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## Tactical Load Carriage: Impacts and Conditioning

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# — THE 2017 — SPORTS SCIENCE SUMMIT

## ABSTRACTS



24th - 26th January 2017

Location: **Online**

EuroSciCon 

**Covering a broad range of topics within sports science, this three day event will provide plenty of opportunity for networking and debate. This informal international meeting will bring you up to date with current research and thinking regarding enhancing performance, together with the application of treatment and prevention of injuries related to sports medicine and technology.**

**We encourage presentations from the wide spectrum of sports professionals, including physiology, psychology, biomechanics and nutrition.**

This event has [CPD accreditation](#)

This abstract book will be finalised two weeks before the event

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#Sports2017

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## Invited Speakers Abstracts

### **Evolutionary aspects of spinal health: implications for spine pathology**

Dr. Been Ella, Head of Physical Therapy Department, Faculty of Health Professions, Ono Academic College, Department of Anatomy and Anthropology, Tel Aviv University, Israel

The attainment of upright posture, with its requisite spinal curvatures, was a major turning point in human evolution. Nonhuman primates have small spinal curvatures, whereas the human spine exhibits distinct curvatures. It is widely believed that moving from the quadrupedal posture and locomotion of primates to the upright two-legged posture and locomotion of humans is a major reason for the high incidence of spinal pathology in humans. Is this so? In this paper, we will explore the relationship between habitual posture, spinal curvatures and axial loading to spinal pathology.

In order to do so we examined the existence of spinal pathology in 3 groups: Bipedal modern humans, with pronounced spinal curvatures; Quadrupedal non-human primates with small spinal curvatures; and extinct hominins with a variety of spinal curvatures. In each group, we examined the following pathologies: spondylosis (degenerative changes of the vertebral bodies or discs), scoliosis, osteoporosis, spondylolysis and spondylolisthesis.

### **Optimising High Intensity Training to Maximise Sports Performance**

Dr. John Babraj, Abertay University, Dundee, United Kingdom

High intensity exercise is an efficient way to improve sports performance. However the outcome to this type of training depends on how the training protocol is implemented. This presentation will look at the components of high intensity training that regulate adaptation. Active recovery between sprints ensures a greater aerobic adaptation to this type of exercise. Likewise, work to rest ratio is important when seeking to induce aerobic or anaerobic adaptations following HIT. Further, failure to achieve sufficient intensity will result in smaller training adaptations; whereas sprint duration is not a key determinant of adaptation.

### **Knee Osteoarthritis: Applying Basic Science Principles to Aquatic and Land Interventions**

Dr. Lori Thein Brody, UW Clinics Research Park, Madison, United States

This talk will explore the relationship between structure and function of articular cartilage, and the impact of exercise interventions on its health. Aquatic based interventions will be the primary focus, with examples of how the water's unique properties can be applied to articular cartilage health in knee osteoarthritis. Integration with land-based exercises and decisions about therapeutic exercise dosage in the different environments will be described.

### **Recovery Strategies**

Dr Emma Cockburn, London Sport Institute, Middlesex University, London, United Kingdom

The use of post-exercise strategies to enhance recovery from exercise stress is common within applied practice and has become a priority topic within research. The aim of recovery strategies is to return performance to pre-exercise levels as soon as possible following the exercise stress to allow training and/or performance to be optimal. A variety of recovery strategies are used including physiological, nutritional and pharmacological but the results are equivocal. This talk will discuss the most recent research on a few key strategies for acute recovery. In addition, chronic use of recovery strategies has become a hot topic of debate and, therefore, this presentation will discuss this research.

### **Exercise and intestine: what gut has to do with it?**

Dr Patrícia L. Campos-Ferraz, University of Sao Paulo, São Paulo, School of Physical Education and Sport, Sao Paulo, SP, Brazil

The intestine has an important role in modulating the immune system and housing the gut microbiota. Exercise is an emerging factor influencing both microbiota diversity and the function of important structural proteins. This talk will summarize trends on the topic and discuss the most recent research regarding this issue.

### **Nutrition and Exercise Immunology**

Dr Glen Davison, School of Sport & Exercise Sciences, University of Kent, Kent, United Kingdom

Endurance athletes have a higher than 'normal' incidence of upper respiratory tract infections (URTI). Although usually trivial in nature URITs may affect training or competition performance. Nutritional strategies to minimise exercise-induced immune disturbance and/or reduce URTI risk are of value to such athletes. There are many products on the market that are advocated as 'immune boosting', but many are not backed up by credible scientific evidence. Some nutritional practices or supplements have good evidence for reducing URTI occurrences and/or severity in athletes. This presentation will cover recent evidence for some proven nutritional strategies and also challenge some common misconceptions.

### **Exercise-induced inflammation and recovery kinetics in team sports**

Associate Professor Ioannis G. Fatouros, School of Physical Education & Sport Sciences, University of Thessaly, Trikala, Greece

The study of exercise-induced inflammation is of paramount importance for elite team sports because it affects the time needed for optimal recovery before the next intense training session or competitive event. Various team sports are characterized by different physiological and metabolic demands as well as characteristics of field-based activity. During the last 8 years our research group monitors the kinetics of performance and inflammatory markers after training and match activity with and without the application of various anti-inflammatory agents. In this presentation, data the inflammatory response and performance recovery kinetics after football, basketball and team handball training and match activity will be presented. Issues on how this information affect training planning will be discussed. A

### **Injury Prevention Considerations for Tactical Athletes**

Professor Kenneth Games, Indiana State University, Terre Haute, United States

Tactical athletes (e.g. fire service, law enforcement, military) are expected to perform their activities in personal protective equipment (PPE) in order to reduce the risk of specific worksite hazards. Although PPE has drastically reduced injury and death from some hazards (e.g. smoke inhalation, gunshot wounds) it may increase risk for musculoskeletal injury. Understanding how PPE alters musculoskeletal injury risk allows for a more directed approach to prevention in tactical athletes. The information presented will provide practitioners with concrete evidence of the mobility, stability, and balance deficits PPE creates and actionable strategies to improve these deficits with the goal of improved health-related quality of life and functional performance in the tactical athlete population.

### **Strength training induces specific neural adaptations**

Dr. Louis-Solal Giboin, University of Konstanz, Konstanz, Germany

It is known that specific strength training, i.e. sustained contractions vs. explosive contractions, induces specific behaviour adaptations, i.e. specific changes in RFD or MVC. However, the mechanisms behind these specific adaptations are still not understood. We demonstrate here that only 4 specific training sessions can modify motor evoked potential area induced by TMS over the quadriceps primary motor cortex, but only when performing the trained task.

### **Development of Critical Power Road Testing**

Dr. Bettina Karsten, University of Greenwich, London, United Kingdom

Dr Bettina Karsten is a Senior Lecturer in Sport Physiology at the University of Greenwich. She completed her PhD entitled 'Analysis of Reliability and Validity of Critical Power Testing in the Field' in 2014. Her other areas of research interest are strength and conditioning and exercise rehabilitation of athletes.

### **The neural correlates of superior performance in elite athletes: behavioural and neurophysiological evidence**

Dr. Stergios Makris, Edge Hill University, Ormskirk, Lancashire, United Kingdom

The ability to form anticipatory representations of ongoing actions is crucial for effective interactions in dynamic environments. In sports, elite athletes exhibit greater ability than novices in predicting other players' actions. This superior ability has been associated with a modulation of visual and motor brain areas. In a series of non-invasive brain stimulation studies we investigated the causative roles of visual and motor action representations in expert athletes' ability to predict the outcome of sport actions. We asked expert players across different sports and novices to predict the outcome of ongoing sport actions containing or not deceptive cues. Prior to or during the task, we applied brain stimulation interference over areas associated with the visual and motor representation of actions. The results have indicated that distinct brain areas between expert players and novices are involved in the perception and simulation of familiar actions. Most importantly, the involvement of motor neural areas for making accurate action predictions was only observed in expert athletes. Moreover, for the first time we provide causative evidence on the involvement of brain motor areas in the detection of bluffing actions in sports. These findings are particularly interesting for sport science researchers, the athletes and their coaches, as they provide a strong initiative for the development of novel approaches with regards to the training and physical preparation of athletes.

### **Dual Energy X-ray Absorptiometry for the measurement of Body Composition**

Professor Karen Knapp, University of Exeter Medical School, Exeter, United Kingdom

Dual energy x-ray absorptiometry (DXA), traditionally used for osteoporosis assessment also affords the ability to measure body composition, with the additional benefit of providing information for regions of interest. However, it is a technique which uses ionising radiation and even though this is a very small dose, it is still related to a risk of stochastic effects. In the UK, DXA for sports performance assessment currently remains unjustified and not a legal use for this technology. This presentation will explore the current evidence-base for the use of DXA in athlete populations, both for bone and body composition assessment.

### **Enhancing motor skill acquisition by preparing to teach**

Dr. Matthew Miller, Auburn University, Auburn, United States

Determining practical ways to enhance motor skill acquisition is crucial to facilitate motor behavior. I will describe a new means by which to enhance skill acquisition, as revealed by a series of experiments conducted in our laboratory. Specifically, I will discuss research demonstrating that individuals learn a motor skill more effectively when they practice and study the skill in preparation for teaching it.

### **Interactions among physical inactivity, motor illiteracy, obesity and academic success**

Dr Maria Isabel Mourão-Carvalho, University of Trás-os-Montes and Alto Douro, Vila Real, Portugal

The rise in childhood obesity has increased dramatically all over the world. Multiple variables and their complex interactions over time influence the development of childhood obesity. The relationship between physical inactivity and obesity is well established in the literature. Still unknown are the underlying mechanisms of inactivity and obesity. The Stodden model is very smart in the way it explains the dynamical relationship between motor competence, physical activity and obesity. Several investigations demonstrated inverse relationships between motor competence and obesity across childhood. Also is emerging in the literature the association between obesity and academic success. In this context, the main purpose of this communication is the presentation of some data from developed investigation in this area.

### **Stress Appraisals, Emotions, and Coping among Athletes: How to Maximise Performance during Pressurised Competitions**

Dr. Adam Nicholls, University of Hull, Hull, United Kingdom

Participating in sport has the potential to be a very stressful experience, which can negatively impact on performance and well-being. The way in which an athlete appraises and copes with stress and negative emotions has the potential to alleviate stress and thus allow athletes to excel under pressurised situations. This presentation will outline appraisal and coping strategies that will allow athletes to maximise their performance.

### **Screening athletes: the star excursion balance test**

Dr Benita Olivier, University of the Witwatersrand, Johannesburg, South Africa

The star excursion balance test is often used in screening of athletes. This talk will give more insight into the history, development, reliability and predictive validity of the star excursion balance test.

### **Tactical Load Carriage: Impacts and Conditioning**

Dr Rob Orr, Tactical Research Unit / Faculty of Health Sciences and Medicine, Bond University, Australia

Tactical athletes (military, law enforcement and firefighters) are required to carry heavy external loads as part of their occupation - as are several other occupations and sporting athletes. Uniquely this session will merge science and practical application to minimise the risk of injury caused by load carriage and optimise performance. Factors influencing tactical load carriage, from load weight to environment, will be examined as will the negative impacts of load carriage to the athlete and their performance. The session will conclude with a ready-to-apply load carriage conditioning framework that is evidence-based and has been tried and tested in tactical populations.

### **Neuromuscular performance during vertical jumping in children**

Dr Dimitrios Patikas, University of Thessaloniki, Serres, Greece

Children's performance during vertical jumps is obviously lower than the one observed in adults but the reasons underpinning this deficit are not well-known. The goal of this lecture is to present data from recent studies regarding biomechanical and neuromuscular aspects of squat jumps, counter-movement jumps and drop jumps from different heights. Comparisons between these different jump types in various attributes of jump gives evidence about how efficient is the usage of the stretch-shortening cycle which gives clues about the reasons of performance deficits that are observed in childhood.



## **Genetics and Exercise**

Ana Pereira, Polytechnic Institute of Setbal, Setbal, Portugal

Age-related decline in strength and especially in muscle power output leads to compromised mobility and an genotype may be associated with a greater proportion of increased risk of falls. ACE I/D and ACTN3 R/X polymorphisms are likely factors in modulating exercise-related phenotypes in older women, particularly in response to a high-speed power training stimuli on maximal strength (1RM), muscle power performance and functional capacity. These genotypes may be important for targeting individuals who may be more susceptible to the decrease of strength and function with aging and may need specific interventions.

## **Fractures in Sport: Optimising their Management and Outcome**

Greg Robertson, Edinburgh Orthopaedic Trauma Unit, University of Edinburgh, Edinburgh, United Kingdom

Fractures in sport are a specialised cohort of injuries, occurring in a high functioning population. While the general principles of fracture management, namely fracture reduction, immobilisation and rehabilitation, guide the treatment of these injuries, management of fractures in athletic populations can differ significantly from those in the general population, due to the need to facilitate a rapid return to high demand activities, as quickly as possible. In order to assess the optimal methods of treating such injuries, and so achieve optimisation of their outcome, the evidence for the management of each specific sport-related fracture type requires assessment and analysis.

## **Human Aquaticity**

Dr Giorgos K. Sakkas, University of Thessaly, Trikala, Thessaly, Greece

The aim of the current talk is to attempt to discuss and define the term aquaticity, as it applies to humans, present the factors that characterize it and reveal the form in which it presents itself in today's society, in order to become a distinct scientific field of study that would allow its assessment as another parameter of human performance.

## **Immunologic aspects of sport**

Dr Ana Maria Teixeira, University of Coimbra, Faculty of Sport Science and Physical Education, Sta Clara, Coimbra, Portugal

The exigent training schedule of elite athletes may induce an inadequate adaptation if imbalanced periods of work and recovery subsist. Coaches of different sports frequently refer that some of their athletes are affected by illnesses following very intense periods of training. Therefore, the predictability of the behaviour of the immune response is highly relevant, given that athletes will be conditioned in their efficiency as long as their health state prevents or limits their participation on the preparation and/or competition schedule. This talk will focus on the behaviour of relevant immune parameters in high competitive level athletes of endurance sports, subjected to high training loads, during a sport season.

## **Digital intervention in self-determined exercise motivation - a randomized controlled trial**

Dr. Karin Weman-Josefsson, Högskolan i Halmstad/Halmstad University, Halmstad, Sweden

Technology and e-health has created new opportunities for health promotion, but recent reviews in the area of physical activity and exercise reveal many digital applications to lack scientific principles and adequate theoretical frameworks. These reviews also conclude such interventions only to show positive effects in the short term, but small or even zero effects in the long term. We therefore designed a digital intervention for the promotion of sustainable exercise motivation based on self-determination theory and used a randomized controlled trial to test potential effects on motivational mechanisms and exercise behaviour.

## **Developing Champions: Practice, Specificity, and Plasticity**

Professor Mark Williams, Brunel University London, London, United Kingdom

Many factors contribute to the development of elite athletes. The contribution of hereditary characteristics and the importance of practice, instruction, and the mentorship of significant others such as parents and coaches are often debated. One perception is that elite athletes are gifted or endowed with greater 'talent', implying that less 'gifted' performers may continually strive to reach excellence without making the necessary gains needed to reach the elite level in the sport. However, recent research in cognitive neuroscience has indicated that individuals achieve excellence through many hours of deliberate, purposeful practice with the specific intention of improving performance. Typically, for example, elite soccer players engage in the sport before the age of 6 years and accumulate in the region of 7,500 hours of practice before the age of 16 years. This commitment and continual engagement in practice may be the

most important determining factor on the path to excellence. A review is provided of research that has examined the developmental history profiles of elite athletes across many countries and continents. The proposal is that expertise develops as a result of specific adaptations to the unique constraints imposed on athletes during practice and competition in the sport. In this presentation, an attempt is made to highlight some of the key psychological adaptations that arise as a result of extended involvement in sport. A particular focus will be on the development of perceptual-cognitive skills such as anticipation and decision making. Finally, implications for talent search and development are highlighted, with attempts to illustrate the nature and type of practice activities most likely to help nurture future generations of experts. An attempt is made to highlight some of the key practice activities that promote the more rapid acquisition of the technical and tactical skills that are crucial at the highest levels in ball sports.

## **Day 1:**

### **Oral Presentation Abstracts**

Oral presentations will be added after the submission deadline

#### **REDUCING ANXIETY IN ELITE ATHLETES: THE EFFECTS OF IMPLEMENTING A MODERATE RUNNING REGIMEN**

*S.C. PRATT*

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## ABSTRACT

Anxiety is an emotional response that elite athletes face. The effectiveness of a mental training component based on the anxiolytic effects of exercise is addressed: How can moderate intensity running be used as a means to reduce anxiety in elite athletes? The positive relationship between physical activity and mental health is investigated through a comprehensive literature review. The review synthesizes research regarding the need for mental skills training among elite athletes and the anxiolytic effects of exercise. Further, a moderate intensity running regimen may provide a viable solution for a wide range of elite athletes experiencing anxiety.

## THE IMMEDIATE MOTOR EFFECTS OF TDCS ON LOWER LIMB MAXIMAL VOLUNTARY STRENGTH IN HEALTHY SUBJECTS

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### Abstract

**Introduction:** Transcranial Direct Current Stimulation has been used for a multitude of ailments and seems to be gaining popularity since 2000a. Few articles have analyzed the effects of tDCS on maximal strength with a gold standard in strength evaluation: an isokinetic device. None have looked at the differences between dominant and non-dominant legs, nor at the difference between concentric and eccentric contractions.

**Material & Methods:** Twenty healthy right-handed adult male subjects (mean age 24,5 years (SD  $\pm$  2,9 years), range 18-30 years) came twice to the isokinetic laboratory. The subjects were randomized and placed into one of four groups: tDCS and dominant leg tested, tDCS and non-dominant leg tested, placebo and dominant leg tested, and placebo and non-dominant leg tested. By using a system of codes, the study was controlled and double-blinded. The first session was a familiarization session, whilst the second consisted of a maximal isokinetic concentric and eccentric strength evaluation of their hamstrings and quadriceps in either their dominant or non-dominant lower limb (depending on their group). They then underwent a 10-minute rest period followed by 20 minutes of anodal stimulation of their lower limb's primary motor cortex (2mA, 20 minutes) (or 20 minutes of placebo stimulation) and were tested again.

**Results:** Strength decreased in the placebo group (-17,7% (SD: 11,9%) in the dominant limb, -19,4% (SD : 13,6%) in the non-dominant limb), probably due to fatigue, but increased in the stimulation group (+12,7 % (SD: 11,1%) in the dominant limb and in +17,7% (SD : 12,2%) in the non-dominant limb). Increases in the non-dominant limb were significantly higher in eccentric contractions than in concentric contractions.

**Conclusion:** Our study found significant increases in strength both dominant and non-dominant limbs following tDCS.

## Day 2:

### Oral Presentation Abstracts

## Day 3:

### Oral Presentation Abstracts

Oral presentations will be added after the submission deadline

## Poster Presentation Abstracts

Poster abstracts will be finalised weeks before the event

### ESSENTIAL FATTY ACIDS IN CONTROL OF THE ENDURANCE OF CROSS-COUNTRY SKIERS

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Research of essential metabolites of energy exchange meet with great interest in the world sport because of their key role in enhancing physical performance. Determination of these metabolites pre- and post-exercise could be good markers in order to evaluate the diet and training strategy. The aim of this work was the estimate of the level of polyunsaturated fatty acids (PUFA) of top-level skiers for the training period and after competition.

Twenty one healthy male athletes (age:  $20.7 \pm 3.4$  years; body mass:  $68.9 \pm 5.2$  kg; body mass index:  $22.2 \pm 1.3$  kg/cm<sup>2</sup>, body fat:  $9.4 \pm 3.1\%$ ; maximal oxygen uptake (VO<sub>2</sub>peak):  $4.3 \pm 0.4$  l min<sup>-1</sup>) from the cross-country skiing members of national team of Russia participated in the study. Data were collected during the period from 2012 to 2015, including training and competitive periods. The athletes performed a 15-km races on National Cup competitions in classical cross-country style in Syktyvkar, Russia, November 2014. The PROFILE OF POLYUNSATURATED FATTY ACIDS (PUFA) in plasma was determined by the gas-liquid chromatography method. TOTAL LIPIDS was measure by "Bio-Test" (Lachema, Brno). All the volunteers were informed of the purpose of the study and gave their written, informed consent. Statistical analyses were performed using "Statistica" software (version 6.0, StatSoft Inc., 2001, USA).

We demonstrated conjugation body fat skiers and total lipid concentrations in blood plasma during training period ( $r = 0,564$ ;  $p = 0.023$ ). Analysis of the class of sportsmanship revealed an inverse relationship between fat body and total lipids in blood in athletes, indicating increased fat utilization in a more trained athletes. The profile of fatty acids of skiers at rest is characterized by low percentages of saturated fatty acids and deficiency of n-3 linolenic (ALA) and n-3 docosahexaenoic (DHA) acids, high index n6/n3 that may be related to inflammation and coagulation markers. Competitive activities (races 15 km) have modified the profile of the PUFA in the blood, which manifested a significant increase in the level of n-3 ALA (C18:3), DHA (C22:6) and decrease of the n-6 PUFA relative basal values.

This study of professional race-skiers during the training period indicating about increased fat utilization in a more trained athletes. Were revealed a deficiency of n-3 linolenic and n-3 docosahexaenoic acids in blood plasma compared with the norms of the almost all participants. Revealed patterns show activation of n-3 PUFA metabolism requiring adjustments training period. Competition activity (15 km races) modified the PUFA profile in their blood, there was increase of the levels of n-3 linolenic (C18:3) and n-3 docosahexaenoic acids (C22:6) relative to the basal data. Revealed links between n-3 PUFA with HR parameters and functional state of the nervous system show on the significant role essential n-3 PUFA to high performance of cross-country skiers. Results may be application by optimization of the training process, correction nutrition programs and development bioactive substance.

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