditure (Etot) was equal to 64.4±19.7 kJ with contributions of Eaer, EalAn and ElAn equal respectively to 9±4.2%, 44±10.3% and 47±9.2%. Etot correlated significantly with MP (r²=0.651). Efficiency was equal to 13±3.1%.

In conclusion, total mechanical work (8.63±3.383kJ) carried out by Paralympic LDA during AC-WAnT is mainly determined (r²=0.518) by lactic acid anaerobic metabolism (ElAn= 31±10.9 kJ). Aerobic contribution to Etot during repeated bouts of AC-WAnT should significantly increase, due to both the exhaustion of the anaerobic sources and the high metabolic level during the first minutes of the slow component of post-exercise oxygen uptake of each bout of AC-WAnT.

References

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NATURE OF SELF-TALK IN ISOMETRIC MUSCULAR EXERCISE UNTIL FAILURE
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The role of self-talk during exercise may be a crucial component of conscious perception and self-awareness alerting the mind about changes in emotional and physical state. Meanwhile self talk during exercise of low intensity is dissociative, when the level of fatigue increases it becomes more associative with voices urging the individual to cancel and voices urging to continue (St. Clair Gibson & Foster, 2007). Recent studies agreed that positive-negative related cue words serve two main functions, cognitive (instructional) and motivational (Hardy, 2006).

Following the dynamical systems approach, we hypothesize that self-talk reflects the complex interactions between personal, task and environmental constraints during exercise. The aim of this study is to show the effects of self talk awareness on the dynamics of the self talk during an isometric muscular exercise until failure. Five physical active subjects (20 y.o) performed during 3 alternative days an isometric arm curl exercise with 90° elbow flexion until failure holding an Olympic bar weighting 25kg for men and 17kg for women. The subjects sat backwards on an inclined bench to minimise the participation of other muscles than biceps brachialis in the exercise. A reference rob was used to help them to keep the elbow angle constant in both extremities during the trials. The verbalisation of their inner self-talk; simplifying its content (positive-UP, negative-DOWN), was recorded during the exercise using a video camera.

The results show that with the trials the awareness of the self talk increases. In the state of self talk awareness the dynamics changes and the system passes from a relatively stable UP state to an intermediate metastable UP-DOWN state until a stable DOWN state coinciding with the failure point.

In conclusion, self awareness of self talk can be trained showing all the effects expected from a complex dynamical system. This can be taken as a support of the hypothesis that the self talk is a dynamical product of complex interactions between personal, task and environmental constraints.

References.

THE EFFECT OF SWIMMING POOL WATER TEMPERATURE ON CARDIOVASCULAR RESPONSES AND TOLERANCE TO EXERCISE DURING IN-WATER CYCLING
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Introduction: The exercise intensity related to water cycling has been the topic of recent studies that show that this activity may reach high intensity depending on cycling cadence. This knowledge is essential for exercise prescription and to adjust the effort associated to water cycling to the individuals needs. Water is a better heat conductor than air and therefore exercise in an aquatic environment might increase the body heat load even for slight differences in water temperature. Heat load per se might diminish the tolerance to exercise or be detrimental to cardiovascular responses. The goal of this study was to compare the cardiorespiratory responses and tolerance to fatigue during in-water cycling at two different water temperatures. Methods: On separate days, 10 young active males (22.4±1.4 yrs) performed a maximal test in a stationary bike (Manorak, 829E) (Max) and twice an incremental cycling exercise on a hydrobike (Hydrodyne) in an indoor swimming pool at 27 degrees (Hydro27) and 31 degrees (Hydro31) Hydrobiking consisted on 3-min stages with cadences of 50, 60, and 70 RPM and then increasing by 5 RPM steps until reaching 100 RPM. Expired air was measured to obtain oxygen consumption and carbon dioxide elimination rates, and minute ventilation (K4D2, COSMED). Heart rate was measured by telemetry (Polar Electro Oy). Capillary Blood Lactate concentration (BL) was measured at 60, 80 RPM and at end of exercise. Thermal Comfort (TC) was obtained by an 11-point scale (0 cold, 5 neutral, 10 hot). Repeated measures ANOVA was used to compare between the three conditions or between different cadences stage. Results: Maximal values during Max, Hydro27 and Hydro31 were, respectively, 4.20 ± 0.43, 4.06 ± 0.52, and 4.25 ± 0.54 L/min (p=0.05). Maximal heat rate was also similar between the three cycling exercises. In Hydro27, the lowest maximal cadence was 90 RPM (one subject) whilst in Hydro31 it was 85 RPM. In Hydro27, 6 of the subjects reached 100 RPM but in Hydro31 this number reduced to 3 subjects. TC scored 7.4±1.1 and 9.2±0.8 units in Hydro27 and Hydro31, respectively (p=0.001). BL concentration during exercise was similar in Hydro27 and Hydro31. Final BL concentration was 11.4±2.2 and 11.9±2.1 mmol.L-1 in Hydro27 and Hydro31, respectively (p=0.05). Discussion: This study shows that hydrobiking might attain maximal intensity. With cadences between 85 and 100 RPM young active subjects reach maximal oxygen uptake and exhaustion even when in cool water. Elevating the water temperature from 27 degrees to 31 degrees, exhaustion occurred at lower cadences and subjects reported high levels of heat discomfort, despite similar BL levels. It is concluded that hydrobiking might be a strenuous exercise and that cadence should be adjusted according to water temperature.

This study was supported by Instituto do Desporto de Portugal (8/DSFDRH/DF/2005).

THE EFFECTS OF 6 DAYS INTENSIVE TRAINING ON SALIVA IMMUNOGLOBULIN - A RESPONSES
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Salivary Immunoglobulin-A (s-IgA) concentration has been shown to decrease during prolonged periods of intensified training at rest and following exercise (Tharp and Barnes, 1990). The aim of this investigation was to determine the effects of high intensity training over a short period (8 day period) upon s-IgA concentration and secretion rate, and salivary cortisol and testosterone concentrations. Four highly trained short track speed skaters (Mean ± SD: height: 181 ± 2 cm; weight: 72 ± 2 kg) were monitored during the 8 day training period which was 3 days training, 2 days rest and 3 days training. Short track speed training consisted of 11 on-ice sessions and 2 off-ice sessions. Total training volume varied daily (range: 20 to 143 laps; Mean ± SD: 84 ± 34 laps). Mean session blood lactate concentrations were significantly lower during aerobic training sessions compared with anaerobic speed training sessions (Mean ± SD: aerobic session average 5.8 ± 2.2 mmol.L-1, anaerobic session average 10.1 ± 0.6 mmol.L-1). Unstimulated whole saliva samples were collected using
passive drool between 0700 and 0730 h. The s-IgA, cortisol and testosterone concentrations were determined using sandwich-type ELISAs. Saliva IgA secretion rate was determined by multiplying the s-IgA concentration by saliva flow rate. Blood lactate concentration was determined during training sessions using a lactate pro analyser. There were no significant alterations in saliva flow rate and salivary testosterone concentration during the 8 day monitoring period. Saliva IgA concentration decreased by 54% following 3 days intensive training (P < 0.01), increased following 2 days rest (albeit 23 % lower than pre-training) and reduced by 35 % following a further 2 days training compared with pre-training (P < 0.05). Saliva IgA secretion rate followed a similar trend to s-IgA concentration decreasing by 50% following 3 days intensive training (P < 0.01), increasing following 2 days rest (albeit 26 % lower than pre-training) and decreasing by 46 % following a further 2 days training compared with pre-training (P < 0.05). Salivary cortisol concentration increased by 45% following 3 days intensive training (P < 0.05) and was significantly reduced during the 2 day rest periods (P < 0.05). These results show that athletes undertaking intensive training have a reduction in s-IgA concentration and secretion rate. Additionally, these data demonstrate that 2 days rest was adequate to allow s-IgA concentration and secretion rate and cortisol concentration to recover. Therefore, athletes undertaking intensive training periods should ensure they have adequate rest to allow the immune system to recover and prevent long periods of immune suppression.

References

COMPARISON OF FOREHAND RECEIVING ABILITY OF MALE TABLE TENNIS PLAYERS AT THREE DIFFERENT LEVELS
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Serving and receiving abilities are crucial to determine if one can take the initiative and win in a table tennis match. The strength and quality of receiving is directly related to bringing skills and tactics into a play.

Purpose: In the present study, a new procedure to assess forehand receiving performance of three level male table tennis players in simulated conditions was adopted. Method: 42 male table tennis players were recruited in this study. Ten are at national-level in 2007, 20 belong to senior high school champion team in 2007 National High School Games, and 12 are in junior high school champion team in 2007 National High School Games. The protocol consists of 5 tests including basic control, reflection, agility, judgment and match-like condition. Every test is composed of 6 spin types of serving repeated 6 times, which are topspin, backspin, left-side spin, right-side spin, left-side downspin and right-side downspin. Each player performed 180 receives in total. Every serve was driven by the same table tennis player at national-level to reproduce a neutral and offensive situation as in a real game. Receiving quality was determined by simultaneous record of success rate and accuracy of target area on the table. Results: In terms of success rate, national-level players scored significantly higher than junior high school and senior high school players on agility, judgment (P<0.05), and match-like condition (P<0.001). But, there are no significant differences on basic control and reflection. National-level group outperformed the other two groups from the viewpoint of accuracy, especially on basic control, agility, and match-like condition (P<0.001). It is not significantly different when compared national-level group to the other two groups on downspin and right-side downspin in the aspect of accuracy. Overall, national-level players performed better than the other two groups on 6 spins in accuracy. Conclusion: In the present study, we found junior high school players performed worst on the accuracy of different complex spins under match-like situation. This test is reliable and valid for evaluating forehand receiving quality. Based upon these test results, coaches can employ different training programs to improve the receiving ability of individual player.

EVALUATION OF FOREHAND RECEIVING QUALITY AT WORLD-LEVEL MALE TABLE TENNIS PLAYERS
Yite, L., Tseng, W.
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In a table tennis match, serving and receiving abilities are crucial to determine if one can take the initiative and win. The strength and quality of receiving is directly related to bringing skills and tactics into a play.

Purpose: In the present study, a new procedure to assess forehand receiving performance of national level male table tennis players in simulated conditions was adopted. Method: Five male table tennis players participated in 2007 Table Tennis World Cup and 5 at national-level in 2007 were recruited in this study. The testing protocol consists of 5 tests including basic control, reflection, agility, judgment and match-like condition. Every test is composed of 6 spin types of serving repeated 6 times, which are topspin, backspin, left-side spin, right-side spin, left-side downspin and right-side downspin. Each player performed 180 receives in total. Every serve was driven by the same table tennis player at national-level to reproduce a neutral and offensive situation as in a real game. Receiving quality was determined by simultaneous record of success rate and accuracy of target area on the table. Results: World-level players scored significantly higher than national-level players in the tests of success rate and accuracy on reflection, agility, and judgment (P<0.05). In term of success rate, world-level players performed better than national-level players on right-side spin, right-side downspin (P<0.05), left-side spin, and top spin (P<0.01); nevertheless, it does not reach significant differences by 6 spin types from the viewpoint of accuracy between two levels. Conclusion: Both groups of participants do not make significant difference on success rate and accuracy under match-like situation. That means all the participants are even when it comes to agility. Coaches can adopt this reliable and valid instrument to evaluate and employ different training programs to improve the receiving ability of individual player.

INFLUENCE OF PERFORMANCE LEVEL ON OXYGEN UPTAKE KINETICS IN SWIMMING
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Although a faster VO2 kinetics have been associated to a lower O2 deficit and a greater fatigue tolerance, it is unclear if it is a determinant of endurance performance. In swimming, to our knowledge, the VO2 kinetics parameters have never been compared in subjects of different performance levels. Therefore, the purpose of this study was to compare the parameters of VO2 kinetics in heavy intensity swimming between elite (E) and club-level (C) swimmers. We hypothesized that E have faster kinetics than C. Seventeen Portuguese swimmers divided into two groups: E (n = 5, 23 ± 1.7 yr.; 85.0 ± 13.7 Kg; 1.86 ± 0.08 m, personal best over 400m freestyle PB400 < 245 s) and C (n=12; 19.2 ± 2.8 yr., 68.9 ± 7.0 kg, 176.7 ± 0.03 m, average PB400 = 267 s) performed on two separate days: 11.5 x 200 m with 30 s rest and 5-10% velocity increment in between for determination of maximal oxygen uptake VO2max and
ventilatory threshold (VT). The last repetition was performed at maximal velocity (vVO2max). VO2max was recorded as the highest 30 s average and VT was established by the V-slope method. 2) Two 6-min constant velocity exercise bouts at 62% VT = 20.1 ± 5.3 s, p = 0.04) were used instead of the others, while the other parameters were not statistically different, i.e. ID: 10.7 ± 2.6 vs. 10.7 ± 4.3 s; A1: 38.6 ± 3.2 vs. 35.1 ± 5.1 mmol/L/kg.1; ID: 20.1 ± 68 vs. 166 ± 15 s; 12: 51.9 ± ± 63 s vs. 35.5 ± 43.4 s; A2: 3.7 ± 0.9 vs. 4.9 ± 2.9 mmol/L/kg.1. The E group presented significantly higher mean values of VO2max (4992 ± 507 vs. 3735 ± 465 mmol/L/kg, p = 0.002) and VO2max (5.2 ± 0.05 vs. 4.0 ± 0.04 mmol/L/kg, p = 0.001). 3) Shorter time constant for the primary phase of the VO2 response seems to be related to higher aerobic fitness and performance level in aerobic swimming exercises, whereas when measured at the same relative intensity, the slow component amplitude appears to be similar between elite and sub-elite swimmers.

References:

EFFECTS OF STRENGTH TRAINING DURING SIDE-ALTERNATING VIBRATION ON KNEE AND ANKLE STRENGTH AND STATIC BALANCE CONTROL
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The purpose of this study was to determine the effect of strength training using a Side-Alternating Vibration (SAV) plate on knee and ankle muscles strength and static balance control. Twenty four women (age: 28.35 ± 2.12yr, mass: 66.33 ± 11.90kg, height: 169 ± 6.60cm) were randomly assigned into the Training (TG, n=14, static and dynamic exercises on a vibration plate for 9 weeks) and the Control (n=10) groups. Moment/angular velocity relationship for knee extenders, knee flexors (-120, -60, -30, 30, 60, and 120 deg/sec), plantarflexors, dorsiflexors, and eversion/extensor exercises were established using an isokinetic dynamometer (Kin-Com, Chattanooga, USA). Isometric moment/angular position relationship was also determined for all muscular groups. Three static balance tasks of increasing difficulty were performed with and in the absence of vision, while standing on a force platform (Cormex SA, Loran Engineering Ltd, Bologna, Italy, 50Hz). Normal Quiet Stance (NQS), Sharpened Romberg (SR), and One-Legged Stance (OLS). Anterior/Posterior (A/P) and Medio-Lateral (M/L) postural sway in direction was quantified using maximum range (CoPmax) and standard deviation (CoPsD of Centre of Pressure displacement. Bipolar surface electrodes were used to record the Electromyographic activity (EMG) of Rectus Femoris (RF), Semi-Tendineous (ST), Tibialis Anterior (TA), Medial Gastrocnemius (MGAS), Peroneus Longus (PL) and Peroneus Brevis (PB). The results showed that after training, concentric knee extensors and flexors strength remained unaltered, whereas eccentric (p<0.05) and isometric (p<0.01) strength was significantly improved. Regardless of type of action and contraction velocity, ankle muscles strength was significantly improved after training. However, the improvement in ankle extension was greater (p<0.001) compared to the other movements. SAV training resulted in decreased postural sway, especially in M/L direction and greater PL and PB muscles EMG activity (p<0.001) during the SR and OLS tests. Improvements were greater in the absence of vision. It is concluded that SAV training, could enhance lower limb strength and reduce postural sway. Specific, reductions in M/L direction following training could be associated to the greater use of ankle evertors as a result of their strength improvements.

PRECISION OF HAND-HELD LACTATE-ANALYZERS AND THEIR PRACTICABILITY FOR EXERCISE PRACTICE
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INTRODUCTION: Lactate (lac) controlled endurance training often is based on mathematical-physiological reference points such as individual lac thresholds or the 4mmol threshold. In exercise practice portable lac-analyzers are frequently used in lots of disciplines due to low costs, easy han-dling and fast analysis. However scientists and coaches need to be aware of the fact that these ana-lyzers are subject to device dependent measurement variability. Knowing these variances is essential for giving precise exercise recommendations. Additionally to this device variance an individual biologi-cal variance of the athlete must be kept in mind. Based on these facts, aim of the study was to point out the influence of the precision of 3 hand-held analyzers on training control recommendations. METHOD& MATERIAL: 14 lac dilutions with unknown concentrations (c[ lac]) where prepared by using a control solution for lac-analyzers (EKF Diagnostics, Barle ben). Each dilution was measured tenfold using either two LACTATE SCOUTs (LS1 & LS2, Senslab, Leipzig) or ACCUTREND LACTATE (AL, Roche Diagnostics, Mannheim). For each dilution variance (V'), standard deviation (s), variation (spread from minimum to maximum score) (V) as well as coefficient of variation (CV) was calculated. RESULTS: For device LS1 a minimum V' of 0.2 mmol/L was detected by testing lac dilutions with a mean c[ lac] of 10.8 mmol/L. Subdivided in ranges LS1 & LS2 show a mean V' of 0.2 mmol/L in the range from 0.7 to 3.6 mmol/L, a mean V' (LS2) of 0.7 mmol/L in the range from 3.8 to 8.0 mmol/L and a mean V' of 1.5 mmol/L (LS1&LS2) in the range from 8.5 to 11.9 mmol/L. For AL a minimum V' of 0.4 mmol/L was identified in dilutions with a mean c[ lac] of 1.6 resp. 4.0 mmol/L whereas a maximal V' of 4.0 mmol/L was found in dilution with a mean c[ lac] of 13.9 mmol/L. Subdivided in ranges AL shows a mean V' of 0.8 mmol/L in the range from 0.5 to 2.1 mmol/L, a mean V' of 1.3 mmol/L in the range from 4.0 to 6.5 mmol/L and a mean V' of 3.4 mmol/L in the range from 10.0 to 13.9 mmol/L. CONCLUSION: Lac controlled endurance training based on lac threshold may lead to a measurement error of ±0.1 mmol/L for LS and ±0.4 mmol/L for AL in intensity corresponding to 0.5 to approx. 4.0 mmol/L Lac due to device depending variance. Higher workloads lead to greater variance. No differences were found when using two iden-tical devices. From our point of view by accepting these little variances modern hand-held lac analyzers seem to be a useful and mostly accurate way to get viable scores. Nevertheless every researcher and coach should first determine the device dependent variance before interpreting lac values. There-fore are reliability test is recommen
ded.
REPEATABILITY AND SYMMETRY OF SOME TECHNICAL ACTIONS IN ITALIAN KARATEKAS: A COMPARISON BETWEEN KATA AND KUMITE ATHLETES

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INTRODUCTION AND AIMS

Studies were carried to integrate the evaluation of some specific karate elements (arms, legs, hip actions and coxofemoral joint flexibility) with physical fitness. Another important ability is to lead effective technical actions with either dominant or non-dominant limbs. The aim of this study was: a) to verify the repeatability of some specific evaluation tests in Italian mid-high level athletes of karate; b) to evaluate the differences between the dominant and non-dominant limbs; c) to analyze the differences between kata and kumite competitors.

MATERIALS AND METHODS

Twelve mid-high level karate athletes (1st Dan to 3rd Dan, six kata and six kumite specialists) volunteered for the study (Mean±SD, age 22.0±2.0 years, weight 71.0±7.1 kg, height 175.0±0.05 cm, BMI 22.9±1.3). Sterkowicz's protocol (1) was applied to collect data regarding both dominant and non-dominant limbs, such as: i) Hip Turning Speed (HTS), ii) Speed Punches (SP), iii) Hip Flexibility Index in the kicks (HFI), iv) Rapide Kicks (IKR). Each test was executed five times (test) and repeated one week later (re-test). All the time needed to complete 30 hip turnings starting from the guard position was recorded. In SP, the time needed to complete 30 Kizami-Gyaku Zuki combinations (in order to alternate punches directed to the face and the body) was recorded. For the HFI, athletes performed five Mawashi-geri kicks. The the kick's height reached by the back leg against a suspended training bag was measured, then the index was calculated as hT / hA, where hT is the average height of the five kicks and hA is the athlete's stature. The HR test, subjects were asked to execute 30 consecutive Mawashi-geri kicks with the front leg against a hand kicking target placed at a face level. The elapsed time from the beginning of the action (guard position) to the foot's contact on the ground after the last kick was recorded.

RESULTS

No differences were found between test and re-test (ICC > 90).

No differences were found between dominant and non-dominant limbs (p>0.05).

No differences were found between kata and kumite athletes (p>0.05).

CONCLUSIONS

All tests executed appear to be repeatable, then suitable to evaluate the training effects in mid-high level karate's athletes. The practice of karate leads to a well balanced development and control of both the dominant and the non dominant limbs, then athletes are able to perform similar effective actions regardless to the guard position.

TECHNICAL AND TACTICAL DIFFERENCES IN REGIONAL AND NATIONAL LEVEL THAI BOXERS

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INTRODUCTION AND AIMS

Analytic observation of athlete's behaviors and actions during combats may supply important elements about their abilities or skill levels (1,2), thus it is essential for planning proper training programs designed to improve the performance.

The aim of this study was to analyze and to compare the tactical and technical behaviors employed by regional and national level Thai boxers during their matches.

MATERIALS AND METHODS

Six national level (NLA) (Mean±SD, age 24.0±2.2 years, weight 70.1±0.4 kg, height 178.6±2.0 cm, BMI 22.0±0.5) and six regional level (RLA) Thai boxers (Mean±SD, age 25.3±2.8 years, weight 74.5±0.5 kg, height 178.3±2.7 cm, BMI 23.4±0.8), weight category 70 to 75 kg, were followed through some competitions. Video-recorded matches of the Italian Championships and the Lombardia Championships were used to compare the technical actions, grouped in four classes: arms (AC), legs (LC), elbow (EC) and knee (KC). Further analysis with respect to their outcome (to target (T), failure (F), parry (P), diverted (D)) and to the round were carried out.

RESULTS

Compared to RLA, NLA led more actions to target (59.1% vs. 42.6%, p<0.01) and failed less (16.0% vs. 31.6%, p<0.01). They used more KC (82.1% vs. 64.9%, p<0.01) and LC techniques (69.5% vs. 48.3%, p<0.01). Significant differences were found mainly in the 3rd round: NLA showed less failures than RLA (15.6% vs. 33.0%, p<0.01), less diverted (13.3% vs. 27.1%, p<0.05) and more targets (69.7% vs. 39.8%, p<0.01).

Compared to RLA, NLA used more KC actions in the 2nd round (90.0% vs. 60.6%, p<0.01) and more LC actions in the 1st and 3rd round (69.4% vs. 46.2%, p<0.01; 78.6% vs. 42.2%, p<0.01). Right blow with the knees is the specific action preferred by NLA (27.1% vs. 8.44%, p<0.01) whereas Jab is the preferred one by RLA (17.5% vs. 11.4%, p<0.05 compared to NLA).

Right front kicks, right middle kicks and left low kicks are the most used actions to target.

CONCLUSIONS

Considering the actions to target and failed, there is evidence of the higher precision of NLA with respect to RLA. Thanks to the better athletic state, even if fatigue arises, NLA are still able to execute knee actions during the second round and the most exhausting leg actions during the first and the third round in particular. Besides, NLA show a better tactical management compared to RLA: the specific action used by RLA is Jab (arm action), whereas NLA prefer knee actions, which score is higher.

References.

TRAINING CONCEPTIONS OF GOALKEEPER COACHES OF FIRST AND SECOND PORTUGUESE SOCCER LEAGUES

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In modern soccer, the goalkeeper is a crucial element in the dynamical team organization, due to your own privileged position and your differentiated role, unlike other players. The evolution of the goalkeeper position is described in the training conceptions. However, the knowledge about the training conceptions associated with the goalkeeper coach is very insufficient. The aim of this study was to compare the training conceptions associated with the goalkeeper coach of Portuguese First (1stLg) and Second (2ndLg) top soccer leagues.

The sample was composed by sixteen goalkeeper coaches’ of the 1stLg (n=8) and the 2ndLg (n=8) [mean±SD: age 43±0.7 (7); coach level 2.6±0.8; years as goalkeeper coach 7.5±5.5]. It was elaborated, construct validated and applied a direct questionnaire at the conceptions related to the planning and sport periodization, to the training contents and to the evaluation and control of goalkeepers’ performance. The Mann-Whitney and the independent T test were applied according to the normality distribution of the variables.

Statistically significant differences were found between the 1stLg and the 2ndLg, with more elevated mean values to the 1stLg to the following aspects: larger duration of the team training sessions per week in the preparatory period (113±32) to the 1stLg and 78±12 minutes to the 2ndLg, p=0.02, larger duration of the goalkeeper coach training sessions per week in the preparatory period [503±200] minutes to the 1stLg and 259±127 minutes to the 2ndLg, p=0.01, more goalkeeper training sessions made separately to the team in the competitive period (3.3±0.7) to the 1stLg and 2.3±0.7 to the 2ndLg, p=0.01, complementary resources like a video analysis are more used (3.4±0.7) to the 1stLg and 2.4±0.7 to the 2ndLg, p=0.04 and the evaluation of the goalkeepers is more frequently made through the performance into the different training exercises (4.6±0.5) to the 1stLg and 3.8±0.9 to the 2ndLg, p=0.04. In the 2ndLg they use often the programs of Indoor Cycling in small-sided games to implement the team game model (3.9±0.5) to the 1stLg and 4.4±0.7 to the 2ndLg, p=0.03. The time spent in the general training sessions, in the goalkeeper training sessions and in goalkeeper training sessions made separately to the team in the competitive period is more elevated in the 1stLg. In future researches, it’s very interesting to understand the influence of these variables in the goalkeepers’ access to the 1stLg. Relatively to the evaluation and control of goalkeepers’ performance, it’s more frequently made through the performance into the different training exercises and it’s more used complementary resources like a video analysis by the goalkeeper coaches’ of the 1stLg than the 2ndLg. The superior importance given to these facts can be as consider specific precise details in maximizing the performance of Portuguese top goalkeepers.

INDOOR CYCLING - LACTATE KINETICS CONCERNING THE ANAEROBIC THRESHOLD

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Objectives

Indoor Cycling (IC) providers promise an attractive, interesting, health-orientated aerobic endurance-training. Following motivating music a virtual track is simulated. The compound is emulated by changing the resistance. The resistance was set subjectively or according to the heart rate (hr). The aim of this study was to determine lactate kinetics during a IC session with resistance set subjectively (ICsubj) and set at a heart rate control (IC Chr).

Methods

31 subjects (M=15; F=16) between 32 and 46 yrs. (41.2±6.2 yrs.) were recruited. The tests took place on three consecutive weekends. To determine the individual exercise capacity a submaximal bike-ergometer test was conducted. Afterwards each subject participated in both subjectively controlled and heart rate controlled IC session. These sessions were identically composed of seven intensities profiles: WarmUp, Hill, Recovery, Jumps, Slipstream, Sprint and CoolDown. Concerning the lactate concentration one baseline value and after each profile a further value was measured using LactatePro LT1710. The hr was constantly monitored using Polar RS800. The perceived exertion was assessed using the RPE-scale by Borg. The statistical analysis was conducted with SPSS 14.0. To determine the deviation of the individual results regarding the lactate threshold (4 mmolL-1) a one-sample t-test to test-value 4 was accomplished. Significance was set at p<0.01.

Results

During IC Chr the lactate baseline was 1.8±1.2 mmolL-1. Already after the WarmUp lactate increased above the anaerobic threshold (4 mmolL-1) and resulted during the sprint in the highest value of 8.0±3.3 mmolL-1. The lactate values of the profiles Hill (p=0.000), Sprint (p=0.000) and CoolDown (p=0.000) were significantly above the lactate threshold. During IC subj the lactate baseline was 2.2±1.6 mmolL-1 and the peak-value after the Hill was 9.6±3.3 mmolL-1. The profiles Hill (p=0.000), Recovery (p=0.001), Jumps (p=0.001), Slipstream (p=0.003), Sprint (p=0.000) and CoolDown (p=0.000) were significant above the lactate threshold.

Conclusions

In total, the anaerobic component during the IC subj was 70%, during the IC Chr 47%. Therefore IC cannot be promoted as aerobic endurance training. Already after the WarmUp lactate concentration increased above the anaerobic threshold and reached in particular cases peak values above 14 mmolL-1.

IC does not represent aerobic endurance training. For healthy ath-letes Indoor Cycling can act as an alternative workout, though regarding overtraining it should not be attended as daily exercise unit. Against the background of risks with high hr values it is not suitable for patients with coronary or cardiac heart disease, overweight or for seniors and sports-newcomers.

INDOOR CYCLING - LACTATE KINETICS CONCERNING THE ANAEROBIC THRESHOLD AND DIFFERENCES IN PHYSIOLOGICAL PARAMETERS BETWEEN SUBJECTIVELY AND HEART RATE CONTROLLED LESSONS

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Objectives

Indoor Cycling (IC) providers promise an attractive, health-orientated aerobic endurance-training. Following motivating music a virtual track is simulated. The compound is emulated by changing the resistance. The resistance is set subjectively or according to the heart rate. The aim of this study was to determine lactate kinetics during a IC session with resistance set subjectively (IC subj) and set at a percentage of maximal heart rate (IC Chr) estimated by the Kar-vonen-formula (hrmax=220-age). Furthermore the significant deviation

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from the anaerobic 4 mmol threshold was traced. In addition the differences in heart rate (hr), lactate (lact) and RPE-value were determined between these two lessons.

Methods: 31 subjects (M=15; F=16) between 32 and 46 yrs. were recruited. Each subject participated in both ICSsubj and IChr. These sessions were identically composed of seven intensity profiles. Concerning the lact one baseline value and after each profile a further value was measured. The hr was constantly monitored. The perceived exertion was assessed using the RPE-scale by Borg.

Results: During IChr the lact baseline was 1.7 ± 1.2 mmol.L-1. Already after the WarmUp lact increased above the anaerobic threshold and resulted during the sprint in the highest value of 8.0 ± 3.3 mmol.L-1. The lact values of three profiles were significantly above the lact threshold. During ICSsubj the lact baseline was 2.2 ± 1.6 mmol.L-1. The peak-value after the Hill was 9.6 ± 3.3 mmol.L-1. Six profiles were significantly (p<0.01) above the lact threshold.

The composition of the lessons concerning lact shows, that five out of seven profiles resulted in higher values during the ICSsubj compared to the IChr, two profiles were significantly higher for the ICSsubj in terms of hr, six out of seven profiles were higher during the ICSsubj compared to the IChr. Five profiles were significantly higher for the ICSsubj. Regarding the RPE six out of seven profiles were higher during the ICSsubj compared to the IChr. Five profiles were significantly higher for the ICSsubj.

Conclusions: The anaerobic component during the ICSsubj was 85%, during the IChr 47%. Therefore IC cannot be promoted as aerobic training. Already after the WarmUp lact increased above the anaerobic threshold and reached in particular cases peak values above 14 mmol.L-1. The comparison of both lessons shows, that a majority of the IC-lesson participants had a less distincted body and performance feeling. That is the reason why in most cases they had difficulties to judge and convert the subjectively induced intensities. Therefore we could find significantly higher lact, hr and RPE during the ICSsubj compared to the IChr.

Against the background of risks with high hr values it is not suitable for patients with coronary or cardiac heart disease, overweight or for seniors and sports-newcomers.

DIFFERENCES IN HEART RATE, LACTATE AND RPE-VALUE BETWEEN HEART RATE AND SUBJECTIVELY CONTROLLED INDOOR-CYCLING LESSONS

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Objectives

Indoor Cycling (IC) is said to be an health-orientated aerobic endurance training. Following motivating music a virtual track is simulated. The compound is emulated by changing the resistance. The resistance is set subjectively or according to the heart rate (hr) which was indicated by a percentage of the maximal heart rate estimated by the Karvonen formula. The aim of this study was to determine if there are significant differences in heart rate, lactate and RPE-value between heart rate (IChr) and subjectively (ICsubj) controlled Indoor-Cycling lessons.

Another purpose was to answer the question if people who are less well trained in endurance, IC beginners or sports-newcomers should rather practice the IC-lesson heart rate or subjectively controlled.

Methods

There were 31 subjects (M=15; F=16) between 32 and 46 yrs. recruited. The tests took place on three consecutive weekends. To determine the individual exercise capacity a submaximal bike-ergometer test was conducted. Followed by a subjectively controlled and a heart rate controlled IC lesson. Concerning the lactate concentration one baseline value and seven further values were measured using Lactate-ProTM LT1710. The hr was constantly monitored using Polar RS800. The perceived exertion was assessed also seven times by using the RPE-scale by Borg. The statistical analysis was conducted with SPSS 14.0 (Ancova for heart rate and lactate and Wilcoxon for RPE-values). Significance was set at p<0.01.

Results

Concerning lactate, two out of seven profiles were during the ICSsubj significantly (p<0.01) higher compared to the IChr. In terms of heart rate, five out of seven profiles were significantly (p<0.01) higher during the ICSsubj compared to the IChr. Regarding the RPE-values we found similar results. Five out of seven profiles were significantly (p<0.01) higher during the ICSsubj compared to the IChr.

Discussion

A majority of the IC-lesson participants had a less distincted body and performance feeling. That is the reason why in most cases they had difficulties to judge and convert the subjectively induced intensities. Therefore we could find significantly higher lactate, heart rate and RPE-values during the ICSsubj compared to the IChr.

Conclusions

According to the results it is advised for people who are less well trained in endurance, IC beginners or sports-newcomers that they should rather practice the IC-lesson heart rate controlled than subjectively controlled. In this manner it is less stressful for the entire heart circulation system. In addition to this, Indoor-Cycling is not an aerobic endurance sport, which confirms the above mentioned recommendation.

SOMATOTYPIING OF SWISS TEAM SKIALPINISM ATHLETES

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Introduction: Skialpinism was an Olympic sport at the OlympicWinter Games from 1924 (Chamonix) to 1948 (St.Moritz). The popularity of this sport has again increased over the last decade. Different institutions (e.g. Union Internationale des Associations d’Alpinisme) try to establish its Olympic status again. Race distances may vary between 10 and 20 km (the longest reaches 50 km). During such an event athletes have to climb 3000 to 7500 meters. Individual and team competitions are organized. Skialpinism athletes generally participate at 23 races per winter season.

Aim: To assess the somatotype (S) of Swiss Team Skialpinism (STS) athletes.

Methods: Ten male and three female STS athletes participated in this study. Anthropometry was assessed following the ISAK guidelines. S was calculated using the Carter&Heath method (1990). References of other ski disciplines were used for comparison. A simple t-test procedure was used for analysis. Significance was set at the 5% level.

Results: Age ranged from 17 to 37 years. Male stature and body weight were 179.5 ± 2.6 cm and 73.4 ± 4.0 kg respectively. BMI ranged from 20.5 to 24.9 kg.m-2. Male mean S was 2.0-5.1-2.8 ± 0.6-0.7-1.4. Female stature and body weight were 162.3 ± 3.8 cm and 61.5 ± 7.2 kg respectively. BMI ranged from 19.9 to 24.1 kg.m-2. Female mean S was 3.4-5.1-1.7 ± 0.8-1.6-1.4.
Discussion: Male STS athletes are ectomorphic-mesomorphs, borderline to balanced mesomorphs. Individual World Cup ranking of the athletes increases with mesomorphy levels. Compared with the 5 of 46 Tjech elite cross-country ski athletes (1.7-6.3-2.0), the male STS athletes show significant lower mesomorphy and higher ectomorphy (Orvanova, 1987). European elite Alpine ski athletes show significant higher mesomorphy levels compared to male STS athletes (Carter&Heath, 1990). These findings may suggest that an increase of the degree of mesomorphy should be a major training objective in male STS athletes to ensure further athletic success. Strength training together with nutritional advice of the athletes may therefore be appropriate.

Female STS athletes are endomorphic-mesomorphs. No significant differences with the reference data of other ski disciplines were observed.

Conclusion. Male and female Swiss Team Skialpinism athletes show ectomorphic-mesomorph and endomorphic-mesomorph somatypes respectively. Male STS athletes show significant lower mesomorphy levels than athletes of other ski disciplines. In the male group, mesomorphy is positively associated with World Cup ranking. Hence, our data suggest that training should be aimed at a further increase of mesomorphy in male STS athletes.

References.

HIGH INTENSITY SHOCK MICROCYCLES: AN EFFICIENT METHOD TO IMPROVE VO2MAX
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Introduction: Maximal oxygen consumption (VO2max) as a determinant of cardiorespiratory fitness is an often used predictor of aerobic endurance capacity. In already trained soccer players, VO2max can further be improved by performing high-intensity interval training (HIIT) sessions over two month twice a week (Helgerud et al., 2001). Alternatively it seems, that VO2max can effectively be increased when HIIT sessions are performed daily once or twice within a 10-day shock microcycle (Stolen et al., 2005). The aim of our study was to investigate the effect of a 15-day high intensity shock microcycle on endurance performance and muscle fatigue in moderately endurance trained subjects.

Methods: Two female and five male subjects, age 29.7 ± 5.0 yr, performed during 15 days an average of 17 ± 3 HIIT-sessions. One session consisted of 4 times 4 min cycling on a cycle ergometer at 90-95% of the individual maximal heart rate with a 3-min recovery period in between. Continuous heart rate measurement, rating of perceived exertion and lactate measurement were used to supervise the training sessions. Before (T1), as well as 2 days (T2) and 7 days (T3) after the last training session a incremental exercise tests to exhaustion on a bicycle ergometer was performed to determine maximal heart rate, maximal oxygen consumption and maximal aerobic power output. At T1, T2 and T3 as well as at day 3, 6, 9 and 11 during the training additional counter movement jumps on a force plate were performed.

Results and discussion: VO2max increased by 5.8% (from 58.5 ± 4.9 mLkgmin-1 to 61.7 ± 5.4 mLkgmin-1 (P < 0.01)) and maximal aerobic power output by 5.4% (from 396 ± 59 watts to 418 ± 62 watts (P < 0.01)). Maximal counter movement jump performance decreased during the microcycle by 16.3% from 48.7 ± 4.5 watts/kg to 41.8 ± 1.7 watts/kg (P < 0.01) and recovered by 12.0% at T3 (46.7 ± 5.0 watts/kg).

We conclude that 17 sessions of high-intensity interval training during a 15-day shock microcycle effectively improves VO2max and maximal aerobic power output. Decreased jump performance indicates for substantial muscular fatigue immediately at the end of the microcycle, which was not fully recovered one week after cessation of the training.

References.

ACCURACY AND RELIABILITY OF MINIMAXX GPS TECHNOLOGY IN ROWING
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Background
Improvements in GPS technology have provided a platform for the monitoring and tracking of athletes on a much wider scale than ever before. The size and low cost of GPS hardware now allows for a complete unit to be worn by the athlete or alternatively placed unobtrusively on their equipment. Rowing is a perfect sport for the implementation of GPS technology due to the uninterrupted view of the sky and that movements of the boat are recorded predominantly in the horizontal plane. Despite the near perfect environment of rowing there are still uncertainties with respect to the accuracy and reliability of GPS determinations of position and time.

Methods
The Australian Institute of Sport has been involved in the designed and manufacture of inertial data loggers with built-in GPS and RF capabilities that weigh under 70g. The GPS devices (MinimaxX, Catapult Innovations, Australia) have been used by the Australian Rowing Team for the last 3 years. Inertial data are recorded at 100Hz and GPS data at 5Hz. The devices were placed on 244 boats during major competitions at international standard rowing courses. Race time from the GPS device (MinimaxX 2000m race time) was compared with official race time from each boat monitored. In addition, 45 boats were fitted with two devices to calculate a reliability of the MinimaxX 2000m race time measure.

Data Analysis
MinimaxX 2000m race time was calculated as the time taken from the first boat movement (measured by the inertial sensors) to the time when the boat had travelled a straight line distance of 2000m. Standard error of the estimate (SEE) was calculated using official race times and corresponding 2000m race times from the MinimaxX unit. Reliability typical error measure (TEM), s and % and 95% confidence limits (CI) of MinimaxX 2000m race times were determined (1).

Results
Mean difference +/-SD between official race time and MinimaxX 2000m race time was 0.02+/-0.42s. Correlation between the measures was near perfect (R2=0.99999). SEE between MinimaxX 2000m race time and official race time was 0.45s. This translates to a boat displacement error of 2-3m depending on the boat class. MinimaxX 2000m race time from boats which had 2 units fitted during the race had a TEM of 0.30s with a lower CI of 0.25s and an upper CI of 0.37s. When expressed as % reliability data was 0.12% with a lower CI of 0.10% and an upper CI of 0.15%.
CONTRIBUTIONS AT THE CONCEPTUAL AND PRACTICAL OPTIMIZATION OF THE METHODOLOGY FOR THE REALIZATION OF THE PHYSICAL PREPARATION IN THE HANDBALL GAME

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Introduction. The performances in handball are determined by a multitude of factors that condition each other. The interdependence between these factors is correlated with the athletic mastery of the players and the team. The unification of the technical-tactic value in the performance sport as well as the use of methods, means and equipment used for training gives back to the physical value its real contribution, this being the fact which could determine the result in the competitions. Organization of the research. The research for the present experiment was realized during a competition year, the experimental sample being constituted of two groups, each of 14 players and participants in the performance echelons of the handball in Romania. During the experiment on the experimental group there was acted with a series of means for the perfection of the previous 400-m. Obtained results. The new aspects in the conceptual and practical optimization of the methodology of the physical preparation in handball are offered by the instructional project in which the instructional operations insure a tight connection between the objectives of the training methodology. I visualize that the entire preparation and especially the physical training should be developed according to a clean-cut, in the main time in tight connection.

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DECREASE IN OXYGEN UPTAKE AT THE END OF A SUPRA-MAXIMAL 400M  
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A decrease has been observed in all subjects during an 800-m running test (Thomas et al 2005). This study was realized according to the pacing strategy of competition (fast start and velocity decrease in the final part). During a 1500m this phenomenon has been observed only in 8/12 subjects (Hanon et al 2008). The purpose of the present study was 1) to verify that a decrease occurs during a 400-m running test performed according to the usual event pacing regulation and 2) to determine the relationship between the magnitude of the decrease and the metabolic state at the intermediate 300m of a 400-m running trial. Nine well-trained runners (8 male 400-m and one woman) (age 21.6 ± 6.3 [18] years, height 177.7 ± 6.3 [165] cm, and body mass 70.0 ± 4.7 kg [56], average performance 50.7 ± 1.3 [1,586] for the men [wman] volunteered for the study. The first track running test was a supra-maximal 400-m exercise reproducing the conditions of competition and the second test was a 300-m exercise realized two days later with help of audio-signal aiming to duplicate the exact pacing strategy of the previous 400-m. For both tests, ventilatory variables were recorded by means of a breath by breath gas exchange system (Cosmed K4b2, Roma, Italy). Heart rate (HR) was measured and recorded continuously with a heart rate monitor (Sport Tester PE 3000, Polar, Kempele, Finland). Blood samples were collected from the ear lobe and measured with the i-stat portable clinical analyser (Abbott, East Windsor, USA) before and 1, 4, 7, 10 min after the end of the running test. The difference between the time at 300-m on the 400-m running test and the time at the 300-m running test was not significant. The mean velocity decrease in the last 100m was 8.9% and ranged from 2.20 to 15.9% according to the subjects. During the 400-m running test, the maximum average value was detected 200m after the onset of the race. From this moment, a decrease was observed until the end of the race. This phenomenon was significant in the last 100m of the race and equal to 11.7 + 4.2 mlO2·min^-1·kg^-1 that was 20.4 + 7.0 % of peak.

The peak and nadir metabolic results after the 400-m were 7.01 + 0.04, 21.6 + 2.6 mmol·l^-1, 5.5 + 1.0 and 96 + 1.8 % and were 7.18 + 0.03, 16.5 + 1.5 mmol·l^-1, 10.9 + 1.6 and 96.3 + 1.5 % after the 300m for pH, blood lactate, HCO3-, SaO2, respectively. A significant relationship was observed between decrease and pH (r= -0.76), HCO3- (r= -0.67) and SaO2 (r= -0.73) p< 0.05. These track running data highlighted the fact that the decrease is the consequence of metabolic perturbations linked to acidosis status and that the buffering capacity of the athletes is of importance to success in this distance.

References.  
COMPARISON OF PHYSIOLOGICAL PROFILES BETWEEN ELITE CADET AND YOUNG SENIOR JUDOKS

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Previous investigations showed that functional abilities represent one of the determinants of success in judo competition. A significant correlation between functional abilities and technical elements in judo means that an improvement in some of the physiological variables can have a positive effect on the execution of techniques during fights. The aim of the conducted study was to determine and compare the functional characteristics between elite cadet (n=11, age 15 yrs. +/-0.5) and young senior judokists (n=8, age 20yrs. +/-1.2). All subjects underwent an identical study protocol (measurement of anthropometric characteristics, estimation of parameters of anaerobic capacity by 30-s all-out Wingate test on arm cycle ergometer, estimation of VO2max on leg cycle ergometer, estimation of VO2peak on arm cycle ergometer and measurements of parameters of dynamic lung function) in the concluding part of preparation periods before European Championship in respective age groups. Results: Cadets vs. young senior judokists (mean+/-SD): Peak power (W/kg) 9.66+/-1.02 vs. 9.34+/-3.32 (p>0.05); Mean power (W/kg) 6.86+/-0.91 vs. 6.72+/-0.89 (p>0.05); VO2max (ml/kg/min) 58.82+/-4.78 vs. 57.32+/-5.24 (p>0.05); VO2peak (ml/kg/min) 40.72+/-4.47 vs. 47.12+/-4.47 (p<0.05); FVC (l) 5.56+/-0.31 vs. 6.99+/-1.36 (p<0.05); FEV1 (l) 4.69+/-0.5 vs. 5.44+/-0.45 (p<0.05); body fat (%),10.38+/-5.6 vs. 8.22+/-3.06 (p<0.05). The results obtained showed that young senior judo players were characterized by a lower percentage of fat tissue, better aerobic capacity of upper body and better dynamic lung function in relation to cadet judo athletes. Contrary to the supposed, relative values of maximum power were higher in cadet judo athletes, but without statistical significance. Results of the conducted investigation provide information for quantitative presentations of physiological adaptation of elite cadets and young senior judokists to the physical demands over many years lasting specific training process. The proposed test battery may be used in the estimation of functional status in competitors and more precise determination of competition profile in top judo.

RELATIVE AGE EFFECT IN ELITE YOUTH SOCCER PLAYERS - BIRTHDATES DISTRIBUTION AND BODY MEASUREMENTS ANALYSIS

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Relative age effect studies have systematically showed a skewed birthdates distribution among participants, in several sports and different age-groups, reporting a higher number of participants born in the early part of the year. Although many researchers pointed physical development and maturation as one of the possible causes for this effect, few works have related physical measurements with birthdates distribution. Therefore, the aim of this study was to analyse the distribution of birthdates from elite youth soccer players, and relate them to players' height and weight. All studied players (n=1007) were participants in the UI7 and U20 FIFA 2007 World Cup and were divided according to their specific field position (Goalkeepers, Defenders, Midfielders and Forwards) and according to their teams Confederation (Asian Football Confederation AFC, Confederation Africaine de Football CAF, Confederation of North, Central American and Caribbean Association Football CONCACAF, Confederacion Sudamericana de Futbol CONMEBOL, Union des Associations Europeennes de Football UEFA, and Oceania Football Confederation OFC). Each player's birthdate was analysed and classified by trimester. The distribution of all players and groups (Position and Confederation) was compared through Chi-Square test and body measurements comparison between trimesters of birth was made using one-way ANOVA. Significant differences were found in the distribution of the total group (p<0.01), in all of the field positions (p<0.01) and in AFC, CAF, CONCACAF, CONMEBOL and UEFA (p<0.01), revealing that the players from these groups tend to be born near the beginning of the selection year. On the contrary,CAF players tend to be born in the late part of the year. Significant differences were also found in players' height comparison between trimesters of birth, revealing taller players in the beginning of the selection year (F=2.716, p<0.05). These results suggest that the time of year when a player is born may have influence on the selection of young elite soccer players, and that body measurements are also related to this selection.

EVALUATION OF BODY COMPOSITION USING THREE DIFFERENT METHODS COMPARED TO DEXA IN TURKISH UNIVERSITY STUDENTS

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Purpose: This study evaluates the simple methods of Skinfold (SKF), Ultrasound (US) and Bioelectrical Impedance Analysis (BIA), using dual-energy X-ray absorptiometry (DEXA) as a reference method for the assessment of body fat (BF) in normoactive Turkish male and female university students. Moreover, we aimed to develop new regression equations to predict %BF from SKF and US measurements. Methods: Two hundred and eight students (104 males, 104 females) aged between 18 to 26 years participated in this study. Differences among DEXA, SKF, US and BIA were examined by ANOVA test. Intra-class correlation coefficient and Bland and Altman plot analysis were used for comparative analysis among the methods. Moreover, multiple regression analyses were conducted to developed regression equations to predict %BF from SKF and US measurements. Results: Results demonstrated the mean %BF derived from DEXA was significantly (p<0.01) greater than those of SKF, US and BIA in both genders. Regression analysis for predicting %BF using three sites simultaneously for male and female university students was r= 0.92, SEE=2.40 and r= 0.91, SEE=2.82 for SKF and r= 0.93, SEE=2.31 and r= 0.90, SEE=3.00 for US, respectively. Conclusion: With these new regression equations, US appears to be a reliable, portable, and non-invasive tool which can be used by any field investigation.

KINEMATIC STUDY OF THE CHOKU-ZUKI PUNCHING MOVEMENT PERFORMED BY THE PORTUGUESE KARATE TEAM AND PEOPLE WITHOUT KARATE EXPERIENCE

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Introduction

This study compares the upper limb kinematics in a karate punching movement (choku-zuki) on a makiwara (training instrument) performed by a group of karate athletes (KGI) and by a group of subjects without any karate experience (NKG).
PHYSIOLOGICAL RESPONSES TO SHORT-TERM, HIGH-INTENSITY INTERMITTENT ROWING EXERCISE ON ERGOMETER

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Purpose: This study was designed to observe physiological response during one bout of high-intensity intermittent short time rowing exercise and to evaluate the effect of repeated bouts of the exercise on rowing performance by using the indoor rowing ergometer for college rowers.

Methods: In the first experiment, nine male collegiate rowers were participated in the high-intensity, intermittent short time exercise on rowing ergometer. Vo2max was measured by incremental rowing exercise on the ergometer. The high-intensity, intermittent exercise consisted of either five or eight bouts of 20-sec rowing with the maximal effort of the subjects, and each bout was separated by 10-sec rest. Oxygen consumption and heart rate were monitored during the test. Blood lactate concentrations were analyzed before, immediately after the high-intensity exercises. In the second experiment, 13 male collegiate rowers performed 6-week training regimens which consisted of high-intensity rowing exercise (8 sets with 10-sec interval, either 20-sec rowing with 10-sec interval, or 2 times/week). Performance tests and maximal incremental exercise on rowing ergometer were carried out before and after the 6-week training.

Results and Discussion: In the first experiment, subjects reached to the maximal level of Vo2 and heart rate at the fourth set during both 5- and 8- sets of high-intensity, intermittent exercises. However, blood lactate concentration immediately after high-intensity, intermittent exercise was significantly lower in the 5-set protocol than in the 8-set protocol (9.1±1.2 vs. 11.3±1.6 mM, p<0.05). This result suggests that the 8-set protocol is much more vigorous and better than the 5-set protocol as high-intensity, intermittent rowing exercise for rowers. In the 6- week high-intensity, intermittent exercise training, low frequency group (LF; 2 times/week) significantly improved their rowing performance (3.2±1.9 sec/1000m and 8.4±5.5 sec/2000m time trials), whereas high frequency group (HF; 5 times/week) significantly improved their performance in 1000m trial (4.5±2.3 sec), but not in 2000m trial (3.1±6.7 sec). Maximal power during incremental rowing test was not changed in both LF and HF groups in response to the repeated bouts of high-intensity intermittent exercise for 6 weeks. When compared with HF group, LF group seemed to be less burdened with the 6-week high-intensity, intermittent exercise regimen. These results suggest that high-intensity, intermittent rowing exercise on ergometer, which consists of 20-sec maximal exertion with 10-sec interval, 8 sets/bout, 2 times/week, more than 6 weeks, could be recommended to the young rowers in order to improve their rowing performance.

RUNNING- VS. STRENGTH-BASED WARM-UP: ACUTE EFFECTS ON THE NEUROMUSCULAR FUNCTION

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Introduction: Although active warm-up (WW) is often prescribed before physical activity, little is known on its effects on the neuromuscular function. The aim of this study was to investigate the influence of two running- vs. strength-based warm-up protocols on neural and contractile properties of knee extensor (KE) muscles.

Methods: 10 trained subjects performed randomly two different WW protocols, one of which (running warm-up, RWU) included a slow running of 8-10 km.h-1, 10 min, athletic drills of 10 min and sprints of 3 x 60 m accelerations and 5 x 15 m; ~15 min, while the other (strength warm-up, SWU) consisted of strength exercises (e.g. bilateral 90° back squats (2 x [3 reps at 90% RM followed by a set of 6 reps at 30% recovery) and 2 min), Olympic lifting movements (clean and snatch, 3 x [6 reps at 30 kg followed by a set of 6 reps at 20 kg], recovery = 2 min) and reactively running (4 x 10 m exercises). Of importance is that all work performed was similar between RWU and SWU (318±7 vs. 318±6 J.kg⁻¹). Before and immediately after WW, maximal percutaneous electrical stimulations were applied to the femoral nerve. Changes in EMG activity of vastus lateralis (VL) and vastus medialis (VM) muscles normalized to M-wave amplitude (RMS/M) as well as muscle activation (VA) were quantified during KE maximal voluntary contraction (MVC). M-wave characteristics and twitch contractile properties were assessed after each stimulus. The torque and EMG data were recorded (2000 Hz).

Results: Subjects performed I+51.6%, P<0.01 and +10.9%, P<0.05 and VA I+10.9 and +12.9%, P<0.05 increased to the same extent after RWU and SWU, respectively. The changes in MVC and VA were highly correlated (r = 0.83 and 0.85; P<0.01) and the raw EMG activity during MVC increased in VL I+18.6 and +22.2%, P<0.01 and VM I+18.3 and +20.1%, P<0.05 for RWU and SWU, respectively, RMS/M increased in the two vasti (32.4% and 28.9% in VL and VM, both P<0.05) for SWU, whereas did not change significantly for RWU I+14.8 and +20.4% in VL and VM, P=0.32 and P=0.07, respectively. Both protocols caused a significant and similar shortening of time to contraction (-12.8 and -11.8% after RWU and SWU), both P<0.05, while the other twitch parameters and the M-wave amplitude of both vasti did not change significantly.
Simultaneous strength and endurance training can result in interference effects on neuromuscular adaptations compared with both type of training performed alone. Few studies investigated concurrently swimming endurance training and strength training. The purpose of present study was compare the neuromuscular adaptations of 17 untrained women to 10 weeks of concurrent strength and swimming training or strength training only, 3 times per week. The subjects were assigned to strength training group only (STO, n=7), or strength and swimming training group (SST, n=5). A third group, control (C, n=5), did not train during the period of training. The following measurements were made before and after 10 wk of training: isokinetic peak torque concentric and eccentric of the knee extension, elbow extension and elbow flexion at speed of 90°·s⁻¹. One-repetition maximum (1RM) leg extension, 1RM bench press, 1RM elbow extension and 1RM elbow flexion. Swimming training (freestyle) was performed 3 times per week for 40 minutes between 90% and 95% of critical speed. Strength training program consisted of 2-4 sets with 50-60% of 1RM on 8 exercises designed to train all the major muscle groups of the body. All sets were performed until the failure of the muscle involved. Both swimming and strength training was performed in sequence always beginning for strength training. Results indicated that 1RM leg extension increased 30 and 32% (p < 0.05) for the STO and SST groups, respectively. 1RM bench press increased 23 and 19% (p < 0.05) for the STO and SST groups, respectively. 1RM elbow extension increased 26 and 21% (p < 0.05) for the STO and SST groups, respectively. 1RM elbow flexion increased 26 and 21% (p < 0.05) for the STO and SST groups, respectively. No significant changes were found for any of the 1RM exercises in the C group. No differences on 1RM were detectable among groups at the conclusion of training in all exercises (p > 0.05). Peak torque concentric and eccentric during knee extension increased for the STO and SST groups (p < 0.05). Peak torque concentric and eccentric during elbow extension increased only for the STO group (p < 0.05). Peak torque concentric and eccentric during elbow extension increased for the STO and SST groups, except peak torque concentric for the STO (p < 0.05). No significant changes on peak torque were found for any exercises in the C group. There were no differences on peak torque among groups at the conclusion of training in any exercises (p > 0.05). The present results indicate similar strength gains on 1RM in both training groups, and do not demonstrate any negative effects on 1RM strength development for women concurrently training for strength and swimming. Peak torque may be compromised when the same muscle groups is exercised by both methods of training.

PREDICTING 1 RM VALUES BY BODY MASS AND LEAN BODY MASS IN STRENGTH TRAINED AND UNTRAINED MEN
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One repetition maximum test (1 RM) is usually used to measured muscle strength and to prescription of strength training. However, the determination of test load and the time to perform this test make difficult its execution in non-individualized ambient. Thus, the purpose of present study was determinate coefficients of prediction of 1 RM load, based in the relationship between muscle strength with body mass (BM) and lean body mass (LBM). Twenty-eight (40 ± 4 years old) middle-aged men strength-trained (ST, n=13) and untrained (UT, n=15) participated of this study. Maximal strength was determined by 1RM test in four free-weight exercises: bench press, supported row, squats and leg press. Body composition was measured by skinfolds thickness method. The coefficients were calculated by ratio of maximal strength [kg] and body mass [kg] (1 RM/BM) and maximal strength and lean body mass [kg] (1 RM/LBM). Pearson's product moment correlation test was used to verify the associations between the variables measured and Student independent t-tests were used to compare muscle strength. Due to significant differences on strength values between groups (ST > UT), different coefficients were calculated to ST and UT groups. After that, independent t-tests were used to compare of coefficients between groups. Significant correlations were observed between BM and LBM with 1RM values in all exercises (r = 0.47 - 0.76, p < 0.05). The higher correlations were observed between maximal load in bench press and LBM (r = 0.76, P = 0.0001), supported row and LBM (r = 0.64, P = 0.001), squat and LBM (r = 0.65, P = 0.0001) and leg press and LBM (r = 0.56, P = 0.001). The coefficients calculated were significant different between groups in all exercise tested (p<0.05). In ST, the coefficients by the ratio 1RM/BM were 1.1, 1.1, 1.7 and 4.9 for bench press, supported row, squat and leg press and by the ratio 1RM/LBM were 1.4, 2.1, 1.3 and 6.0 for bench press, supported row, squat and leg press. In UT, the coefficients by the ratio 1 RM/BM were 0.7, 0.8, 1.3 and 3.0 for bench press, supported row, squats and leg press and by the ratio 1 RM/LBM were 1.0, 1.6, 1.1 and 4.0 for bench press, supported row, squat and leg press. There were no differences between 1 RM values tested and predicted by coefficients. The present results have demonstrated that the coefficients of prediction of test-load of 1RM must to considerate body composition and training status of subjects. The coefficients could be used to make easier the strength testing and in the prescription of strength training in non-individualized situations.

AN INVESTIGATION OF THE RELATIONSHIP BETWEEN ANAEROBIC POWER-CAPACITY, BODY COMPOSITION AND HEART RATE IN TURKISH NATIONAL SENIOR HANDBALL PLAYERS
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The purpose of this study was to analyze the relationship between Peak Anaerobic Power (AnP)-Capacity (AnC), body composition and heart rate on male handball players, who played in Turkish National Senior Handball Players, and also to compare their data with non regular trained Physical Education and Sport (PES) students. At this study 22 national male handball players (trained group) were measured who involved in training 5-29 years (Mage= 15.50, SD= 6.16 years) and aged between 18 to 38 years (Mage=27.22, SD=5.45 years). The control group consisted of 22 non regular trained PES students aged between 18 to 26 years (Mage= 21.54, SD=2.06 years). Wingate Anaerobic Test (WAnT) was used to measure AnP and AnC for both groups. During the test, heart rates of the subjects were recorded using heart rate telemeter. In addition, body compositions of all subjects were measured by bioelectric impedance analyzer.
It was found that the mean of AnP and AnC of national players were 11.51 ± 1.32 W/kg, and 6.54 ± 0.48 W/kg, while those of PES students were 12.31 ± 1.84 W/kg, and 6.36 ± 0.42 W/kg, respectively. The mean heart rate (HRmean) and the mean of maximal heart rate (HRmax) during the WAnT were found 146.17 ± 7.30 bpm and 163.54 ± 5.85 bpm for national players, and 168.93 ± 8.76 bpm and 180.50 ± 8.52 bpm for PES students, respectively. In terms of body composition of subjects, percent of body fat was measured as 12.47 ± 2.19 for national players, and 11.50 ± 3.06 for PES students.

The results of the study revealed that there was a significant relationship between AnC and HRmean in national players (r=.52, p<.05). Besides, significant difference was found between HRmean, HRmax, and AnC values of national players and those of PES students (p<.05). National players had higher AnC values than that of PES students.

2x6 (Group x Time) split plot design of analysis on variance was conducted on changes in AnC and HR values in time (6 measures with 5 seconds interval in 30 seconds) separately. Results of analysis yielded significant main effects for time in AnC and HR values (F15, 210=189.52, p<.01; F15, 210=301.17, p<.01, respectively). Significant group x time interaction was found in both values (F15, 210=3.36, p<.01; F15, 210=10.44, p<.001, respectively).

DECISIONAL ANALYSIS OF THE PICK & ROLL IN NCAA

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INTRODUCTION.
The target of this work is to carry out an analysis of the decisional analysis in pick&roll situations in order to establish a proper framework for our study. The decisional analysis in pick&roll situations will include different approaches: the decision making and the offence/defence systems in basketball.

MATERIAL AND METHOD.
The data for this work were collected from videos of the five final matches of the NCAA, using registry sheet elaborated for this work, in which we took as reference the following variables: total positional offences, total pick & rolls, defensive action, offensive action, zone, time and success.

RESULTS.
346 positional offensive actions were put under study from which the following results were obtained: 58.38% of those actions were pick&roll, obtaining success in a 40.10% of the cases. In addition, we must emphasize that the most used options by the defenders were pass over pick (27.23%), aid and recovery (28.71%) and change of player (23.27%). In offensive actions, we found that the possibility of passing to a free player (52.97%) was the most frequent option.

DISCUSSION.
The direct blockade in positional offensive actions is quite often in NCAA, however its use is not so relevant in order to achieve success in the attack. Within the defensive possibilities we found as most frequent the over screen, help and recover and the switch, in addition, they are the most significant in terms of success in defence. With regard to the offensive options, we appreciated that most outstanding is pass to the unmarked player, being the most effective stop and shot and pass to rolling. The area where most of the pick&roll are made are the central zone, in which player can find a wider space to develop the different offensive options, being the lateral zone left the one that accumulates the higher percentage of success. As far as the temporary distribution of the picks, we found that they regularly occur during the whole match, although we observe that the effectiveness of them increases as it comes closer the end of each quarter.

References.


THROWING ACCURACY OF WATERPOLO PLAYERS OF DIFFERENT AGE AND SWIMMING PERFORMANCE, IN STATIC POSITION AND AFTER PREVIOUS SWIMMING

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There are two possibilities for shooting in water polo. Shots that become while the players are static and shots that players have previous swim with the ball. The effectiveness of shooting mainly depends from accuracy. In water polo, a few researches exist referring on the study of kinematic and on velocity of throwing, while exists absence of studies that would examine the effect of chronological age and swimming performance with the effectiveness of shooting (static or with previous swimming). Aim of this study was to compare the accuracy of shooting, static or with previous swimming, in relation to a) chronological age and b) swimming performance. Totally 50 players were tested. 21 of the sample belonged to the age group 10-12 years, 15 to the age group 13-14 years and 14 were older than 15 years. Each individual executed, from a constant place and 5 m away from the goalpost. 5 shots to a standard goal and then 5 more shots after swimming 10m away from the goalpost and stopping in 5m for shooting. Goals had been placed at 2 corners of goalpost with dimensions double size of ball’s diameter. Two 1WAY ANOVA compared the accuracy on throwing, with swimming and static, in relation to age and performance. Static shots that were achieved with accuracy were significantly (p<0.001) more than those achieved by shooting with previous swimming. In addition, more successful shots were achieved by older players. More specifically, players who belonged in the age group of 10 to 12 years old achieved in average from static position 1.7 times the goal (54.3%); players 13 to 15 years old 3.3 times (63.5%), whilst players over 15 years old, 3.9 times (77.3%). In motion the number of successful shots for each age group was 0.8 (16.2%), 2.1 (41.3%) and 2.6 (51.4%), respectively. No significant differences were found between the successful shots in static position and with previous swimming across the three age groups. Similar results were observed concerning the swimming performance of the players as those with the best swimming record were considerably more accurate in shooting. Accordingly, players with swimming time 60-40 sec in 50m crawl achieved on average 1.6 times the goal (32%); players from 39.90 to 32.0 sec, 2.7 times (54.1%) and players who swim in less than 31.9 sec, 3.8 (76.7%). The corresponding values while in motion were: 0.5 (10.7%), 1.6 (32.9%) and 2.7 (53.30%), respectively.

High coefficient correlation was found between chronological age and accuracy in static position and after previous swimming (r=0.75, 13TH ANNUAL CONGRESS OF THE EUROPEAN COLLEGE OF SPORT SCIENCE
RELATIONS BETWEEN MUSCLE FUNCTION AND GAIT PARAMETER ASYMMETRY IN TOTAL HIP ARTHROPLASTY PATIENTS

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INTRODUCTION: Total hip arthroplasty is considered one of the most successful orthopedic interventions and is recommended for severe hip osteoarthritis. Its effectiveness in relieving pain and improving function has been well documented. However, while relief in pain and self-perceived improvement in physical function occur soon after the discharge from the hospital (<2 months), restoration of muscular strength necessitates more time. Indeed, muscle strength asymmetries (>10%) can be found after 1 year from surgery (Shin et al., Clin Orthop Relat Res, 1994). The ability to perform daily-life activities such as walking, rising from a chair or climbing stairs has been suggested to be related to hip muscle strength (Bean et al., J Gerontol A Biol Sci Med Sci, 2003). In addition, muscle strength bilateral asymmetry has been shown to be related to risk of falls in older people (Skelton et al., Age and Aging, 2002). However, very few studies have examined whether asymmetries in the strength of the muscles surrounding the hip are related to asymmetries in walking (spatio-temporal gait parameters). Therefore, the first aim of this study was to examine this relation in total hip arthroplasty (THA) patients 6 months after surgery. Secondary aim was to examine the associations between subjective measures of pain and function ability with objective measures of muscle strength and walking ability. METHODS: Nine male (age, 71±6 years; BMI, 29±4) and 11 female (age, 72±5 years; BMI, 26±4) THA patients were involved in the study. Maximal isometric strength of hip abductor, flexor and extensor muscles and gait parameters during normal and fast walking were measured 5-7 months after surgery. Patients also filled the Western Ontario and McMaster Universities Index and the Harris Hip Score questionnaires. The alpha level was set a 0.01 (pseudo-Bonferroni adjustment). RESULTS: After 6 months patients showed strength asymmetries in flexor and abductor muscles (operated leg 89 and 91% of nonoperated leg, respectively). No correlations were found between asymmetries in strength measurements and asymmetries in gait parameters during normal walking (mean r after Fisher transformation, 0.15<r<0.29). During fast walking significant moderate correlations were found between flexor strength asymmetries and swing (r=0.66) and stance (r=0.64). No correlation were found between subjective and objective measures of functional ability. DISCUSSION: The results of this study showed that, according to the literature, significant impairments in muscle strength are still evident 6 months after surgery. However, only hip flexor bilateral asymmetries were significantly related to asymmetries in gait parameters during normal or fast walking. The lack of correlations between objective and subjective measures of physical function further underlines the importance of performance measures to obtain a complete picture of osteoarthritis patients (Stratford et al., J Clin Epidemiol, 2006).

ELABORATION OF A CIRCUIT FOR THE TRAINING AND THE EVALUATION OF SPECIAL ENDURANCE IN KICK BOXING K1 STYLE

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Introduction
Some studies show that the anaerobic metabolism has a key role in the performance of combat sports. In such sports, the athletes may reach concentrations of blood lactate of about 15 mmol/l. So, to excel in Kick Boxing K1 Style are necessary a good training and evaluation of speed endurance. We experimented a standard protocol of a specific test/training: the specific circuit K1 (SCK1).

Methods
SCK1 consists in 3 series, each one of 2’, with a pause of 1’ (amateur fight duration) and in 4 places where the athlete perform the typical techniques (with PAO1: 1) ob-cross-hook 2) Low kick and Middle kick right; 3) knee left and right 4) Low kick and Middle kick left. The experiment was conducted over 20 k1 agonists (age:22±4; w:73±6kg; h:178±7cm; years of practice: 5±2). We divided them into 2 groups (EG and CG, each one of 10 athletes), with the same physical and technical characteristics. The groups had to do a series of tests (SCK1 and Fight), surveying the performance and measuring the lactate in three moments (basal, after 3’ and after 6’ from the end of the circuit/combat) with Lactate Pro. The tests reliability was proved by the correlation test-retest. Then all the athletes had to do a 4-weeks standard training, the athletes of the Experimental Group made also the SCK1. At the end of the training period, all the tests were repeated.

Results
The values of the correlation test-retest are high for the rounds number (SCK1), the kicks number and the lactate, with r always bigger than 0.79. (p<0.01). The study on SCK1 showed a big improvement of the EG results in the 1st series (+35%; p<0.0001), in the 2nd (+48%; p<0.0001) and in the 3rd (+50%; p<0.0001), against non significant lactate variations (-5/-8%). In the 3 series, the EG improved only for (+2/+5%). Lactate formation during the combat is lower than that of the circuit because during the fight pauses and tactical rests are more frequent. The lactate produced by the GS in the circuit is about 12mmol/l (min 9.6, max 15.3), while during the fight it is about 10mmol/l (min8.7, max 13.6).

Conclusions
The experimentation prove the usefulness of SCK1 as specific training exercise in K1. This circuit in the training program of the athletes examined, had very positive effects on the increase of the attack rate during the training, with no increase of the lactate levels. In conclusion, the circuit may be considered an effective training and specific evaluation method.

References
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Interval Training Group (ITG n=30). The TR has been carried through during a period of 8 weeks (W) with frequency of 5 days/W and based in corresponding intensities to the LAn. The speed of LAn (SLAn) and the lactate concentration in the LAn ([Lac]-LAn) have been evaluated.

**METHODS:** 60 Wistar rats (190-210g), separated randomly have been used in two groups: Continuous Training Group (CTG n=30) and Interval Training Group (ITG n=30). The TR has been carried through during a period of 8 weeks (W) with frequency of 5 days/W and based in corresponding intensities to the LAn. The speed of LAn (SLAn) and the lactate concentration in the LAn ([Lac]-LAn) have been evaluated before the TR, after 4W and after 8W. The lactate concentration was evaluated in blood analysis in Yellow Spring® 1500 Sport. The CT was executed to 95% of the LAn and duration of 30'/session. The IT was carried through in 7 series (1ª-5ª with 4' and 6ª-7ª with 5' of duration) before the TR, after 4W and after 8W. The lactate concentration was evaluated in blood analysis in Yellow Spring® 1500 Sport. The CTG and ITG were of 1200 min, but, the realized were 1303 and 1141 respectively. CONCLUSION: CT as well as the IT of 8W monitored by the LAn didn’t cause positive adaptations in the aerobic performance (AP) of Wistar rats in running exercise, showing that variations in the intensity alone are not enough to promote positive adaptations in the LAn. The CT seems to have positive effect on the LAn only in the initial W, therefore, with the maintenance of the protocol for longer periods, the negative effect of the monotony become evident, reducing the AP. Such notes corroborate to the concept of the relation duration/intensity and the effect of the monotony in the TC.

**TIME AND MOTION ANALYSIS OF ELITE MALE SOCCER PLAYERS - A COMPARATIVE ANALYSIS OF THE AUSTRALIAN A-LEAGUE**

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In recent decades there has been growing interest in time and motion analysis of soccer players, which has been used to describe the physiological demands of the game. The application of GPS technology and computerised video analysis has undoubtedly improved the accuracy and variety of measurements available to sport scientists. The present work describes the findings of a time and motion analysis of soccer players from the professional Australian A-League and compares the results with similar previous reports from Europe (Di Salvo et al. 2007) and Brazil (Barros et al. 2007). Defending and midfield players were tracked during games for one season using GPS devices (Minimaxx, Catapult Innovations). The devices measured and recorded displacement, velocity and acceleration during 53 games. Total and relative distances, and relative time, were calculated for five velocity ranges (Di Salvo et al. 2007), as well as the number of bursts of high intensity activity per game for each player. The average total distance covered by all players during a game was 11361±1580 m. Most of the total distance covered during a game occurred whilst walking and jogging (66%), while smaller distances were covered during low speed running (13%), moderate speed running (13%), high speed running (5%) and sprinting (3%). Even though the distance covered in the second half of a game was typically less than the first half (51% vs. 49%), they were not significantly different (p=0.08). Midfield players covered a greater distance than defending players during each game (p<0.001), with the difference occurring in all velocity ranges. Midfield players also performed more bursts of high intensity activity (3.3±0.2 km/h) per game than defending players (2.4±0.2 km/h, p=0.001).

The total distance covered by an Australian player for each game is very similar to what has been reported in European players (Di Salvo et al. 2007) and slightly more than in Brazilian players (Barros et al. 2007). The profile of relative distance covered in each velocity range is also very similar between the three leagues. However, the decrease in distance covered in the second half is lower in the A-League (2%), compared with the European (9%) and Brazilian (7%) leagues. There are also differences in the distribution of high intensity activity performed by different playing positions. Overall, this time and motion analysis of the Australian A-League reveals similar results to previous studies from Europe and Brazil.

**CHANGE IN PHYSICAL FITNESS IN MALE MILITARY CADETS DURING FIRST YEAR ATTENDANCE AT THE ROYAL NORWEGIAN AIR FORCE ACADEMY**

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**Introduction**

Good physical fitness is considered one of the basic features of military personnel due to possible high physical occupational demands. Compared to 20-30 years ago, physical fitness is reduced in young Norwegian civilian (1) and military (2) adults. Despite the fact that all Norwegian cadets must pass physical fitness screening tests before admittance to Military Academies, physical fitness levels of cadets is assumed to vary. Hence, the aim of this study was to identify initial physical fitness in Norwegian cadets and examine changes in fitness during the first year at the Air Force Academy.

**Methods**

All first year cadets enrolled at the Royal Norwegian Air Force Academy in August 2006 were invited to participate in the study (n=31). Among them was only one female, who therefore was excluded from analysis. Anthropometric data were collected from 30 male cadets (age 23.2 ± 4.0 yrs), while 26 cadets twice undertook treadmill testing. All fitness tests were conducted within two weeks after entrance
and at the end of the first year (May 2007). Direct maximal oxygen uptake (VO2max) and exercise tolerance time (ETT) were measured from treadmill running until exhaustion. Percent body fat was estimated from biopendence measurements (Quantum II, RJL Systems, USA), using the Weight Manager equation.

Results
VO2max was unchanged during the first year at the Academy, 57.1 ± 4.2 vs. 57.9 ± 4.3 ml/(kg∙min) (p = 0.23), and 4.49 ± 0.57 vs. 4.52 ± 0.60 l/min (p = 0.43). ETT was also unaltered, 323 ± 30 vs. 323 ± 47 sec. (p = 0.93). Peak heart rate in the two treadmill tests was similar, 199 ± 8 vs. 200 ± 6 beats/min (p = 0.17). Height was measured only at entrance (179.5 ± 5.1 cm), while bodyweight was unchanged from entrance to end of first year, 78.4 ± 8.5 vs. 78.6 ± 9.1 kg (p = 0.75). Percent body fat decreased during the first year from 17.8 ± 4.1 to 16.7 ± 4.1% (p = 0.02).

Discussion/conclusion
VO2max, ETT and bodyweight did not change in male cadets during the first year at the Royal Norwegian Air Force Academy. However, estimated percent body fat decreased slightly (6%) in the same period. VO2max was higher than previously reported for Norwegian conscripts during basic training [3] and also favourable compared to values reported in other international studies of military cadets [4,5]. In conclusion, Norwegian male cadets at the Air Force Academy had relatively high initial levels of fitness that were maintained during the first year at the Academy.

References.

SPEED AND AGILITY IN YOUTH SOCCER AND YOUTH HANDBALL PLAYERS
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Activities in soccer and handball are characterised by short intense efforts, such as sprinting and changes in direction. Straight speed and agility have been identified as independent qualities that are specific and produce limited transfer to each other. In this perspective, it is useful to evaluate differences in speed and agility between two similar team sports: soccer and handball. Anthropometrical measurements were performed in 241 youth soccer and 312 youth handball players. Both soccer and handball players performed a 10x5m shuttle sprint and a 30m sprint. The timing of the shuttle run and the 30m sprint (split times at 5m and 30m) were recorded, using Raceliner2 Stopwatch (Microgate, Italy). Independent t-tests were used to compare soccer with handball players. On 30m U12 and U14 soccer groups ran significantly faster than handball players but no significant difference was found after 5m. Also the shuttle sprint did not show a significant distinction between soccer and handball players. Also, there was no significant difference on the 30m sprint and shuttle sprint between soccer and handball players from the U16 and the U18 age groups. The shuttle sprint does not significantly differ between soccer and handball players. Changing in direction for catching the ball or to follow an opponent is in both team sports very important. On the 5m point no significant difference is found for all the age groups between soccer and handball. A possibly explanation is that the first meters in both sports are of major importance. Only in the younger groups (U12 and U14) soccer players run faster than handball players on 30m. The differences in speed and agility between soccer and handball are very small, due to the similar activities in both sports.

References.

INVENTORY OF SURF TECHNIQUES
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Introduction
Even so some studies in surf approach the techniques, these are not characterized in depth, being therefore necessary to find a way to describe the act of riding waves, so to identify all the manoeuvres. This study intended to create a surf techniques taxonomy through an inventory of techniques having this a steady and perceivable nomenclature.

Methods
The inventory of surf manoeuvres was applied to 9 participants (surfers, coaches and judges) and the results were analysed through a qualitative and descriptive statistical analysis (frequencies and model). The inventory of techniques construction had a first version based on bibliographical retraction and after being evaluated it resulted in a 2nd version with 168 manoeuvres. After a pilot application it was verified that it was very extended being reduced to 110 manoeuvres. It is organized in sets of two slides for each manoeuvre including a video of the same one. The first slide is to know what term is used for the shown manoeuvre and the second one is to choose a term from a list presented from the 10 classes of manoeuvres for the chosen terms and when analyzing the sample in its totality, 373 answers were verified that it was very extended being reduced to 110 manoeuvres. It is organized in sets of two slides for each manoeuvre including a video of the same one. The first slide is to know what term is used for the shown manoeuvre and the second one is to choose a term from a list presented from the 10 classes of manoeuvres for the chosen terms and when analyzing the sample in its totality, 373 answers were verified that it was very extended being reduced to 110 manoeuvres. Moreover, the inventory of surf manoeuvres was applied to 9 participants (surfers, coaches and judges) and the results were analysed through a qualitative and descriptive statistical analysis (frequencies and model). The inventory of techniques construction had a first version based on bibliographical retraction and after being evaluated it resulted in a 2nd version with 168 manoeuvres. After a pilot application it was verified that it was very extended being reduced to 110 manoeuvres. It is organized in sets of two slides for each manoeuvre including a video of the same one. The first slide is to know what term is used for the shown manoeuvre and the second one is to choose a term from a list presented from the 10 classes of manoeuvres for the chosen terms and when analyzing the sample in its totality, 373 answers were verified that it was very extended being reduced to 110 manoeuvres. It is organized in sets of two slides for each manoeuvre including a video of the same one. The first slide is to know what term is used for the shown manoeuvre and the second one is to choose a term from a list presented from the 10 classes of manoeuvres for the chosen terms and when analyzing the sample in its totality, 373 answers were verified that it was very extended being reduced to 110 manoeuvres.

Results
Having in consideration the 110 presented manoeuvres, when analyzing the sample in its totality, it was verified that for the used terms there were 767 different terms being the average of approximately 7 terms for each manoeuvre. It was perceived that the answers tend to be different for all participants, being this confirmed by the value of the mode which had maximum possible terms for each manoeuvre. Through the used terms were identified by unanimity the following manoeuvres: bottom turn, roundhouse, floater and tube. Having in consideration the 110 presented manoeuvres for the chosen terms and when analyzing the sample in its totality, 373 answers were identified with an approach average of 3 terms for each manoeuvre being this also the value for the medium and the mode. The chosen terms were identified by unanimity the following manoeuvres: frontside drop, frontside bottom turn, frontside air, frontside cover up and frontside tube. Surfers changed riding stance in the backside reverse 180° bottom turn and had some difficulty differentiating details in tubes. Coaches presented some difficulties with the rotation axis in aerials and also differentiating details in tubes. Judges changed riding stance in the backside 180° bottom turn, had some difficulty with the rotation axis in aerials but they identified the grabs better.

Conclusions

Saturday, July 12th, 2008

14:15 - 15:15
The choices made were not influenced by the participants’ functions. Coaches presented the biggest number of choices concordant with the respective terms of manoeuvres. There is a difficulty in identifying the terms for the respective manoeuvres, proving that the participants have trend in not differentiating the manoeuvres and do not have a steady trend.

**TYPES OF JUMPS VS SPORTS RESULTS IN ATHLETIC JUMPS**

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Introduction: Jumping exercises are undoubtedly a leading training element in athletics jumps. The aim of this study was to make an attempt at highlighting these types of jumping exercises whose volume was the most closely connected with sports results of elite jumpers with long training experience.

Methods: Annual training programmes of 19 long jumpers (LJ) and 23 triple jumpers (TJ) were analysed. The parameters of the subjects in LJ and TJ were as follows: age: 24.74±/−2.12 and 25.82±/−2.75 years, training experience: 7.16+/-1.63 and 7.95+/-2.21 years, and sports level (season's best)=7.66+/-0.32 and 15.94+/-0.59 m respectively. The relations between examined parameters were evaluated using Pearson's correlation coefficient. The exercises were divided into single-leg jumps (SLJ) and double-leg jumps (DLJ), horizontal jumps (HJ) and vertical jumps (VJ), external load jumps including depth jumps (ELJ) and without external load jumps (WELJ). The volume of exercises was expressed with the number of jumps (contacts).

Results: Long jumpers and triple jumpers performed the following number of contacts (respectively): 55±39+/-8 26 and 7204±/−877 SLJ, was expressed with the number of jumps (contacts). Heart rate was verified and recorded all long race. Blood was taken before the start (bf), immediately after swimming (as), after cycling training. Basing on our research we recommend depth jumps from the height of 60 and 80 cm to elite athletes.

**SELECTING LOADS IN PLIMETRIC TRAINING BY MEANS OF BIOCHEMICAL MEASUREMENTS**

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Introduction: The main criterion for selecting the height of a depth jump is the displacement of the centre of mass (CM) after a depth jump or Reactive Strength Index (RSI) which additionally includes the time of a contact. The technique correctness of performing an exercise, e.g. on the basis of stability of biomechanical parameters in a particular exercise, is taken into consideration less often. The aim of this study was to select the height of depth jumps on the basis of the stability of biomechanical parameters.

Methods: This study was performed on 8 athletics jumpers (age: 21.3+/-2.4 years, mass: 77.5+/-5.2 kg, height: 182.3+/-7.3 cm). Five depth jumps per each height were performed with landing on the ball of a foot from 20, 40, 60, 80, 100, 120 cm with the trial height order randomized for each subject. The task was to jump as high as possible immediately after the landing. Repeatability (within-subject) of two parameters was evaluated: vertical Ground Reaction Force (GRF) by means of the coefficient of variance (CV), and the ground contact time (CT) by means of standard deviation (SD). The measurements were made using a piezoelectric force platform (Kistler). To reveal significant differences between GRF and CT for various heights of depth jumps a 1-way between-group ANOVA was used. In order to highlight uniform groups the LSD test was applied (p<0.05).

Results: The highest repeatability of GRF was noticed from the height of 60 cm (6.87%) and 80 cm (10.18%), whereas the lowest was observed in depth jumps performed from 20 cm (12.76%), 40 cm (13.28%), 120 cm (14.29%) and 100 cm (16.44%). In turn, the highest repeatability of CT was seen from 80 cm (0.009 s), 40 cm (0.011 s), 60 cm (0.015 s), while a lower one was observed in depth jumps from 100 cm (0.022 s), 20 cm (0.023 s) and 120 cm (0.026 s).

Conclusion: Stability of biomechanical parameters while performing depth jumps may be a criterion for selecting loads in plyometric training. Basing on our research we recommend depth jumps from the height of 60 and 80 cm to elite athletes.

References.


**EFFECTS OF AN OLYMPIC TRIATHLON ON BIOCHEMICAL AND PHYSIOLOGICAL MARKERS**

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The aim of the study is to investigate the effects of strenuous exercise on commonly used biochemical, hematological and physiological variables in male subjects participating in the Olympic triathlon competition. The sample consisted of 12 males volunteers triathletes (mean ± standard error) age, 27.9±1.7 yr; body mass, 73.9±2.1kg; height, 177.9±1.7 cm, body fat, 7.3±0.6%).

Methods: Annual training programmes of 19 long jumpers (LJ) and 23 triple jumpers (TJ) were analysed. The parameters of the subjects in LJ and TJ were as follows: age=24.74+/−2.12 and 25.82+/−2.75 years, training experience=7.16+/-1.63 and 7.95+/-2.21 years, and sports level (season's best)=7.66+/-0.32 and 15.94+/-0.59 m respectively. The relations between examined parameters were evaluated using Pearson’s correlation coefficient. The exercises were divided into single-leg jumps (SLJ) and double-leg jumps (DLJ), horizontal jumps (HJ) and vertical jumps (VJ), external load jumps including depth jumps (ELJ) and without external load jumps (WELJ). The volume of exercises was expressed with the number of jumps (contacts).

Results: Long jumpers and triple jumpers performed the following number of contacts (respectively): 55±39+/-8 26 and 7204±/−877 SLJ, was expressed with the number of jumps (contacts). Heart rate was verified and recorded all long race. Blood was taken before the start (bf), immediately after swimming (as), after cycling training. Basing on our research we recommend depth jumps from the height of 60 and 80 cm to elite athletes.

Conclusion: We assume that jumping training in athletes with extensive competition experience ought to be based on high intensity efforts. The view can be supported by strong correlations between sports results and the number of jumps performed with additional external loads and single-leg jumps. Moreover, it seems that exercises done in accordance with spatial movement structure of a performance exercise (e.g. horizontal jumps) play an important role in the jumping training.

The results confirm previous studies reported elsewhere in the literature for longer and strenuous events (REID et al, 2004; SMITH et al., 2004). There are many changes in biochemical, hematological and physiological parameters during a triathlon. If some coaches make...
Eighty basketball games were observed and reconstructed in their evolution of point's difference per ball possession. The Variation Coefficient of Point's Difference (VCPD) was game balance and success. Critical moments on basketball game using the referred method and to identify the critical moments according the independent effects of episodes. This was confirmed in the two analyzed game periods. However, the statistical means of the differences only was determined found for both periods in the game balance variable. The analysis of success demonstrates that winning teams provoked more of these episodes. In the first three periods unbalanced games presented more critical episodes than balanced games. Statistical differences were not determined for the first three periods of game. No differences were depicted for the last period. Ten points of the final game result was the mark to distinguish each category (Ferreira, 2006). The success variable was the qualitative use of these parameters acknowledgments to elaborate a different kind of training before and after competitive events, it may be possible to minimize effects of overtaining, skeletal muscular damages and injuries.

References.

A COMPARISON OF VARIETY SOCCER PLAYERS PHYSICAL ACTIVITY EXPENDITURE DURING TRAINING SESSIONS AND MATCHES

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Goal: The purpose of this study was to analyze and compare men’s variety soccer player’s physical activity expenditure (PAE) during training (T) and matches (M) days over a Canadian university season (end of August till end of October). Methods: A total of 17 players were recruited and participated in the study for a 10-week period. Heart rate (HR) during training sessions (T/week) and match days (T/week) were recorded with heart rate monitors (Polar Team System, Fi). Prior to heart rate monitoring, all subjects completed a maximal incremental treadmill test in order to obtain each player’s respective VO2max and HR max. The soccer players were instructed to run at a constant speed comfortable to them set between 8km/h and 12 km/h with a 2% increase inclination every 2 min until exhaustion. VO2max was measured directly using a breath-by-breath metabolic gas analyser. The PAE response was quantified for every individual by 5 different methods: %HR reserve (HRR), %VO2max, %VO2 reserve (VO2R), TRIMPS (HR-zone) and TRIMPS/min. %VO2max and %VO2R were calculated from the extrapolated VO2 of the player’s own VO2/HR relationship (established during the treadmill test) TRIMPS were calculated as proposed by Edwards (1993) and used by (Ferreira, 2000) Statistical analysis was performed by paired t-test for training vs match of the same week. ANOVA was used for comparing the same variables across time (week 3 vs week 6 vs week 10) Post-hoc analysis was performed by using Tukey HSD. Level of significance was set at p < 0.05. Results: Mean VO2max and HRmax for the group was 66.2±5.44 ml/kg/min and 187±7.11 b.p.m., respectively. All PAE variables were all significantly larger, unless noted otherwise, during match days when compared to training sessions: %HRR T vs %HRR M, respectively, was for week 3, 51±8.1 vs 80.3±10.8, week 6, 50.4±10.5 vs 82.8±5.9, and week 10, 53.1±7.8 vs 85.4±12.5; %VO2 max T vs %VO2 max M, respectively, was for week 3, 45.5±9.3 vs 75±9.71, week 6, 47.5±8.5 vs 75.1±5.7, and week 10, 50.2±6.3 vs 74±7.71; %VO2R T vs %VO2R M, respectively, was for week 3, 44.5±9.3 vs 74±4.7, week 6, 44.8±8.6 vs 73.6±5.8, and week 10, 47.3±6.3 vs 76.0±7.4, TRIMPS (HR-zone) T vs TRIMPS (HR-zone) M, respectively, was for week 3, 225±60.7 vs 306.0±115.7, week 6, 253.0±90.9 vs 359.2±151.3 (not significant), and week 10, 234±72.0 vs 502.7±114.4, TRIMPS/min T vs TRIMPS/min M, respectively, was for week 3, 2.6±0.31 vs 3.0±0.53, week 6, 2.6±0.48 vs 3.0±0.46, and week 10, 2.8±0.30 vs 3.4±0.34.

Summary: Comparing week 3 to week 10 there was a significant increase in intensity of some PAE variables (TRIMPS (HR-zone) T vs TRIMPS (HR-zone) M, week 3 vs 10) for both training sessions and matches. However, all PAE variables were higher during matches when compared to training sessions. Conclusion: PAE increased during the 10 week season and was higher during matches when compared to training sessions.

INDEPENDENT EFFECTS OF GAME BALANCE AND SUCCESS ON BASKETBALL CRITICAL MOMENTS

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The Variation Coefficient of Point's Difference (VCPD) represents a variation ratio of punctual difference obtained among consecutive intervals of game time (Ferreira, Volossovich & Gonçalves, 2003). However, understanding the basketball game as a sequence of ball possessions shared by both teams, their succession can describe VCPD during the game’s course as a timeline. Ferreira (2006) suggested it as a more appropriate functional perspective to observe basketball game dynamics. This study has the aim of determining the critical moments on basketball game using the referred method and to identify the critical moments according the independent effects of game balance and success.

Eighty basketball games were observed and reconstructed in their evolution of point’s difference per ball possession. The VCPD was determined for episodes of six consecutive ball possessions (three for each team) and described in an independently way for the three first periods and for the fourth period. Ferreira (2006) demonstrated that coaches divide the basketball game in two main parts: the 1st, 2nd and 3rd as a unitary block and the 4th period. A critical moment was considered when some critical point could interrupt the normal flow of the VCPD dynamics. To determine what it could be normal or abnormal flow of the VCPD dynamics, the 95 percentile was considered as a cut-off value. After the determination process each critical moment was subtracted from the whole game and studied as a physical episode of the game. Game balance was defined by a dichotomous division: balanced and unbalanced games. The reference of ten points of the final game result was the mark to distinguish each category (Ferreira, 2006). The success variable was the qualitative expression of the final game result: win and loss. In the first three periods unbalanced games presented more critical episodes than balanced games. Statistical differences were not found for both periods in the game balance variable. The analysis of success demonstrates that winning teams provoked more of these episodes. This was confirmed in the two analysed game periods. However, the statistical means of the differences only was determined for the first three periods of game. No differences were depicted for the last period.

The results suggests a negligible influence from game balance in the number of critical moments generated during a basketball game. On the other side, game success also appears as an important variable. To provoke some critical episodes in order to disturb the normal flow of game final score differences seems to be an important reason to lead a winning game. The reference is used of these parameters acknowledgments to elaborate a different kind of training before and after competitive events, it may be possible to minimize effects of overtaining, skeletal muscular damages and injuries.

References.
STUDY OF THE OFFENSIVE ACTIONS THAT CULMINATE IN SHOT AT GOAL IN THE EURO 2004

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Introduction
This study proposes to characterize the offensive situations that culminate in shot at goal in football teams that had participated in Euro 2004. We did the characterization of the actions depending on its duration, number of passes, number of players involved and technical-tactics actions used. The characterization of the stages of the process offensive. The characterization of communication established in the team, in the resolute action of the game depending on the areas of the field and players. And, the analyse view of the last pass, in the resolute action of the game, depending on the areas of the field and players.

Method
In this study our sample is composed by 7 games of the final stage. Based on previous work, especially, Maças (1997) and Costa (2005), developed and validated a system of observation, classified by categories with 11 variables. Several measures of fidelity were also undertaken. 165 offensive situations that culminate in shot were observed (systematic observation, indirect and not participated). The methods used to collect data were the registration of occurrences for most of the variables of duration and registration for other, until the minimum unit of the second.

Results
There was higher percentage of offensive situations that culminate in shot at goal between 75 and 90 minutes. More goals were done between 45 and 75 minutes. On average, are needed, only 2 pass and 3 players by offensive action to reach situations of shot at goal. In 52.1% of the offensive situations exist free kick. Almost 39% of the offensive situations not had success.

Discussion/Conclusions
The number of offensive actions with shot at goal increase with the time of the game elapsed. There is also an increase in the number of offensive actions without success to the course of the game. In football there is a current trend towards a decrease in the number of players involved in offensive actions. Nowadays the free kicks have an increasingly crucial importance in football. We see an increasing of the intervention of the Defenders of offensive actions teams in the game. Increasingly the observation and analysis of the game is an indispensable tool for any coach, team or player wishing to improve their income. It is important realize that structural whether to intervene so that the process of training have the results indicated more for the teams.

References.

AEROBIC GYMNASTICS (AER) IN FEDERAL UNIVERSITY OF MINAS GERAIS SEARCHING FOR THE MOST EFFICIENT TRAINING

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Aerobic Gymnastics (AER) has a recent history as a sport modality. Nowadays, Brazil is considered one of the major nations in AER. Since 1996, when AER’s project in the Federal University of Minas Gerais (UFMG) was initiated, it has been offered with free cost for internal and external communities of the university. Totally inserted in the three pillars of UFMG (graduation, research and extension), numerous nationals and internationals championships were conquered by the elite team of UFMG over the years. Currently, through voluntary work, we have a multidisciplinary technique team: biomechanics, physiotherapy, strength training, exercise physiology and sports psychology. In 2007, we looked for a training program that integrates these research areas to attend the Elite team. Based on the data from 2006 and aiming upgrades on technical trainings and physical preparation of the athletes (considering the national and international competitions of 2007), we programmed a periodization including differentiated and integrated strategies of training. Initially, we carried out an analysis of the elements using videos and biomechanical studies. Also, the progression of learning elements of high degree of difficulty was accomplished with the help of artistic gymnastics coaches. The strength training was realized initially aiming increases in strength through morphologic adaptations (muscular hypertrophy). The workload of training has been chosen based on the literature (1), using general and specific exercises related to the sport modality. After a specific technique analysis of each movement used by the gymnasts in their competition’s routines, the major goal was then focused on the neural adaptations, through specific exercises, considering the individual demands of strength of each athlete. On the other hand, in technical training, the micro-cycles were designed considering the major requirement of AER’s Competitions: a perfect performance, including endurance methods developed in partnership with the physical trainer. The training was conducted in six weekly sessions with 5 hours a day; each session included the technical and physical preparation. An assessment of technical performance was made in each micro-cycle. This interactive and multidiscipline dialogue become real with the active participation of the athletes who had understood, discussed and assisted the professionals involved in each sphere of the sports training. As a result, we reached a better performance that was confirmed by various national titles and 12 gold medals won at the Pan Championship and World Cup Series of AER.

References.

VALIDATION OF WATER AND LAND ANAEROBIC TESTS USING WINGATE TEST AS A GOLD STANDARD

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Anaerobic performance assessment still being a not fully accomplish mission (Bangsbo, 1998). The several methods and tests applicable in sports field are indirect and surrounded by a number of limitations. The cycleergometer Wingate anaerobic test seams to be the most worldwide accepted method for measure anaerobic performance. Nevertheless, the Wingate test is very unspecific for a number of sports, like swimming, for instance. This is especially because it takes place out of the swimming pool and because in swimming legs don’t seem to be prominent as propulsive segments. The aim of the present study was to validate other 30s land and water tests taking
as a gold standard the Wingate test performed in cycloergometer. 90 swimmers, 30 pre-pubertal, 30 pubertal and 30 post-pubertal, being 15 males and 15 females in each group, participate in the study. Pubertal stages were defined using stages described by Tanner (1962). Experimental procedures consisted on live 30s tests: (I) free swimming with the swimmers connected to a cable velocimetric system; (II) fully tethered swimming (Globus strain-gage); (III) simulated swimming on a biokinetic swim bench; (IV) crank ergometer Wingate test and (V) cycloergometer Wingate test (the gold standard test). Post-exercise maximum blood lactate concentration ([La-]) was measured after each test with a LactatePro analyser. Validation was tried considering as variables: the maximum [La-], stroke or pedalling movement rate (WV) and fatigue index (FI). First validation procedure consisted on an exploratory study of the association (Pearson Correlation Product, p<0.05) observed between gold standard test and concurrent ones, for each variable. Concordance degree was then established by a repeated measures ANOVA test (Bonferroni adjustment; p<0.05). Finally, a factorial confirmatory analysis was made. Four factorial models have been tested. The metabolic indicator [La-] showed the strong possibility of any test to produce information similar to the one produced by the gold standard test (63% r² 75%). The variables MV and FI failed in establishing the same relation-ship for [La-] variable, swim bench and crank ergometer Wingate tests were the closest to the gold standard in representing anaerobic potential. Free and tethered swimming represent the same potential, but with a less strong relationship with gold standard. This is probably due to the fact of these last tests were performed in aquatic environment.

References.

ANALYSE OF THE INFLUENCE OF OFFENSIVE SEQUENCES IN THE ATTACK SUCCESS IN BEACH VOLLEYBALL

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Introduction
The purpose of this study was to analyze the influence of offensive sequences in attack success in two groups of beach Volleyball teams, according to their position in the World Ranking.

Methods
Two groups of top-level beach volleyball competing in a Pool of the World Circuit of Beach Volleyball in Espinho in 2006 were considered in this study: G1, was composed by teams classified in the 'Top-five' of the World Ranking, and G2 included teams classified between the 13th and the 26th position of the World Ranking. For the effect, 854 offensive retreats of the games were analyzed considering the moment, space and task, in the ¼ final, ½ final and final, in a total amount of 8 games, that put in confrontation the 26 best teams of the World, according to the Ranking of the International Federation of Volleyball (FIVB). A descriptive analysis was done to obtain the frequency and occurrence percentages. An inferential analysis was done through contingency tables and a qui-square (2) test to find out the possible association between variables. The level of significance was established in 5%.

Results / Discussion
The results pointed out that: i) the highest success in the analyzed games have occurred in Side-out; iii) The middle zone near the net was the most often used zone to pass, iii) lateral zones had more success in the attack; iv) although the finger pass was the most used the pass was more succeeded; vi) in the beach volleyball the best teams had more passes of good quality and also get of higher success; vii) the use of strong attack was related with the final result of the match; vii) despite the players used more frequently the crossed attack, the higher success was obtained when the attack to the line was performed; viii) the situation of opposition with a blocker is the most frequent and well succeeded; ix) players usually chose the attack situations without touch in block, but the results revealed an increase in success in situations where touch in the block exists.

Conclusion
The G1 presented higher values of point and lower values of continuity and error, in almost the totality of the variables analyzed compared to G2. According to the results of this study effectiveness in attack is a technical tactical element that was significantly higher for the winning when compared to the defeated teams.

COMPARISONS BETWEEN TWO AEROBIC POWER TESTS IN SOCCER PLAYERS: VO2MAX TEST AT TREADMILL AND THE YO-YO INTERMITTENT ENDURANCE LEVEL 2

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The objective of this study was to compare the maximal cardiopulmonary responses and the performance of soccer players submitted to two different types of assessment for aerobic power: the Yo-yo intermittent endurance level 2 test performed on the soccer field (Bangsbo, 1996) and the VO2max test performed in the laboratory on a motorized treadmill. In both tests the subjects ran until maximal exertion. The sample was composed by 16 young soccer players and the tests were performed at least one week apart. In both tests the subjects had their expired air continuously monitored by the analysis of O2 and CO2 concentrations (Cosmed k4b2, Rome-Italy). The Student t test for dependent samples and Pearson moment correlations were determined for the selected variables. There was statistical significance for the values obtained on the treadmill and Yo-yo tests (p<0.05), respectively, in the following variables: Minute ventilation: 149.7±15.86 and 135.8±15.94 l/min; Respiratory exchange rate: 1.28±0.07 and 1.21±0.05; Heart rate: 193.9±7.86 and 190.00±6.71 bpm. The VO2MAX (56.00±6.33 and 57.20±4.67 ml/kg/min) was not statistically different when comparing both tests. Based on the Pearson Moment Correlations, two equations were proposed to predict the VO2MAX using the total time (min) [r=0.91 e r²=83,13%] or the distance covered (m) in the Yo-Yo (r=0.89 e r²=79,1%). VO2time=13,2537+5,762time and VO2(distance)=20,196+0,0334distance. Considering these results, it seems that the Yo-yo intermittent endurance level 2 test could be used to evaluate the aerobic power of soccer players since it showed similar responses to a gold-standard VO2max test and also it seems to have a much easier applicability, less costs and it is specific to soccer.
ANAEROBIC METABOLIC AND VELOCIMETRIC FATIGUE THRESHOLDS IN SWIMMING

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Delivering fatigue onset is one of the training purposes. Moving fatigue thresholds in response to training, like the anaerobic threshold, it's an example of it. Although, fatigue thresholds use seems to be possible only for evaluations performed under aerobic metabolic domain. This could be due to difficulties associated to anaerobic potential evaluation (Bangsbo, 1998). The aim of the present study was to determine if metabolic and velocimetric anaerobic fatigue thresholds are coincident on time. Research protocol consisted on two tests performed by two different groups. First group (10 male and female pubertal swimmers) accomplished a maximal front crawl 30s swimming test attached to a cable velocimetric system. The second group (10 pubertal male swimmers) performed 6 maximal front crawl swim stages with 5s increasing time from 5 to 30s. Post exercise peak blood lactate was measured (LactatePro analyser) after each stage of the incremental exercise. A especially developed Matlab program allowed to determine fatigue thresholds on the continuous 30s effort v(t) function based on frequency analysis using wavelets (Soares et al., 2006). It was possible to observe velocimetric curves with one (13.83±1.33s) and two (9.67±2.27 and 17.42±2.35s) fatigue thresholds. Metabolic fatigue threshold determined trough blood lactate kinetics during the incremental 30s protocol showed differences in blood lactate accumulation near to 15s swimming effort. Results showed that metabolic thresholds are close to velocimetric thresholds of v(t) curves were one threshold was observed.

References.

ANAEROBIC CRITICAL VELOCITY AS A POSSIBLE TOOL FOR SWIMMERS’ EVALUATION

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Considering that most of swimming competition distances are equal or lower than 200m, and that events last around 2 min or lower, it's commonly recognized the importance of swimmers' anaerobic potential (Troup, 1999). Although, valid and easily applicable methods for anaerobic potential evaluation still missing. Wakayoshi et al. (1992) adapted the critical power concept of Scherrer e Monod (1960) to swimming. Authors proposed the regression of swimming distances over respective times of maximal intensity. This method allowed for critical velocity calculation, and has been well accepted as an aerobic capacity indicator. Some authors get the y-intercept value of that regression line and tested it in order to be used as an anaerobic potential indicator. Results were somewhat encouraging (Soares et al., 2003). In an attempt to implement an alternative, simple and non-evasive test that evaluate swimmers anaerobic performance based upon CV concept, the purpose of this study was to calculate and analyze CV, determined only with supposed anaerobic swimming distances - short distances - (CVanaer), in order to understand its meaning, namely on what means swimmer’s anaerobic performance evaluation.

10 pubertal male swimmers (12.8±0.7 years) were evaluated. Subjects have accomplished 6 maximal front crawl swim stages with increasing time-duration from 5 to 30s. The increments were of 5s. Recovery between bouts was 20 min active front crawl swimming and two distances swim test of 200 and 800m swam at maximal intensity. CVanaer was on average 6.5±2.3m.s-1 higher than CV (p<0.05). Mean average difference was 0.1±1.5s and that seems to confirm that VCanaer could be used as a possible indicator of the anaerobic swimming capacity performance.

References.

INVESTIGATION OF THE INDIVIDUAL CONTRIBUTION TO CREW PERFORMANCE IN ROWING

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The main aim of the study was to investigate the individual contribution of each rower to team performance in a quad scull boat. Two quad scull teams consisting of eight rowers with similar physical age 19.7±1.6 years, weight 84,0±3.2 kg and height 185,9±3.9 cm and no age profile participated in the study. On land, a 1000m ergometer test measured the performance of the rowers while a staged rowing ergometer test yielded the physiological capacity parameters. In the 2000m ergometer test, power per stroke was recorded continuously by RowPro® software. In the staged rowing ergometer test heart rate, oxygen uptake and carbon dioxide output were recorded by Zan® Ergospirometer, and max-VO2 and anaerobic threshold were determined by Zan® software and Wasserman® plots. On water, a staged test with increasing stroke rate and a 2000m race test were performed. In these tests, the force generated by left and right oars, stroke arc, boat velocity, boat acceleration (two axes), and heart rate were continuously recorded by the RowX-outdoor® system and analyzed by Webas Expert® and Dataplore® software.

Max-VO2 of the rower was 4.99±0.08 l/min and the anaerobic threshold was reached at 77.2±2.1% of max-VO2. On the ergometer, with exception of the first and final sprint period, the variation of the individual contribution to total team power output was confined to 1%. In the on water staged test mean boat velocity significantly correlated with power, drive time power, force, efficiency of stroke rate, stroke arc, effective arc, angle to force peak and angle at force peak (p<0.05). In the 2000m on water test, power and force production of both the teams and the individual rowers varied instantaneously. Individual force curves remained stable, but were different between rowers. For all parameters left-right differences were observed. The individual contribution of the rowers to total power output of the team showed a variation of 2.1% for team 1 (the more experienced one), and 2.7% for team 2. Contrary to the variation profile observed on the
EXAMINING HEARTH RATE DURING GOLF TRAINING
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The aim of the study was to determine the hearth rate of a golfer, and how many steps the golfers walk during training and approach about the structure of golf.

Total 3 male golfers with handicaps of -2.6 / 2.1 (mean age 20.4±2.19) and 2 female golfers with handicaps 2 - -3 took part in this study.

The golfers have been involved in golf for 10 years. Measurements were taken on a golf course with 18 holes in Antalya.

The golfers did not do any intense physical activity the day before training. The resting hearth rate of the golfers was taken before training.

They went into the course after hearth rate monitors and a pedometer (Yamax Digiwalker CW-701 Pedometer) was worn on the belt. It started to record as the golfer walked on the golf course and stopped on the last hole. The distance was calculated by multiplying number of steps and step length (distance = number of steps x step length).

Heart rate monitor (Polar S610i) was used in order to determine the hearth rate of the golfers during training. Heart rate monitor was worn before warming up and the monitor was stopped after the game completed. Golfers played the game as pairs. In the beginning of every session and at the end of the session, time marker (lap time) was used in order to evaluate the heart rate of the golfers on every hole including warming up and warming up with the ball. Every exercise file of each golfer was transferred to a computer via infrared. Exercise files of the golfers were examined one by one in order to revise any mistake which could occur in hearth rate monitor during the game. After that all the data of the whole group was evaluated statistically.

The mean resting hearth rate of the golfers was 68±6.52, 91 minutes (minimum 71 minutes, maximum 120 minutes) and mean hearth rate was 123±5.07 per minute after warming up. Golfers completed 16 holes owing to weather condition. It has been seen that minimum heart rate was 116±6.6, while maximum heart rate was 163±11.48 after the game. Total duration the golfers spent on the golf course including warming up was 249 minutes (minimum 202, maximum 300 minutes). Average number of steps the golfers walked was 14931.

It has been seen that golfers do an intense physical activity when the distance they treaded was taken into consideration and their hearth rate decreased remarkably in aerobic level. It is conspicuous that golf is a sport which requires pretty much aerobic endurance.

KINETICS OF STROKE RATE, STROKE LENGTH, AND SWIMMING VELOCITY, DURING A SHORT-COURSE 100M FRONT CRAWL SWIMMING EVENT
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The ratio between stroke rate (SR) and stroke length (SL), as well as the changes of swimming velocity (v), during competitive swimming, are widely regarded as macro characteristics of sport technique and its efficiency, specially when combined in the stroke index: SI = SL * v (Costill et al., 1985). Efficient movements allow lower energy expenditure, highlighting the importance of biomechanics as a factor of energy saving.

The purpose of this study was two-fold: (i) to analyze the kinetics of the stroking characteristics - SR, SL, stroke index (SI) -, and v throughout a 100m front crawl swimming and (ii) to analyze the relationships between these indexes and the specialty of the swimmers (sprinters, middle distance, and endurance swimmers).

Seven elite front crawl swimmers were divided into three groups: 2 sprint swimmers (50.3±0.9s personal best in 100m freestyle), 3 middle distance swimmers (242.2±4.5s personal best in 400m freestyle) and 2 endurance swimmers (956.7±3.4s personal best in 1500m freestyle). The subjects were tested in a 4 phases protocol: (i) a maximal 100m front crawl event, recording the four 25m time splits (and corresponding v); (ii) after 1h of active recovery, a 25m paced swim at the velocity assessed in the first 25m split and (iii and iv) 24 h after, corresponding v).

Throughout the 100m front crawl, the velocity decreased significantly during the three first laps (increasing in the last 25m split), and the SR rises and the SI decreases, being these parameters inversely correlated (r=-0.98, p<0.05), as found by Seifert et al. (2005). Additionally, it was observed a high correlation between SR and v (r=0.661; p<0.05). When comparing swimming specialists, the sprinters were significantly faster than middle and long distance swimmers, presenting higher SR. Furthermore, we found lower SL and SI in sprinters than in middle and long distance swimmers.

It was possible to conclude that the 100m event imposes specific fatigue effects and, complementarily, that the specific specialized aerobic training allows swimmers to keep with a apparently specific event strategy.

References.

CHANGES OF KINETIC MEASURES IN YOUNG WOMEN ATHLETES
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Kinetic measures may provide information for differences due to training background [Ligrinoiwhi et al., 2007], as well as for changes in the progress of a training season [Häkkinen et al., 1993]. They may also be used for optimizing an athletic movement [Hochmuth, 1984]. This study evaluated changes in kinetic measures of jumping performance in young track & field jumpers [TFJ: n=13, 17.5±1.5yrs, 57.3±5.6 kg, 168±4.6.6cm] and volleyball players [n=19, 16±1.9yrs, 61.7±6.8 kg, 170.3±8.7cm]. Athletes were initially tested in the preparation...
EFFECT OF THE CRITERION TO DETERMINE MAXIMAL LACTATE STEADY STATE DURING AN INTERMITTENT PROTOCOL WITH ACTIVE RECOVERY

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Introduction: Most endurance athletes have utilized interval training, which involves repeated bouts at exercise intensities equals or near to maximal lactate steady state (MLSS), interspersed with recovery periods. MLSS corresponds to the highest workload exercise that can be maintained over time without continual blood lactate accumulation and it has often been determined trough 30-min continuous exercise sessions (Beneke et al., 2003). In general, an increase in blood lactate concentration by no more than 1.0 mM during the final 20 min of the test is used as a criterion to calculate MLSS. However, there is few knowledge referred to its determination at intermittent exercise conditions. Since test interruptions may interfere in the blood lactate response, the moment of blood collection may interfere in the blood lactate values (Beneke et al., 2003). Therefore, the objective of this study was to analyze the effect of the criterion utilized to determine the workload (MLSSw) and blood lactate concentration ([La]) corresponding to MLSS.

Methods: Eight trained male cyclists (25 ± 4 yr, 71.30 ± 11.60 kg, 178.00 ± 4.50 cm), performed the following tests on different days on a cycle ergometer: (1) incremental test in order to determine the workload (MLSSw) and blood lactate concentration ([La]); (2) two to five constant workload tests to determine MLSS and [La], consisting on eight 4-min bouts and 2-min of active recovery at 50%Pmax (i.e., 46 min of exercise protocol). The first trial was performed at 105%AT. If during the first constant load test a steady state or a decrease in lactate was observed, further subsequent constant load tests with 5% higher workload intensities were performed on separate days until no [La] steady state could be maintained over time without continual blood lactate accumulation.

Results: The [La] obtained trough constant load tests with 5% higher workload intensities were performed on separate days until no [La] steady state could be maintained. If during the first constant l oad test a steady state or a decrease in lactate was observed, further subsequent constant load tests with 5% higher workload intensities were performed on separate days until no [La] steady state could be maintained.

Discussion: Results revealed that MLSS was calculated using two criteria: a) Delta [La] between 10th (after the second bout) and 30th min (after the fifth recovery period) of the entire test protocol (i.e., considering recovery periods IC1 and IC2 between 14th and 44th min (in the middle of the eight bout) of the entire test protocol (i.e., without considering recovery periods IC1 and IC2). Results: The [La] obtained trough C1 (6.06 ± 1.76 mM) was significantly higher than C2 (5.41 ± 1.8 mM). There was no significant difference in MLSSw calculated from C1 (303.50 ± 24.22 W, 84.87 ± 4.23%Pmax) and C2 (310.75 ± 26.47 W, 84.40 ± 5.01%Pmax). Conclusions: Although metabolic response is higher when the recovery period is considered for the data analysis, the exercise workload corresponding to MLSS is not affected by the criterion used for its determination.

References:
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THE EFFECTIVENESS OF THE SIDE-OUT IN A HIGH LEVEL TEAM OF VOLLEYBALL IN 2007 SEASON

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Introduction

The aim of this study was to evaluate the efficacy in the side-out situations of a Portuguese team, the Leixões Sport Club (LSC), during the 2006/2007 championship.

Methods

The last five male seniors games of the LSC were observed using the observation system SOS-vgs (Moutinho, 1993) in a total amount of 18 sets and 296 technical actions concerning to the side-out phase. In order to appreciate the association between variables (reception, distribution, attack), descriptive and inferential statistics were used namely the Chi-Square and Monte Carlo test. The reliability was confirmed through the Kappa of Cohen statistic.

Results / Discussion

Our results revealed that LSC had a high percentage of success in the pass quality (reception) as well as a high quality of jumping pass increasing the number of pass possibilities in the attack, varying between 75.0% and 81.2%. The distribution action was also positive with increasing the number of pass possibilities in the attack, varying between 75.0% and 81.2%. The distribution action was also positive with increasing the number of pass possibilities in the attack, varying between 75.0% and 81.2%. The distribution action was also positive with increasing the number of pass possibilities in the attack, varying between 75.0% and 81.2%. The distribution action was also positive with increasing the number of pass possibilities in the attack, varying between 75.0% and 81.2%. The distribution action was also positive with increasing the number of pass possibilities in the attack, varying between 75.0% and 81.2%.

Conclusion

When a comparison between the games carried out 'at home' and of the games carried out 'outside home' was made, our results failed to find any difference in the effectiveness of reception, distribution and attack.
The most pertinent conclusion was the high team efficacy realization on the side-out phase. Despite this level of efficacy, this team was unable to qualify for the play-offs, reaching the sixth place on the final ranking.

**BAKEBALL GAME-RELATED STATISTICS THAT DISCRIMINATE BETWEEN TEAMS’ LONG-TERM SUCCESS**

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The study of basketball game-related statistics in game situation has been used to identify variables that can distinguish between successful teams and players, and consequently lead to better sport results. Several studies have been showing that basketball winning teams outperform losing teams in shooting field-goals and securing defensive rebounds Ibáñez, Sampaio, Sáenz-López, Giménez, & Janeiro, 2003). No study has been conducted in several basketball seasons in order to identify long-term success. Therefore, the aim of the present study was to identify the basketball game-related statistics that discriminate between teams’ long-term success, as measured by teams’ qualification for the playoffs. The sample was constituted by all 145 average records per season from the 3274 games played during the 2000-2001 and the 2005-2006 regular seasons in the basketball Spanish league (LEB1 league). The following game-related statistics were gathered from the official boxscores of the Spanish basketball federation: 2 and 3 point field-goals (both successful and unsuccessful), free-throws (both successful and unsuccessful), defensive and offensive rebounds, assists, steals, turnovers, blocks (both made and received), and fouls (both committed and received). In order to control season variability all results were normalized to minutes played each season and afterwards they were converted in z-scores. The first result was the absence of statistical significant differences between best and worst teams’ game ball possessions, which represent game rhythm (Oliver, 2004). This result allows to suggest that basketball overall team success is not associated with higher or lower game rhythms. On the other hand, the best teams did exhibit higher offensive efficacies than the worst teams (1.42±0.07 vs. 1.35±0.07, p<0.05). Results from discriminant analysis were statistically significant (Wilks’ Lambda[1,15]=0.46, p<0.01) and allowed to emphasize the structure coefficients (SC) from assists (SC=.42), steals (SC=.33) and blocks (SC=.30). The obtained function correctly classified 84.2% of the cases. In conclusion, high-level basketball team success was not dependent on how many opportunities the team has to score but on how to take profit from current opportunities. The best teams’ exhibited better passing skills and better outside and inside defensive pressure.

References.


**DIFFERENCES BETWEEN GAME LEVEL AND GENDER BASKETBALL PLAYERS IN FORMATIVE YEARS**

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Various studies have analyzed the differences in the performance of basketball players with regard to gender and level from the study of game actions. Men’s teams differ from women’s teams by executing a higher number of blocks, a lower number of steals, and by having a higher number of successful two-point field goals. Junior teams differ from senior teams by executing fewer assists and more turnovers (Sampaio, Ibáñez & Feu, 2004). In the literature, no studies have been found that analyze these differences in periods of formation. The purpose of the present study was to identify the differences in the game through the study of the official game statistics between male and female basketball teams from the U16 and U14 categories. The sample was composed of 148 games from the 2007 Spanish championships (U16 males n=43, females n=36; U14 males n=40, females n=29). The variables studied were the following official game statistics: 1-, 2-, and 3-point shots (attempted and successful), defensive and offensive rebounds, assists, steals, turnovers, blocks (made and received), and fouls (committed and received). To avoid the game rhythm effect, all variables were normalized to 100 possessions (Oliver, 2004). The file was divided in order to analyze only the games ending with a close score (n=190, final point difference of 1-12 points). The discriminant analysis for the level of the teams showed a statistically significant relationship (p<0.01). The study of the structural coefficients demonstrated the importance of the attempted 2-point field goals (SC=-.30), attempted 3-point field goals (SC=.40), and turnovers (SC=-.32). The results of the discriminant analysis for gender were equally significant (p<0.01). It was found that the game action that most predicts a male team are attempted 3-point field goals (SC=.44). For the discriminant analysis for level and gender, the function obtained was statistically significant (p<0.05) and correctly classified 90.9% of the cases. Discriminant function 1 correctly classified 60.1% and discriminant function 2 correctly classified 26.8%. The structural coefficients of function 1 reflect the importance of both successful (SC=38) and attempted (SC=-32) 3-point field goals. There were no significant structural coefficients in function 2. The results show the importance of game actions that require greater effort and precision (3-point field goals) when discriminating teams, and these actions are associated with a greater evolutionary development.

References.


**1 X 1 IN EURO 2004, THE BEHAVIOR OF FIRST DEFENDER IN THE GAME OF FOOTBALL**

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**Introduction**

The aim of this study is characterise the behaviour of the first defender, verifying if exists differences over the behaviour application in the different zones, sectors and field sides. Methods

That behaviour is composed by four stages that include: ii) approach to the offensive player with ball possession (stage 1); ii) adequate speed approach between offensive player with ball possession and defender (stage 2); iii) leading the offensive player with ball possession into the lateral field limits (stage 3); and iv) attempt to disarm or disarm (stage 4). There were defined twelve field zones. We analyse 5659 defensive behaviours (1x1) on the 17 recorded games played by the best four selections of the EURO 2004 Football Championship took place in Portugal: Greece, Portugal, Check Republic and The Netherlands. There was used the Contingency Coefficient, the Chi square test with an error probability 0.05.
Results
Was detected a characterization of several behaviour profiles on specific zones. The first defender, in greater proportion, applies stages 1 (approach) and 4 (disarm) of contention (first defender behaviour) in the central defensive zone (zone 2) since that's a good zone to shoot to goal. In zone 1 and 3 (left and right defensive sides), the increasing of ball possession grants more time to apply all stages of behaviour of first defender. In zone 4 and 6 (left and right defensive midfield) the first defender avoiding the risk of trying to disarm the player with ball possession. In zone 7 and 9 (left and right offensive midfield) the objective of the first defender is to take place between the ball and is goal avoiding the entrance of the ball into the zone 5. In zone 8 (central offensive midfielder), the first defender shows a vigilant attitude, like a first blockage for the offensive players. In zone 10 and 12 (left and right offensive sides) the first defender tries to retake the ball possession, while all companions are in attack position. The zone 11 (central offensive) is a zone where the first defender waits a mistake of the ball possession player.

Conclusion
The obtained data permits us to assume that there were found significant differences in application of the defensive behaviour on 1x1, over the several defined zones of the field. The first stage (approach): highly used, reducing only in zone 2 and a little increased over the self goal to the attack goal; second stage (adequate speed): reduce over the self goal to the attack goal and from lateral sides to the central side, third stage (leading to the side field): reduce substantially over the self goal to the attack goal and from lateral sides to the central side; fourth stage (disarm): less used in the midfield, offensive and defensive, highly used in zone 2 and corner sides (zones 1, 3, 10 and 12).

IMPACT OF FASTING DURING RAMADAN ON ATHLETIC PERFORMANCE IN TUNISIAN ELITE JUDO ATHLETES
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During Ramadan, Muslims abstain from food and fluid intake from dawn to sunset for one month. However, at present the influence of the Ramadan intermittent fast (RIF) on athletic performance is not well known. Therefore, the aim of the present study was to evaluate the influence of the RIF on the level of aerobic and anaerobic power in elite judo athletes maintaining their usual training loads. A battery of physical performance tests (squat jump (SJ), countermovement jump (CMJ), 30-s-repeated jump, 30-m sprint test, and the multistage fitness test), fatigue questionnaire and haematological parameters were measured from 15 elite judo athletes on four occasions: before Ramadan, at the beginning, the end and after Ramadan. The results showed that 30-m-sprint performance, multistage shuttle run test, SJ, and CMJ did not change during Ramadan. However, the 30-s repeated jumps test decreased at the end of Ramadan (P<0.05). There were also a significant reductions in body mass (P<0.05) and an increase in total fatigue score (P<0.05) during Ramadan in comparison with the control period. These results show that the RIF has little effect on performance in most of the aerobic and anaerobic power test in judo athletes. Additionally, athletes can maintain both sufficient energy intake and normal training loads during the RIF. The reduction in the 30-s jump test may be associated with reduced central drive and reductions in body mass. Future studies should examine the effects of the RIF on sport-specific athletic performance. Coaches should carefully plan training loads during the RIF to avoid maladaptive training and to avoid increases of athlete's fatigue which can be an early sign of overreaching. Therefore we suggest that careful periodisation of training, diet and recovery may all be important factors that coaches should consider when training Muslim athletes during the RIF.

STUDY CONCERNING THE IDENTIFICATION OF TALENTS FOR THE HANDBALL GAME FOR DEBUTANTS
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Introduction.
The prognosis of the sporting performance for debutant children is a compulsory condition for obtaining some exceptional results in the sport of high performance. In this sense, the identification of young talents with special skills for practicing the game of handball, did and will permanently attract the attention of the specialists in the domain, as a specific element, included in the sport of performance and directed towards obtaining some superior results in the great world-wide competitions.

Methods.
In order to experiment the theoretic considerations presented and to identify the abilities which favor the practicing of the game of handball, we undertook an experimental study concerning their finding in the initial phase and their degree of manifestation at an early age, inside the Sports Club Sport Team Pitesti, which made a selection in order to form a group of children of beginners in the game of handball. To this action, took part a number of 96 children with the ages between 10 and 11 (born in 1996 and 1997), a number of 18 with inclinations towards the practicing of this game being selected. The measurements were done over the main anthropometric, motric, psycho-motric, functional and psychological parameters, decisive for the practicing of the game of handball, the relationship between these categories being established by parameters and limits of trust in which one can request the physical capability at the age of growing up.

Conclusions.
The basis of the general and specific sporting talent must be searched in the type of physical constitution of the athlete and in his capability to achieve performances, as well as in the perfectibility of the basic motric skills. At the level of the beginners’ children groups, the curriculum of training must rely on the general sporting development, and not on the obtaining of special results in the competitions of handball. The analysis of the current system of sporting selection leads to the conclusion that this is made from measurements which identify with priority the athletic qualities and less those ludic, which forecast the favorable features for the practicing of the game of handball. The selection of talented children can be made at maximum parameters, only if this is made from a biological, functional, bio-chemical, psychological and motric point of view.
HEART RATE RESPONSE TO DURATION AND PLAYERS' NUMBER VARIATIONS IN FUTSAL SPECIFIC DRILL

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Introduction: Recent findings demonstrate that Futsal is a multiple-sprint sport in which high-intensity exercise constitutes a greater proportion of match time than all other team sports (Barbero-Alvarez et al., 2008), but the research of training intensity is a unknown way. Specific drills with variations are constantly used in Futsal practices, however the knowledge about how these variations influence drill intensity is very insufficient (Duarte et al., 2007). Therefore, this study aimed to measure the effects of duration and players’ number variations in a Futsal specific drill by the elicited percentage of maximal Heart Rate (HRmax%) and percentage of time spent in three Heart Rate intensity zones (HRzone1<65%HRmax; HRzone2=65-85%HRmax; HRzone3>85%HRmax).

Methods: The studied sample was constituted by eight players from a Portuguese First Division team (age 25.9±4.5; weight 67.6±7.5; height 1.70±1.0; BMI 22.2±2.0). The exercise testing consists in a half-pitch game with official rules. To test the effect of players’ numerical relations, the drill was played in 4v4, 3v3 and 2v2 conditions, during 4 minutes and followed with an active break (continuous running with low intensity) of 4 minutes. In order to test the effect of exercise duration, the drill was played during 4 minutes and 10 minutes conditions, maintaining an active break of 4 minutes.

Results: In players’ number variation statistically significant differences were found in HRmax% [4v4 81.5±10.6 to 3v3 86.8±7.3 and to 2v2 87.9±11.7; p=0.01] and in percentage of time spent in HRzone2 [35.4% in 4v4, 12.5% in 3v3 and 10.4% in 2v2; p=0.01]. In the exercise duration statistically significant differences were found only in percentage of time spent in higher Heart Rate zone and induce more elevated physiological stimulation.

Conclusions: The decrease in the number of players resulted in an intensity increase, probably due to the larger ratio of area per player and to the progressive decision making constraint by the limited choices of the ball carrier to cooperating with the teams-mate. The variation of the exercise duration did not induce any change in HRmax%. However, playing the half-pitch game during 4 minutes period brings more significant percentage of time spent in higher Heart Rate zone and induce more elevated physiological stimulation.

Keywords: Heart Rate, Specific Drill, Futsal

References.

IMPROVEMENT OF EXTENSION STRENGTH OF THE LOWER LIMBS USING PROGRAMS OF STRENGTH TRAINING COMBINED WITH ELECTROMYOSTIMULATION: STUDY CARRIED OUT IN MALE SENIOR PRE-LEAGUE BASKETBALL ATHLETES

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The main purpose of the present study consists on researching the best procedures for morphologic and functional development of the extensor muscles of the lower limbs. We want to evaluate if the electrical stimulation (EMS) could improve the training process, i.e., whether the results would be optimized if the 'conventional' training of the extensor muscles of the lower limbs was added EMS as well as if the results were consistent after 2 or 3 weeks, keeping the athletes under regular training according to the respective sport.

Our sample, 8 pre-League Basketball athletes, had been split in 2 groups: the control group (GC) composed by 4 Maia Basket athletes only submitted to the initial and final evaluation, and the experimental group (GE) composed by 4 Vitoria de Guimarães athletes who were submitted to a mixed training program - the 'conventional' and the 'electromyostimulation' programs. The training program lasted 8 weeks, with 2 weekly sessions. Each session of about 90’ with an initial warming up, followed by a circuit where the GE worked the different muscular groups, with predominance of the lower limbs extensor muscles [leg-extension, leg-press and squat] normal exercises in 1st set and EMS exercises in the 2nd set bench press, military press, horizontal row, curl Scott and triceps 10RM[s]. Each athlete had been submitted to anthropometric measurements of weight and height. The tests to assess the different strength expressions were: (1) knee extension in the ‘Leg-extension’ - continuous maximum force, (2) leg-press - dynamic maximum force, (3) Counter Movement Jump (CMJ) - explosive and reactive long duration force, (4) Squat Jump (SJ) - explosive force, (5) Drop Jump (DJ) - reactive short duration force, (6) isokinetics Dynamometer - Peak Torque.

The results show that GE improved the lower limbs extensor muscles strength from the 1st to the 2nd evaluation moment, in the different tests. The 3rd moment only showed a positive evolution in the ‘Leg-Extension’ and the ‘Leg-Press’. In the GC, the ‘Leg-Extension’ improvements reached 15.8% and from the 2nd to 3rd moment 15.4%, both statistically relevant. The GC had a loss of 2.7%. In the ‘Leg-Press’, the improvement reached 18.8%, for the GE from the 1st to 2nd moment and 6.9% in the detraining period. The GC got a deficit of 2.7% between the 1st and the 2nd evaluation. During isokinetic force (extension) the improvements reached 3.3% for the GE, on the right lower limb 7.6% (p=0.03) and on the left one 6.1% (p = 0.087).

The CMJ improvements reached 14.3% in the GE from the 1st to the 2nd moment and a decrease of 3.4% from the 2nd to the 3rd, the GC decreased 2.4% between the 2 first moments. The SJ improvement was 14.3% in the GE between the first 2 tests and -5.3% from the 2nd to the 3rd, the GC reached -7.7% from the 1st to the 2nd moment! In the DJ, the improvements reached 10.3% for the GE from the 1st to the 2nd moment, and -2.9% from the 2nd to the 3rd, and there was

IMPROVEMENT OF EXTENSION STRENGTH OF THE LOWER LIMBS USING PROGRAMS OF STRENGTH TRAINING COMBINED WITH ELECTROMYOSTIMULATION: STUDY CARRIED OUT IN MALE SENIOR PRE-LEAGUE BASKETBALL ATHLETES

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**CHOICE REACTION TIME RELATED TO SEX, AGE, ANXIETY, STRENGTH AND MAXIMUM MOVEMENT FREQUENCY**

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**INTRODUCTION**

The relation between reaction time and other characteristics is not clear in the literature. The aim of this study was to compare choice reaction time (CRT) with other subject characteristics in order to see which of them better predict CRT.

**MATERIAL AND METHODS**

After signing an informed consent, 201 subjects (86 women and 115 men), of whom 169 were Karate players and 32 sedentary people, participated in the study. Choice Reaction Time was measured using the software SuperLab Pro 2.0 (Cedrus, San Pedro, CA, USA). Every participant performed 4 blocks of 25 trials. The whole first block and the first trial of each block were excluded from the statistical analysis. Two variables were calculated: CRT [mean of 72 the trials] and efficiency in the test [number of correct responses divided by reaction time and multiplied by a constant to avoid decimals]. A 30 second tapping task was designed to set the maximum movement frequency (MMF). Strength per body mass was measured with a (Grip-D.T.K.K. 5401 Takei) dynamometer and the State Trait Anxiety Inventory (STAI[II]) was used to measure anxiety. Using SPSS 9.0, groups (men/women) were compared with a Student T-test after confirming the equality of variances with the Levene's test.

**RESULTS**

CRT correlates with MMF (r=-.285, p<0.01), efficiency (r=.318, p<0.01) and hand grip strength related to body mass (r=-.165, p<0.05). Also a relation was found between hand grip strength and efficiency (r=.220, p<0.01). No relations were found between CRT, age and anxiety. Men and women CRT was similar and differences were found in efficiency (r=2.69, p<0.01).

**DISCUSSION**

CRT has been related to other performance components (2), in contrast with results of RT as an independent variable (3). Our results suggest a relation between CRT, strength and MMF. These differences could be done to the measuring protocol used, as we measured all variables in the same muscle groups. The independence of CRT and trait-anxiety, in opposition to previous studies (4,5), could be done to our task, developed without stress and without emotional charge. Results suggest better performance in a CRT task in men, according with previous studies where initial differences were avoided increasing the motivation of both groups (6). The evolution of CRT with age previously reported in women between 20 and 89 years (7), has not been demonstrated here, in young adults. In conclusion, RT is related with other subject characteristics.

**References.**


**PHYSIOLOGICAL DETERMINANTS OF AGILITY IN BASKETBALL**

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Agility is a prerequisite for the successful performance in various modern team sports. Little is known about its physiological and Muscular determinants in elite basketball. To get more insight into the physiological and muscular determinants of agility performance and given the proposed importance of this motor quality in sporting performance it would seem beneficial for coaches, strength and conditioning practitioners to identify possible best predictors of a court sport specific agility performance and exercises training to develop training strategies that may best optimize it. The aims of this study were to examine the relationship between squat 1RM and basketball-relevant tests and the variables that influence agility (T-Test) in elite male professional basketball players (n=14, age 23.3±2.7 years, height 195.6±8.3cm, body-mass 94.2±10.2 kg). Testing consisted of anthropometric and physiological measures of height, body mass, %body fat and endurance (VO2max), performance measures of speed (5, 10, and 30 meters), strength (Bench press and squat), vertical jump, horizontal jump test (SJ) and agility. T-test performance was significantly related to body mass (r=0.58, p=0.03) and to % of body-fat (r=0.80, p<0.001). A significant negative correlation was observed between T-Test and 5-Jump test performance (r=-0.61, p=0.02). Squat 1RM was significantly related to 5-m, 10-m and 30-m sprint times. Stepwise correlation analysis showed % body fat percentage was the best single predictor factor (p<0.05) of agility. Squat 1RM performance was the best single predictor of 5-m and 10-m sprint times.
understand the effect of biological maturation on VO2max. Biological maturation has an effect upon VB2 in any way it is expressed, but aerobic capacity development.

The aim of the present study was to evaluate the effects of biological maturation on maximal oxygen uptake (VO2max) and ventilatory breakpoints (VB1 and VB2) in young football players on three separate scales. One hundred and twenty male amateur athletes were allocated into three groups, prepubescent (PreP), pubescent (Pub) and postpubescent (PostP) according to Tanner’s maturation stage. Ventilatory and respiratory parameters were measured by indirect calorimetry (CPX-D, MIC, USA). The VO2max and VB were determined according to the following plots: ventilation (VE) and ventilatory equivalents (VE/VO2 and VE/VCO2), as a function of VO2. VO2max was defined as the highest VO2 achieved during the test. The values of VO2 were expressed in absolute (l.min-1), relative (ml.kg-1.min-1) and allometric (ml.kg-0.75.min-1) forms. VB1 was considered the lowest workload in which VE/VO2 showed a systematic increase without a concomitant increase in VE/VCO2. VB2 was considered the lowest workload in which VE/VO2 showed a concomitant increase in VE/VCO2. The absolute form of VO2 was different among groups in VB1, VB2 and VO2max, whereas in the relative form, there was no difference among groups in VB1 and VO2max. Nevertheless, in VB2, Pub (44.3±3.1) and PostP (44.1±3.0) presented higher VO2 than PreP (42.0±3.9). Allometric VO2max was different among groups (151.3±15.1, 168.9±11.5, 176.3±14.0 for PreP, Pub and PostP, respectively). VB2 in allometric form was higher in Pub (125.1±7.8) and PostP (129.2±9.7) groups when compared with PreP (111.6±9.0). In relation to VB1 allometric, Pub (82.4±9.1) and PostP (81.9±9.1) groups were higher than PreP (71.6±9.0). A multiple linear regression was used to express the relative contribution of the chronologic age, years of training, biological maturation, body mass and height on VB1, VB2 and VO2max in three separate scalings. The main variables explaining absolute, relative and allometric VO2max were body mass and biological maturation (82.8%), whereas body mass and biological maturation only accounted for 7.5% and biological maturation 34.1%. Body mass was the main variable explaining absolute VO2 (71.8%) and allometric VO2 (18.4%). Body mass and biological maturation explained 84.5% and 6.6% of absolute and relative body mass VB2 respectively. Biological maturation explained allometric VB2 in 32.2%. All differences were significant when p<0.05. In conclusion, biological maturation has an effect upon absolute and allometric VO2max. However, relative VO2max does not seem to properly adjust for the effect of body mass on VO2max in young soccer players. This makes it difficult to understand the effect of biological maturation on VO2max. Biological maturation has an effect upon VB2 in any way it is expressed, but does not show an effect on VB1. Also, it seems that the transition of the PreP stage from to Pub stage is the most significant period for aerobic capacity development.

RELATIONSHIP BETWEEN SEASON OF BIRTH BIAS, ASSESSMENT OF MATURATION AND YEARS OF SPORT EXPERIENCE IN THE TALENT SELECTION PROCESS

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PURPOSE: Previous research has found that season of birth bias has an influence in the selection process for many sports. A common cause for this bias was thought to be the selection of early maturing students and greater sporting experience. The primary purpose of this study was to determine if the talent selection process for a youth sport academy had a season of birth bias influence and if so, were early maturation or previous sporting experience contributing factors. METHODS: Measurements were collected during the second phase of ASPIRE’s annual Talent Identification program in 2007 (283 males, age 12.93 ± 1.00 yr). There were three phases involved in the selection process (Silver, Gold and Aspire) were collected during the second phase (Silver) and during all further phases, the successful students initial Silver results were carried forward and grouped for further analysis. Date of birth, standing height, sitting height, and self assessed training experience was collected for all students participating in the program. The year was divided into four quarters when Q1 included Jan, Feb, Mar, Q2 included Apr, May, Jun, Q3 included Jul, Aug, Sep, and Q4 included Oct, Nov, Dec. RESULTS: The first selection (Silver) phase showed no season of birth bias between the quarters (Q1 = 50, Q2 = 58, Q3 = 52, Q4 = 43; p = 0.520). This phase of the selection process was purely objective in that selection was based upon predetermined standards. However the second selection (Gold) phase that involved both subjective and objective evaluations produced a season of birth bias (Q1 = 24, Q2 = 16, Q3 = 11, Q4 = 4; x2 = 15.5, p = 0.001). The third and final selection (Aspire) phase was not found to be statistically significant, however a clear trend was evident towards the first two quarters of the year (Q1 = 9, Q2 = 10, Q3 = 3, Q4 = 3, x2 = 6.8; p = 0.077). Although objective measures were included in the final selection, more importance was given to the coaches subjective evaluation. When the maturation assessment (determined as age at peak height velocity) was evaluated for the three groups (Silver 14.1 ± 0.68 yrs, Gold 13.9 ± 0.75 yrs, and Aspire ± 14.0 ± 0.78 yrs) no differences were evident (x2 = 1.57, p = 0.45). When the self assessed years of training experience was evaluated for the three groups (Silver 1.35 ± 1.51 yrs, Gold 1.30 ± 1.41 yrs, Aspire 1.16 ± 1.18 yrs) no differences were found (x2 = 0.83, p = 0.96). CONCLUSIONS: These results found that a season a birth bias was clearly evident in our selection process even when measures were put in place to prevent this from occurring. Closer evaluation determined that early maturation and more training experience were not significantly different between the groups and thus did not contribute to the season of birth bias. Further research is required to determine the cause of the season of birth bias in the selection process.

EFFECTS OF A STRENGTH PROGRAM TRAINING ASSOCIATED TO SPECIFIC PLYOMETRICS

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In the plan of the current sport profil, the contemplation at short and long term of the strenght training is essential, being a type of work accepted in all the modern methodologies of the athletic training. In Handball, such as in other collective sports, the training of the strength is very important for the improvement of the athlete’s sport.
The main goal of this study was to check the effects of a program of strength associated to specific plyometric training in the strength of vertical jump, in the different forms of demonstration of the strength and in the body composition of senior Handball athletes. Following this idea, we did practice a twelve week training program of strength, being the last seven weeks dedicated to a program in which simultaneously was applied a specific plyometric training twice a week.

The sample was constituted by twelve male senior Handball athletes with ages between twenty and twenty five years old, an average of height and weight of 183.9 cm and 81.7 kg respectively, all players of Associação Desportiva académica do ISMAI, which competed in Campeonato Nacional da 1ª divisão. The evaluation, which was made in two moments of the experimental work, consisted in the following tests: anthropometric measures (weight, height, wingspan, tricipital, bicipital, sub-escapular, supra-iliaca, abdominal, crural, geminal and iliacs skinfolds, bicôndilo umeral e bicôndilo femural diameters and body perimeters such as braquial relaxado, braquial tenso, crural e geminal) and evaluations of vertical jump, expressed in the resistant explosive, reactive and quick resistant of the inferior members, using an electromechanical device Ergojump.

The applied tests were the Squat Jump (SJ) and Counter Mouvement Jump (CMJ), to which were added the Free Jump and forty Consecutive Jumps. The dynamic concentric muscular strength, isometric and dynamic eccentric of the extensors and flexores of the knee were measured through the isocinetic dynamometer REV 9000.

The group evolved in all forms of demonstration of strength, however, the biggest differences happened at the isometric strength of the knees and in the eccentric strength of the flexores and extensors. Simultaneously, improvements happened at the vertical jump between the two moments of evaluation, namely in the resistant explosive, reactive and quick strength of the inferior members, noted by the values obtained in the tests of SJ, CMJ and forty Consecutive Jumps.

In what concerns to the body composition, the group to which the program was applied had statistically significant reductions in the percentage of fat, reducing also the fat mass and increasing thin mass.

VARIABILITY AND RELIABILITY IN ANALYSING BACK POSTURE

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The working Group on Guidelines for Prevention in low back pain (LBP) advocates randomized controlled trails evaluating the possible positive effect of preventive programmes and risk factor modifications in childhood, because this field is neglected (Burton et al., 2004). One risk factor may be the posture in general or postural habits in particular. Posture is very variable (McEvoy & Grimmer, 2005), especially in children. This variability increases the challenge to generate reproducible data. To solve this problem of low reliability, we refer to a neurocybernetic approach. Longier phases of a regulative process has to be examined, as posturography or Armvorhalte-Test (Matthias, 1966) does. Armvorhalte-Test is an easy and traditionally used clinical screening-test. Its quantification of this functional test is possible in sagittal view by videometry. The task is to hold erect for 30 seconds with arms spread forward. The method tests the skill to stabilize posture while provacating the risk factor of a hollow-backposition. One reason of low reliability of this test shown by Bös et al. (2004) can be deficits in standardization. However, high reliability is an important requirement in general and as well to make sure of its validation. Therefore, correlation of 'Armvorhalte-Test' with LBP in childhood or its predictive value of LBP in adulthood have to be verified.

The aim of the present study is to modify the test to enhance its reliability in primary school children as a requirement for further studies to proof its relevance in the genesis of specific low back pain. In the presentation, the original method of Armvorhalte-Test is discussed critically, and coefficients of reliability of a modified test in the present study will be shown. Moreover, following experiments to examine causes of risk behavior in Armvorhalte-Test (e.g. deficits in proprioception/bodyperception, strength of trunk or shoulder muscles) will be discussed.

References.


RELATIONSHIP BETWEEN ANTHROPOMETRIC AND PHYSICAL CHARACTERISTICS IN THE TALENT SELECTION PROCESS

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Aspire Academy for Sports Excellence, Qatar

PURPOSE: Talent search programs around the world have emphasized anthropometric and physical characteristics in the selection of talent. However, it is well known that to be an elite level performer also requires more than just physical prowess. Thus, the purpose of this study was to evaluate the importance of anthropometric and physical characteristics in the overall selection process for a youth sport academy. METHODS: Measurements were collected during ASPIRE’s annual Talent Identification Program during the 2006/2007 school year (5956 males, aged 12 to 15 yrs). All students were assessed on standing height, sitting height, body mass, arm span, 2 kg seated shot throw, 100 g over-arm throw, 40 m sprint, counter movement jump (Yardstick) and 20 m shuttle run. Four phases were involved in the selection process (Bronze, Silver, Gold and Aspire). Measures were collected once during the first phase (Bronze) and during all further phases, the successful students initial Bronze results were carried forward and grouped for further analysis. RESULTS: An initial nonparametric test for independent samples performed between the four groups showed significant differences for all tests (p = 0.01) except body mass (Z = 4.544, p = 0.216). A more detailed analysis was then undertaken (Mann-Whitney U test) to determine specific differences between the groups. All measured values were significantly different between Bronze and Silver except body mass (Z = 0.762, p = 0.446). When Silver was compared to Gold, all the measured characteristics were found to be significantly different except body mass (Z = 1.434, p = 0.152), BMI (Z = 0.529, p = 0.597) and CMJ (Z = 1.904, p = 0.057). Finally when Gold was compared to Aspire, none of the characteristics was found to be significantly different. The anthropometric and physical characteristics were found to be important during the early stages of the talent search process, but other characteristics became more important in the later stages of the talent selection process. CONCLUSIONS: These results suggested that although anthropometric and physical characteristics were very important early in the talent selection process they became less important as the process continued. It was thought that as the quality of the students within the groups increased other characteristics such as motivation, work ethic, and ability to learn new skills became more...
important. In other words, a successful candidate required a minimum standard for the anthropometric and physical characteristics (1st tier), however once these standards had been met, then other characteristics became more important (2nd tier).

**A MULTIDIMENSIONAL TRAINING PROGRAM TO IMPROVE PHYSICAL FITNESS IN ELDERLY PEOPLE**

**Dupont, S., Gauthier, A., Davenne, D.**

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Today it is classically admitted, that at any age the participation in a program of regular physical exercises can reduce the noxious effects of ageing. However, obtaining physiological metabolic, psychological and functional adaptations requires exercises adapted in terms of intensity and duration. This study tested the assumption that a multidimensional program based on muscular and cardiovascular exercises is necessary to hope to improve both the physical and functional capacities and, in term, the quality of life of the retired people.

Moreover, to minimize the risks of injuries, the training program as to be done with a progressive intensity and length of the exercise. Lastly, the training program has to be based on various physical activities to avoid monotonous and to consider that the subjects will keep their desire to go with physical activities at the end of the protocol.

**Methods:** Twenty four sedentary subjects were selected. They were retired and in good health (67±5). They were then randomly divided into two groups: An experimental group (EG, n=12) and a control group (CG, n = 12). EG had to perform our training program of 1 hour, 3 times a week. This program consisted of an alternation of 2 cardiovascular and 1 muscular resistance session each week. It lasted 4 months. CG had to maintain their usual activities for the same period of 4 months. Before (T0) and after (T4) the experimental period, a test session was set up during which the following parameters were recorded on each subject: VO2max (maximal grade cycling test), hand force (dynamometer), power of legs (vertical jump), flexibility and body fat and mass.

**Results:** An ANOVA (groups x time) on each parameter shows that only EG evolved significantly. After 4 months in EG, by comparison between T0 and T4, our training program produced a significant increase of VO2max (23.7±8.2 vs 25.3±7.7 ml kg-1 min-1, +7%), hand force (28.6±8 vs 33.5±8.6 Nm; +8,6%), vertical jump (28.2±8 vs 33.5±9.7 W; +8%) and flexibility (93.5±11 vs 99.2±7.5). The data revealed also a reduction of body fat (-16.9%), and of the index of body mass (-3%). The body weight was not significantly reduced. No significant differences were noted for CG for all these parameters. One year later 90% of the EG subjects are still involved in personal training program.

In conclusion, these results prove that it is possible to improve both the cardiovascular and muscular capacities throughout the same training program. They also suggest that it is of primary importance to apply exercises in a progressive way in order (i) to prevent injuries, (ii) to optimize the physical performances and (iii) to maintain a sufficient motivation so that the subjects can pursue the exercises. The diversity of the tasks, the intensities of work and the modes of action suggested during our training program being effective means to preserve the pleasure of practising a physical activity.

**ASSOCIATION BETWEEN THE BEGINNING AND CONCLUSION OF THE OFFENSIVE PROCESS IN ELITE FEMALE HANDBALL**

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The purpose of the present study was to determine association between the beginning and conclusion of the offensive process in elite female Handball games. We have analysed twelve games performed by Portuguese teams (classified in pool position at the National Championship 2001/02) and nine games from international teams (European competition, National Selection 2001/02). The Spearman’s rho correlation was used to determine association between variables. The results showed in Portuguese teams’ fast break and fast attack, a strong positive association between goals scored and balls introduced by goalkeeper (rs=0.60, p=0.03), interceptions (rs = 0.63, p = 0.02) and lateral throws (rs=0.61, p=0.03). We also found significant and positive correlations in international teams’ fast break and fast attack. Goals scored had strong association with block situations (rs=0.81, p=0.00) and interceptions (rs=0.75, p=0.02). The Portuguese teams committed more mistakes and received more balls from the goalkeeper and lateral throws, while in the international teams the ball came from block situations.
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