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FRENCH SOCIETY OF SPORTS TRAUMATOLOGY

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## European Journal of Sports Medicine

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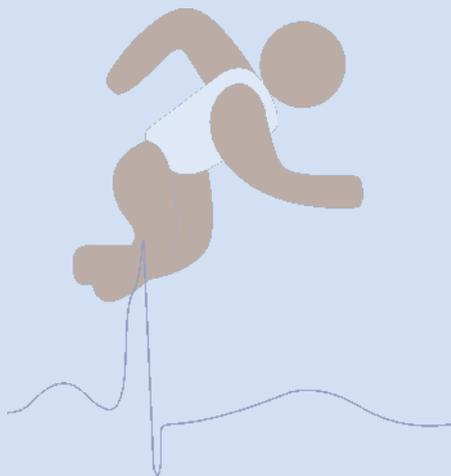
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- c) **Chapter in a book:** Phillips SJ, Whisnant JP. Hypertension and stroke. In: Leregh JH, Brenner BM, editors, *Hypertension: pathophysiology, diagnosis, and management.* 2nd ed. New York: Raven Press; 1995. p. 465-78.
- d) **Conference/Congress proceedings:** Tocitu D. Enzymatic of the adaptative processes in High Performance Sport. Proceedings of the 12th Balkan Sports Medicine Congress, 6th International Congress of the Sports Medicine Association of Greece, 3rd Hellenic-Cyprus Sports Medicine Congress 2002 March 21-24; Thessaloniki, Greece.
- e) **Dissertation Thesis:** Natsis K. Ultrastructural study of the skeletal muscle fibers after an experimental muscle atrophy [dissertation number 870]. Medical School, Aristotle University of Thessaloniki, 1993.
- f) **Journal article in electronic format:** Christodoulou A., Terzidis I., Natsis K., Gigin I., Pournaras J. Soleus accessorius, an anomalous muscle in a young athlete: case report and analysis of the literature. *Br J Sports Med* 2004;38(6):e-38.

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**6<sup>TH</sup> JOINT MEETING SFMES AND SFTS**  
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# Invited Presentations

Thursday, September 26, 2013

INVITED PRESENTATIONS

PLENARY SESSION – EXERCISE PRESCRIPTION FOR HEALTH

IP-01

## ACTIONS OF THE FRENCH GOVERNMENT IN FAVOUR TO EXERCISE FOR HEALTH AND WELLBEING

V. FOURNEYRON

*French Minister in charge of Sports, France*

Exercise is much better than a long list of medication this is what I have been deeply convinced of for many years and I am determined to carry this through as part of my responsibilities as Minister for sports.

Recognized by scientists as a public health tool, thanks to the work supported by the government, during a communication in the Counsel of ministers under the impulse given by Marisol Touraine, minister for social affairs and health as well as mine, health-sports has to be much more than just a public policy measure, it has to be a lifestyle.

The health benefits of physical activity and sports (PAS) are well known to us all and have been amply proven. Many scientific studies conclude that physical activity has positive effects not only on diabetes, obesity or high blood pressure therapy but also on the treatment of cancers or diseases linked to sedentary lifestyles that, according to the World Health Organisation, cause 10% of all deaths.

For all of these reasons, access to physical exercise and sports cannot be a luxury for the happy few. It is an essential right that I am determined to defend by fighting against the inequalities that are still numerous in our country and by helping the many « sports-health » initiatives develop and structure themselves.

We have devised an action plan to meet our twofold priority « sports for all » and « sports-health ». It is aimed at the broad public just as much as at people with « special needs », who require specifically adapted activities.

Its implementation lies particularly with the territories. Our Regional Health Agencies (ARS) and the Regional Directorates for Youth, Sports and Social cohesion (DRJSCS) are jointly steering it, which facilitates the efficient roll out of the « sports, health and wellbeing » plan in every region. Today all the regions are fully equipped.

In parallel I have created within my ministry a « sports-health » resource pool in charge of analysing and evaluating these regional plans in order to extract best practice and disseminate it.

Particularly rich initiatives are emerging in some networks, especially when health professionals - mainly physicians – are put into relation with coaches and professionals in the field of sports.

There people who are too sedentary or suffer from chronic diseases are being oriented by their physician towards a network of PAS specialists who then propose suitable physical activities, either in a sports club

with specially trained personnel or in a medical structure with workshops specifically designed to help them take up some physical activity.

Territorial networks, but also themed experiments help improve the knowledge of sports-health and enhance the national performances in this field. For instance concerning the elderly: the working group on PAS and senior citizens, that Michèle Delaunay, Junior minister in charge of senior citizens, and myself have created, will shortly publish its recommendations.

Let us also mention the experience of the town of Strasbourg, a perfect illustration of the suitability of networks and their innovation capacity. The physicians who are engaged in the project prescribe PAS to their patients, after a preliminary evaluation of their physical capabilities. Then the city takes over and offers the free use of bikes, free entry to the pool or membership in one of the clubs sporting the program label.

Today we should derive some inspiration from this experience and transpose it to the national level.

The medical prescription of physical exercise with its proper « dosage » should contribute to the development of drugless therapies, as numerous studies recommend, in particular the report published by the High Authority on Health in 2011.

Because of its beneficial effects on health and wellbeing, many physicians already recommend regular exercise to their patients. A recommendation is a first step, but a medical prescription is the next step that we have to take. For physical activity reduces health expenditure. Its positive impact on the economy cannot be ignored any longer.

Our national health policy is remarkable in many respects. But it has to give more space to prevention. «Exercise prescription for health», that is the goal I should like us to reach together.

## IP-02

### **PROMOTION OF HEALTHY PHYSICAL-ACTIVITY-RELATED BEHAVIOURS AND PREVENTION OF OVERWEIGHT: A SOCIO-ECOLOGICAL PERSPECTIVE**

C. SIMON<sup>1,2</sup>, E. TRIBY<sup>3</sup>, B. SCHWEITZER<sup>4</sup>, F. HAUSSER<sup>5</sup>, S. BLANC<sup>6</sup>

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Many of the societal and cultural changes of the last decades that we view as progress reduce the amount of energy expended by children in everyday life, in schools and during leisure-time activities. Even if schools are an important avenue for offering physical activity opportunities at a population level, recent trends indicate that traditional compulsory physical education classes are no longer sufficient to compensate for the decline in everyday-life physical activity. On the other hand, according to their age and gender, only 40 to 70% of children regularly participate to sports club activities, the number being even lower in the least wealthy of them. Thus, physical activity and sedentariness are key elements in addressing the obesity epidemic and the associated metabolic and cardiovascular outcomes in youth. Evermore, since physical activity patterns track from childhood to adulthood, promotion of physical activity in youth may be especially efficient and cost-effective, if designed for the long term.

Education- and motivation-based strategies, focused on the individuals, have shown their limits to change behavior permanently. These last years the importance of taking into account large contextual determinants of behaviors - including organizational, social, built and policy environment - when considering health

promotion has been emphasized. In this regard, socio-ecological models indicate that interventions integrating social support and environmental changes that minimize the barriers to adopting an active lifestyle have a higher potential for changing long-term physical activity and for limiting unhealthy weight. Furthermore, limitation of sedentary behaviors and changes in everyday physical activity, and not just for recreational purposes, could be important in a health perspective. Such strategies might also be critical to ensure that prevention strategies are equitable and contribute to reduce the gap in social and environment inequities associated with obesity. As an example we showed that the familial socio-economic context modulates the inverse association between spatial accessibility to PA facilities and overweight. The likelihood of being overweight was higher when spatial accessibility to urban PA facilities was low, but in children of blue-collar-workers only.

Built on the dynamic interplay among personal factors, behaviors, social and environmental influences, ICAPS<sup>a</sup> a 4 year randomised control trial showed that such a systemic and social approach induced an increase in supervised physical activity, limited sedentary behaviours and prevented excessive weight gain in initially normal-weight adolescents during the 4-year intervention. Recent data indicate that the beneficial effects of the intervention on weight maintained 30 months after intervention cessation and might be higher in the most sedentary and the least wealthy students. This was associated with a limitation of TV/Video time, a prevention of the age-related decrease in supervised physical activity, and also, interestingly, with an increase of active commuting between home and school or worksite, as an indicator of everyday physical activity. Our study provides encouraging data regarding the effectiveness to prevent overweight of comprehensive physical activity interventions that simultaneously address the individual attitudes, skills and motivation towards physical activity, the social context, and the environment. It may be key for interventions to incorporate multiple components in order to increase overall physical activity levels in a large proportion of the targeted population and to achieve body composition changes over time. Future studies are necessary to evaluate whether such strategies apply to other age classes, to other cultural contexts, and to countries with different school organization systems. These are the aims of the research program conducted with the collaboration of the French Public Health Authorities and the French National Institute for Prevention and Health Education (INPES), which tests the transferability of ICAPS, and of the European Joint Programming Initiative "Healthy Diet for Healthy Life" and the DEDIPAC Network<sup>b</sup>.

This study was supported by grants from National Research Programs (INSERM and INRA PRNA 2002; ANR ALIA 2008); The Regional Health Insurance of Alsace-Moselle; French Public Authorities within the Health and the Youth and Sports Department; Conseil General du Bas-Rhin; Municipalities of Drusenheim, Illkirch-Graffenstaden, Obernai and Schiltigheim; and the Wyeth and Lab Foundation.

<sup>a</sup>Intervention Centered on Adolescents' Physical activity and Sedentary behaviour. Simon, C., et al., Successful overweight prevention in adolescents by increasing physical activity: a 4-year randomized controlled intervention. *Int J Obes (Lond)*, 2008. 32(10): p. 1489-98.

<sup>b</sup><http://www.jpihdhl.eu/>.

## IP-03

### **ABOUT THE OPPORTUNITY TO INCLUDE PHARMACISTS AS HEALTH PROFESSIONALS FOR PHYSICAL ACTIVITY SENSITIZATION OF PATIENTS WITH CHRONIC DISEASES: PHARMAPS STUDY**

A. POCHET

*Pharmacist inspector for public health, French Ministry of Health*

Development of physical activity is one the major issue for the French nutrition program aiming to contribute for healthy behavior of general population.

Numerous publications are available to demonstrate the benefits of physical activity all along the life cycle and especially for preventing chronic diseases or decreasing the impact of these diseases on human health.

In this context, it is crucial to sensitize sedentary patients and promote physical activity. Health Professionals are naturally the specific target of actors to be mobilized. The new concept of the study described here is to test if pharmacists could be efficient for improving the quality of life of patients with chronic diseases. Indeed, the pharmacist is the unique professional able to be consulted without any appointment. Moreover the territory network of pharmacies is very important: more than 20.000 pharmacies are settled in France.

Pharmaps is a case-control study which will be launched during the worldwide day for diabetes, the 14<sup>th</sup> of November 2013. This study is involving about 14 pharmacies (about 30 pharmacists) all over France (south, north, east and west) and about one thousand patients.

The inclusion criteria are patients aged from 18 to 75 years, well known from the pharmacy and registered since minimum 3 months with a similar medical prescription which should confirm that they have a chronic disease: bronchodilators, medicine against hypertension, osteoporosis, hypoglycemic medicine, anti-cholesterol agents.

This study funded by health Ministry is leaded by the SFMES: Xavier Bigard is the promoter helped by the chairman (Jehan Lecocq), vice chair (Daniel Rivière) and treasurer (Bruno Sesboué). The study is involving the laboratory of Nancy specialized in life quality epidemiological studies.

The pharmacists will receive a specific training before starting and specific tools in order to deliver right message at the right patient in a confidential space.

Instead of delivering one more chemical medicine box to a patient, the originality of the study is that the pharmacist will deliver to the patient a box called PHARMAPS, which is containing everything except drug medicine (instructions of use as a classical medicine, pedometer, physical activity following book, diet advices...).

The patients will be followed periodically through specific questionnaires during one year. The pharmacists will be able to motivate patients to move more and plus if possible: it means in particular to subscribe to an appropriate sportive club after having a medical aptitude certificate.

To conclude in favor of this health professional category, the results should demonstrate that pharmacists are able to increase of 20% of the patients' physical activity practice, to reduce of 10% the sedentary level and improve globally the quality of

## PLENARY SESSION – PHYSICAL ACTIVITY AND TYPE 1 AND TYPE 2 DIABETES

IP-04

### EXERCISE AS MEDICINE FOR TYPE II DIABETES: HORMONAL AND CELLULAR MECHANISMS

L. DI LUIGI

*Unit of Endocrinology – Department of Movement, Human and Health Sciences – University of Roma “Foro Italico” – Roma - Italy*

In humans the metabolic risk is inversely related to performed physical activities and fitness status (e.g. maximum oxygen consumption, consumed METs, energy expenditure, leisure-time behavior, and so forth). It is largely known that a sedentary lifestyle plays a great role in the etiology and/or in the evolution of both lifestyle-related and genes-related metabolic diseases [e.g. dyslipidemia, obesity, metabolic syndrome, type 2 diabetes mellitus (T2DM), double diabetes, etc.]. Physical inactivity is associated to down regulation of insulin receptors, desensitization of insulin post-receptors pathways, increased inter-muscular adipose tissue, altered mitochondrial capacity and increased pro-inflammatory status. For example, it has been showed that increased serum interleukin-6 (IL-6) and C Reactive Protein (hsCR-Protein) concentrations are associated to physical inactivity independent of obesity. Physical activity represents a key element in the primary/secondary prevention and treatment of many metabolic diseases, and of their complications. Actually, exercise is a medicine for T2DM. Many studies show that an active walking behavior and/or the participation in regular exercise prevents and/or delays the onset of T2DM. In subjects affected by T2DM exercise training improves serum glucose control and lipids profile (e.g. reduces glycemia, HbA1c, hyperglycemic peaks, LDL-cholesterol and triglycerides), reduces the needs of pharmacological treatments (e.g. drugs and/or their doses), reduces the risk of complications (e.g. cardiovascular events, mortality, and so forth) and increases the overall quality of life. The effects of physical exercise in the prevention and treatment of metabolic diseases, particularly of T2DM and diabetes-related complications, are related to the acute and chronic effects of physical exercise on genes expression and on different endocrine-metabolic pathways. It has been shown that, depending on the type and intensity of performed physical activity, regular aerobic and/or resistance exercise training could: a) maintain/restore a normal insulin concentration and/or sensitivity by reducing the risk of insulin resistance or recovering from insulin resistance [e.g. effects on insulin receptor substrates (IRS1), AMP-activated protein kinase (AMPK),  $\beta$ -cells function, muscle and adipose tissue peroxisome proliferator-activated receptors- $\gamma$  (PPAR- $\gamma$ ) and peroxisome proliferator - activated receptor gamma coactivator 1 alpha (PGC-1 $\alpha$ ) expression and function], b) guarantee a normal glucose transporters function (GLUT4), c) reduce fat mass and visceral adipose tissue, d) increase serum apelin, ghrelin and adiponectin concentrations, and the expression of its receptors, and decrease visfatin, e) influence endothelin-1 (ET-1) and nitric oxide (NO) production and serum concentrations, f) reduce the pro-inflammatory status [IL-6, IL-18, hsCR-Protein, Tumor Necrosis Factor- $\alpha$  (TNF- $\alpha$ )], g) reduce the response of IL-6 to an acute exercise, h) reduce the markers of oxidative stress (8-iso-PGF2 $\alpha$ ), and, i) improve mitochondrial function and substrates oxidation. Many individual and external factors may influence the different mechanisms and pathways involved in the observed effects of physical training on the endocrine-metabolic status in subject affected by T2DM.

## IP-05

**PRACTICAL RECOMMENDATIONS FOR TYPE 2 DIABETES: HOW, WHERE AND WITH WHOM?**

M. DUCLOS

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Although regular physical activity (PA) is an integral part of type 2 diabetes (T2D) management, few diabetic patients have a sufficient level of PA. However over the past decade, the beneficial effects of regular PA have been well demonstrated, both in T2D prevention (50% reduction in the incidence of T2D in subjects with high metabolic risk) as well as T2D management for the improvement of glycaemic control (mean 0.7% improvement of HbA1c) and the reduction of T2D-related comorbidities (improvement in blood pressure values and lipid profile, decrease in insulin resistance). For clinicians, the question no longer concerns the efficacy of PA but rather how, where and with whom: how can patients be motivated to practice a PA over the long-term? And how can qualified exercise trainers and appropriate practice settings be found?

**In practice: prescription, monitoring, Healthcare collaboration (from Duclos et al. 2013)**

**1) Evaluation of the level of PA:** Questionnaires are the most common evaluation method of PA in all contexts (professional, leisure time, sports, transport, as well as sedentary occupations). Pedometers, which are the simplest and most useful motion counters, measure the number of steps taken when walking or running. The subjects themselves can use the pedometer for self-evaluation of their ambulatory activity, which can help in setting realistic objectives and evaluating whether they have been reached. Recent technological developments have enabled the creation of devices that combine several methods such as the accelerometer, the heart rate monitor, and even GPS. Due to their high costs, these tools are currently used for research only.

**2) Educational assessment concerning PA support:** this enables the evaluation of promoting factors, obstacles and motivation concerning the practice of PA.

**3) Physical activity:** 3 basic principles should be encouraged and implemented together:

– Combating sedentary behaviour: the objective is to decrease the time spent at sedentary activities from 1 to 2 hours per day, so that gradually the total time spent sedentary (between getting up and going to bed) is less than 7 hours per day. The quality of this sedentary time should also be modified by “splitting up” the sedentary time (for example, time spent sitting at a desk or behind the computer), with breaks of at least one minute. During the break, subjects change from the seated or lying position to the standing position using what is considered to be low intensity PA.

– Increasing PA in daily life

– Practicing structured physical and/or sports activities:

They combine endurance exercises (150 minutes/week of moderate intensity activity, at least 3 days during the week) and resistance exercises at least 2 times/week, on non-consecutive days. In all cases, a very progressive approach is recommended. The importance of an initial period of supervised exercise, possibly with the expertise of a qualified sports medicine instructor or trainer, is emphasised. In addition, flexibility exercises can be added.

**4) Places where PA can be practiced and relevant skills needed:** Strategies combining supervised management of PA in groups and with help (social, familial, patient associations, diabetes networks, etc.) with acquisition of necessary skills for improving health state and diabetes management in particular (importance of therapeutic education) seem to be the best guarantee for adopting and maintaining regular PA.

**5) Metabolic Monitoring:** This is indicated at the start of the practice, for educational purposes, so that

patients can become aware of the effects of PA on their blood sugar levels. Self-monitoring of glycaemia (before and after exercise) is also recommended for type 2 diabetics at risk of hypoglycaemia (treatment with sulfonylureas, glinides and/or insulin) when they commit to PA, especially during the initiation period or when undertaking activity requiring unusual and/or prolonged effort. Consequently, when diabetics know their glycaemic responses to a given type of exercise, self-monitoring can be reduced when this type of exercise is performed.

**6) Partnerships/Health-related institutions:** Partnerships with health-related institutions (clubs, federations, associations) that have programmes and activities adapted to the issues of T2D patients are essential for the maintenance of PA behavioural changes and their long-term inclusion in patients' daily lives. The establishment of regular contacts between health professionals and organisers of these institutions is vital and aims to raise awareness and train organisers and to discuss management objectives. These partnerships are ideally springboards for resuming an activity, giving back confidence and initiating change.

#### REFERENCES:

M. Duclos, J.-M. Oppert, B. Verges, V. Coliche, J.-F. Gautier, Y. Guezennec, G. Reach, G. Strauch, for the SFD diabetes and physical activity working group. Physical activity and type 2 diabetes. Recommendations of the SFD (Francophone Diabetes Society) diabetes and physical activity working group. *Diabetes & Metabolism* 39 (2013) 205–216

## IP-06

### PHYSICAL ACTIVITY GUIDELINES FOR TYPE 1 DIABETIC PATIENTS

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A significant increase in the incidence of Type 1 diabetes over the past few decades has been reported worldwide. Physicians and other healthcare professionals can heighten awareness of the importance of physical activity by promoting regular exercise as a key component of therapy (5). Whereas insulin remains the main treatment in type 1 diabetes, adequate lifestyle including appropriate dietary intakes and regular physical activity all along the life are now recognized as key-factors to prevent and delay complications. Both aerobic and resistance exercise are beneficial for patients with diabetes, and it is optimal to do both types of exercise. At least 150 minutes per week of aerobic exercise, plus at least two sessions per week of resistance exercise, is recommended (5). Aerobic activities can help people with diabetes to increase cardiorespiratory fitness (3), decrease insulin resistance, improve lipid profile (4). Additionally, resistance training has been shown to increase lean muscle mass and bone mineral density. A cohort study in people with type 1 diabetes found that 7-year mortality was 50% lower in those reporting more than 2000 kcal of weekly exercise compared to those reporting <1000 kcal of physical activity per week (1). However exercise causes increased insulin sensitivity during, and for many hours after the activity in people with and without diabetes. Therefore, fear of hypoglycemia is an important barrier to exercise in people with type 1 diabetes and advice on physical activity should include strategies to reduce risk of hypoglycemia (2). Before beginning a program of vigorous physical activity, people with diabetes should be assessed for conditions that might increase risks associated with certain types of exercise or predispose them to injury. Finally, patients should be encouraged to set specific physical activity goals, anticipate likely barriers to physical activity (e.g. weather, competing time commitments) and develop strategies to overcome these barriers.

**REFERENCES**

1. Moy CS, Songer TJ, LaPorte RE, et al. Insulin-dependent diabetes mellitus, physical activity, and death. *Am J Epidemiol* (1993) 137:74-81
2. Bussau VA, Ferreira LD, Jones TW, Fournier PA. A 10-s sprint performed prior to moderate-intensity exercise prevents early post-exercise fall in glycaemia in individuals with type 1 diabetes. *Diabetologia* (2007) 50:1815-8.
3. Exercise Training and Cardiovascular Risk Factors in Type 1 Diabetic Adolescent Girls. Heyman E, Toutain C, Delamarche P, Berthon P, Briard D, Youssef H, DeKerdanet M and Gratas-Delamarche A. *Pediatr Exerc Sci* (2007) 19: 408-419,
4. E. Heyman, P. Berthon, H. Youssef, A. Gratas-Delamarche, D. Briard, FX.Gamelin, P. Delamarche, M. de Kerdanet. Metabolic dysfunction in late-puberty adolescent girls with type 1 diabetes: Relationship to physical activity and dietary intakes. *Diabetes & Metabolism* (2012) 337–342
5. RJ. Sigal, MJ. Armstrong, P.Colby, GP. Kenny, RC. Plotnikoff, SM. Reichert, MC. Riddell. Physical Activity and Diabetes *Can J Diabetes* 37 (2013) 40-44

## PLENARY SESSION – ANTIDOPING

IP-07

### **ANALYTICAL APPROACHES FOR NEW AND EMERGING DOPING AGENTS IN SPORTS DRUG TESTING**

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Sports drug testing laboratories are facing multifaceted challenges including the misuse of naturally/endogenously occurring substances, non-approved/discontinued drug candidates, urine manipulation, etc. In order to provide best-possible analytical performance, mass spectrometry-based approaches are predominantly utilized to detect prohibited substances and methods of doping. The majority of the employed instruments provides low resolving power; however, with the constantly increasing analytical requirements concerning the number of target compounds, the complexity of analytes (e.g., peptides and proteins) as well as the desire to accelerate analyses and obtain information allowing also for retrospective data mining, high resolution/high accuracy mass spectrometry has gained much attention recently. Various assays were reported enabling multi-component analyses of low- or high molecular weight measurands, and advantages (higher specificity, reduction of interfering signals, peptide/protein analysis) as well as disadvantages (costs) of such investments will be presented by means of selected applications.

IP-08

### **PHARMACEUTICAL INDUSTRY – ANTI-DOPING AUTHORITIES: MUTUAL BENEFITS OF AN ACTIVE COLLABORATION**

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Over the past decade, several doping affairs in elite sports revealed that some drugs undergoing legitimate clinical development are deviated from their clinical trials by athletes or their entourage to be abused for performance enhancing purposes. In addition, some new substances, in particular those with chemical structures related or similar to naturally produced substances (e.g. hormones, releasing hormones or peptides), are particularly difficult to detect and require substantial time and investment by anti-doping authorities to be integrated as part of the routine anti-doping analysis conducted by laboratories accredited by the World Anti-Doping Agency (WADA).

In order to facilitate the identification of new drugs in development with doping potential, WADA is developing collaborations and partnerships with pharmaceutical and biotechnology companies as well as with associations of biopharmaceutical companies, to encourage exchange of information on drugs with doping potential, long before such drugs complete their clinical development and are commercially available. Companies directly benefit from WADA's input on the risk management of their substances and

also on risk of counterfeiting by some illegal laboratories or unscrupulous companies. A joint process was developed to establish a framework of collaboration and provide a practical tool for the biopharmaceutical companies to identify the new chemical entities at risk early in the development process and further facilitate interactions with WADA to establish proactive and appropriate anti-doping strategies.

This active collaborative model should expand in the years to come with more pharmaceutical and biotechnology companies adhering to this process which ultimately should deter and prevent doped athletes from abusing drugs in clinical development and ultimately reducing health risks for the athletic population while achieving a more levelled playing field in sport.

## PARALLEL SESSION – RETURN TO SPORTS AFTER ACL RECONSTRUCTION

IP-09

### RETURN TO PLAY IN FOOTBALL, A SCIENCE OR AN ART?

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The question that is impossible to answer is: “Return to play in football, a science or an art?”

In a hospital environment it is more of a science because of the more objective criteria, due to the need to adhere to a more closed set of protocols.

In top level football we are, of course, working with objective criteria similar to normal rehabilitation centres; isokinetics, clinical examination, GPS etc, but we also have the possibility to work more regularly with one-to-one contact with the player, seven-days-a-week, with consistent control. We can therefore work more closely and evolve more individual characteristics in our rehabilitation creating more personalised, open protocols.

In our presentation we will demonstrate practical cases and show how we work in our medical department at Chelsea Football Club.

## PARALLEL SESSION – PHYSICAL ACTIVITY FOR ELDERLY

IP-10

### EXERCISE AND SARCOPENIA PREVENTION

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**INTRODUCTION:** Population ageing is a phenomenon that occurs when the median age of country or region rises due to rising life expectancy. An increase in life expectancy causes an increase of older people and they have higher accumulated savings per head than younger people. Strength losses with ageing for men and women are relatively similar. Maximum attainable strength peaks in mid –twenties and declines thereafter. The decline is precipitous after 65 years of age, though few longitudinal studies exist on this topic. A direct assessment of the effects of sarcopenia, even in extremely physically fit individuals, can be seen in the age-related decline in masters athletics (track and field) world records of muscle-intensive sports such as weight lifting. Due to the lessened physical activity and increased longevity of industrialized populations, sarcopenia is emerging as a major health concern. Sarcopenia may progress much more in people with low physical activity.

**RESULTS:** Reduced activity is always the beginning of musculoskeletal and cardiopulmonary deconditioning and this leads later on to functional health problems. Physical activity is influencing also the mental and social fitness in a very positive manner. A lack of physical activity is causing sarcopenia, osteoporosis and frailty. For prevention of that it is necessary to increase the activity in the daily life. The “drug” – “physical activity” must be prescribed. Which movement is done? Intensity? Duration? Number of repetitions? Weekly loading time?

Strength: Sarcopenia is describing the decrease of muscle mass and muscle function in aging people. The decrease of muscle mass is the most important factor for losing strength in the elder people and this is causing the independence in daily living.

Recommended principles for triggering physical fitness in the elderly are first to start with joint mobility and stretching, followed by strengthening, coordination, balance, endurance exercises and at last sport activities should be done, but only in people they like this. Aerobic training is nearly always useful for initiating the increase of physical fitness without negative effects to the joints. In another way aerobic training has a psychological effect and rises the mood. In strengthening you can start with isometrics, but soon as possible it should be done a shift to dynamic strengthening. The principles of training should be given attention.

**SUMMARY:** Although exactly adapted exercises are very beneficial for preventing and treating sarcopenia, people are commonly physically inactive. A regular exercise program is important for maintaining physical, mental and social fitness and function. For catching up this, a strong musculoskeletal system is an important factor. The training program should follow established exercise guidelines that are individualized and progressive in nature. The optimal program will include cardiorespiratory, resistance, flexibility and sensorimotoric exercises. Disease status, comorbidities, physical functions, cognitive limitations, atypical physiological responses and safety are particular areas of consideration when prescribing exercise to elder people. The most important factor to decrease the onset and strength of sarcopenia is to bring more physical activity in the daily life of the people.

## OSTEOARTHRITIS AND EXERCISE

M. IOSIFIDIS

Athletic activity has become a significant component of healthy life style nowadays [2]. As a consequence, the number of professional and recreational athletes in all kinds of sports is rising. However, the association between sports and osteoarthritis (OA) currently remains controversial. Participation in load-bearing and impact sports is considered to place athletes at risk of suffering injuries, commonly to the lower extremities. Even without injury, repetitive joint loading is a possible cause of chondral lesions and subsequent OA [1,4]. In contrast, the effect of moderate impact and torsional joint loading on the risk of OA in athletes with a normal musculoskeletal system remains unclear.

To date, experimental, epidemiological and clinical studies have addressed the hypothesis that mechanical joint loading during sport participation induces or accelerates cartilage degeneration in load bearing joints and have produced overall contradictive results [5]. In general, the individual predisposition for degenerative joint disease, differences in training models and variations in injury patterns make it difficult to establish a clear relationship between athletic activity and the occurrence of OA [1,3,5]. Although several studies have supported the association between joint injury and degeneration, the prevalence of osteoarthritis in the absence of significant joint trauma has scarcely been examined. In addition, the current evidence-base presents significant variability regarding the nature of sport involved, level of subject participation (professional or amateur), occupation and study design. Among the athletic population, elite professional athletes are realistically subjected to the highest impact of repetitive lower limb joint loading. Therefore, comparing former elite athletes with referents of nonsystematic athletic activity would be expected to better elicit differences, if present, in OA prevalence and consequently establish in full scale the effect of sports on lower limb OA.

We performed a study to investigate the prevalence of lower extremities OA in a comparatively large number of former elite athletes and controls from the general population and examine its association with their demographic characteristics, in the absence of major bone or soft tissue joint injury. A questionnaire, clinical and radiographic evaluation were combined to provide a more valid assessment of the occurrence of lower limb clinical and radiographic OA. Our primary hypothesis was that, in this setting, former elite athletes would exhibit a significantly higher prevalence of lower limb OA compared with controls.

Two hundred eighteen former elite male athletes (soccer, volleyball, martial arts, track and field and basketball players, and skiers) and 181 male controls that reported no systematic athletic activity were examined by means of questionnaire, clinical and radiographic evaluation. Former elite male athletes were recruited through athletic associations, among them who had participated in national and at least once in World or European championships or international competitions during their career and remained active at least until the age of 25. Exclusion criteria were age younger than 40 years and a positive history of lower extremity surgery, bone or soft-tissue trauma and inflammatory arthropathy.

Overall, the prevalence of clinical OA between former elite athletes (15.6%) and controls (14.4%) was similar ( $p=0.58$ ). The prevalence of radiographic OA was significantly higher ( $p=0.03$ ) in former elite athletes (36.6%) compared with controls (23.9%). All the participants with clinical OA who underwent radiographic examination also had radiographic OA. The prevalence of clinical and radiographic OA was similar between former athletes of different sports ( $p=0.64$  and  $0.81$  respectively). Age, BMI and occupation variably predicted the prevalence of hip, knee and ankle OA in both study groups.

Our findings partially confirmed our primary hypothesis. The prevalence of radiographic OA was significantly higher in former elite athletes than referents with no systematic athletic activity whereas clinical OA was not significantly different between groups. Although it is true that clinical and radiographic signs of OA are actually part of a single biologic abnormality, in clinical practice they often have a diverse appearance in the course of OA disease. Viewed in this context, our findings suggest that in the absence of major bone and soft tissue lower limb trauma during their athletic career, former elite athletes may not be at increased risk of developing clinical signs of OA. Radiographic signs of OA present in former elite athletes at a higher incidence and possibly precede the clinical onset of OA. Age, BMI and occupation are identified as strong predictors of the development of OA in former elite athletes.

**REFERENCES**

1. Buckwalter JA, Lane NE (1997) Athletics and osteoarthritis. *Am J Sports Med* 25 (6):873-881
2. Hunt A (2003) Musculoskeletal fitness: the keystone in overall well-being and injury prevention. *Clin Orthop Relat Res* (409):96-105
3. Kujala UM, Kaprio J, Sarna S (1994) Osteoarthritis of weight bearing joints of lower limbs in former elite male athletes. *Bmj* 308 (6923):231-234
4. Lequesne MG, Dang N, Lane NE (1997) Sport practice and osteoarthritis of the limbs. *Osteoarthritis Cartilage* 5 (2):75-86
5. Tveit M, Rosengren BE, Nilsson JA, Karlsson MK (2012) Former male elite athletes have a higher prevalence of osteoarthritis and arthroplasty in the hip and knee than expected. *Am J Sports Med* 40 (3):527-533

## PARALLEL SESSION – PAIN IN SPORTS

IP-12

### PAIN, SUFFERING AND COMPETITION: AN ANTHROPOLOGY

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When it is chosen, pain is not associated with suffering. It also performs an identity office, it is a symbolic abutment registered straight from the flesh. It is always a return to oneself, an unstable and effective limit of sense. If the individual decides on circumstances of its registration, he controls it and he is not involved in suffering even if his performance is painful. Most of the sport activities imply a long hand-to-hand fight with the pain. It is not a purpose in itself but rather a limit to be crossed or to be pushed away to go faster or farther than the others. The performance is a symbolic pact with the pain. The training consists in taming the suffering of the activity so that there is not more than a bearable pain. The doping is exactly a deceit made on the painful feeling, and in consequence an extension of the physical abilities of the sportsman. Every day with his sessions of training, the athlete pays symbolically the price of the endurance during the competition. Every day it is a question of forcing the limits of tolerance, of gaining a breath still on the pain by pushing away the suffering. But contrary to the pain stemming from a wound or a disease which imposes its directives, the pain which arises from the training or the competition remains under the control of the follower, it is a personal, intimate hand-to-hand fight, with the oppression, the muscular tension. Mastering the intensity of the effort that he imposes to oneself, the sportsman decides of its duration, knowing that he can suspend a too intense effort or abandon the competition if he goes too far and reaches suffering. A regular pain is the sacrifice granted in a symbolic exchange to make the athlete appear at the right place during the competition. But in principle the day of the event the sportsman always goes farther than during the trainings because he is taken in the atmosphere, his vigilance in the others, he is centered on the uncountable parameters of the competition and less focused on the pain so much that it stays in the bearable. The limits of his suffering are moved back. The pain is the raw material with which the sportsman acts as his body. The conference will lean on the researches of D.

The Breton published in the work: *Expériences de la douleur. Entre destruction et renaissance* (Métailié, 2010).

IP-13

### EVIDENCE-BASED USE OF NON-STEROIDAL ANTI-INFLAMMATORY DRUGS AND ANALGESIA IN SPORTS

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Traditionally, non-steroidal anti-inflammatory drugs (NSAIDs) have been used to reduce the pain and functional impairment resulting from the presumed inflammatory process associated with sport related injuries. Over the last 2 decades however, fundamental and clinical research has challenged the way we use NSAIDs in sports medicine by suggesting that: 1) inflammatory cells are expressed in an interrelated sequence that play an important role in the healing process, 2) inflammatory cells are not detectable in some chronic conditions such as chronic tendinopathies, 3) NSAIDs can impair the adaptive response to exercise and 4) NSAIDs can impair the healing process such as fracture healing. This results in what has been described as the “NSAID paradox” where clinicians want to limit inflammation and stimulate healing. Mackey et al.

**Table 1: Summary of recommended NSAID use for musculoskeletal conditions.**

Tissue	Type of injury	Reviews up to 2010*	What has changed recently?
Bone	Completed fractures	Probably harmful	Probably harmful
	Stress fractures	Probably harmful	<b>Punctual use for pain only</b>
Ligament	Sprains	Possibly useful (<5 days)	Short term use for excessive inflammatory phase
Muscle	Acute strain	Probably not useful	Controversial
	EIMD	Potentially useful	<b>Probably not indicated</b>
	Chronic	Possibly harmful	Not indicated
	Contusions (deep)	Potentially useful	Indicated to prevent heterotropic ossification
Tendon	Tendinopathy	Probably not useful	Not indicated (except for acute impingement)
	Acute tenosynovitis	Possibly useful	Probably useful
Nerve / soft tissue	Impingement	Tend to be most useful	Useful for acute phase

\* (Ziltener et al, 2010; Paoloni et al, 2009; Mehallo et al, 2006)

(2012) recently summarised the situation by writing: “On balance, reports favoring NSAID treatment may be outweighed by evidence pointing to a long-term negative influence of NSAIDs on muscle recovery from injury and adaptation of muscle and connective tissue to exercise training”. Current clinical recommendations for NSAID use in common sport medicine conditions are summarised in table 1.

What about topical NSAIDs? Under experimental conditions involving regular use for adequate duration, topical NSAIDs are an efficient and safe treatment option for painful musculoskeletal conditions (Massey et al. 2010).

When long term NSAID therapy has to be considered, how should we use NSAIDs? Analysis of the individual cardiovascular (CV) or gastro-intestinal (GI) risk should guide the selection of the therapeutic options. There is no conclusive evidence to suggest that any NSAIDs are safe in CV terms. Although network meta-analysis data suggest that naproxen might have a safer CV safety profile (Trelle et al 2011), a more reliable answer to that question should come from the PRECISION study around 2015.

Should paracetamol be considered a NSAID? Initially thought to act centrally, recent data imply an inhibitory effect of paracetamol on the activity of peripheral prostaglandin-synthesising cyclooxygenase enzymes (Hinz et al. 2012). Retrospective cohort data also suggests that, in older patients, combined use of paracetamol and NSAID is associated with more GI complications than either drug alone. Further research will be necessary to verify that association.

Should we tackle the use of over-the-counter (OTC) NSAIDs and analgesics by athletes? In a context of increasing availability, the high prevalence of OTC drug use by athletes in training and competition is well documented. Clinicians should educate athletes as to the probable detrimental effects of regular NSAID use on tissue healing and adaptation.

In summary, NSAID use should be limited to short durations in carefully selected conditions to limit pain, incapacity and additional damage in the acute phase but also with consideration of the probable detrimental effect on healing and adaptation on the longer term.

#### REFERENCES:

- Mackey et al. Scand J Med Sci Sports 2012; 22: e8–e14  
 Ziltener et al. Annals Phys & Rehabilitation Med 2010; 53: 278–288  
 Paoloni et al. Br J Sports Med 2009; 43 : 863-865  
 Mehallo et al. Clin J Sport Med 2006;16(2): 170-174  
 Massey et al. Cochrane Database of Systematic Reviews 2010, Issue 6  
 Trelle et al. BMJ 2011; 342: c7086  
 Hinz et al. Ann Rheum Dis 2012; 71: 20–25

## PARALLEL SESSION – MILITARY MEDICINE AND PHYSIOLOGY

IP-14

**HANDGRIP FORCES, LOAD CARRIAGE AND TRAINABILITY: CAN ELITE FEMALE ATHLETES COMPETE WITH THE AVERAGE MAN?**D. LEYK<sup>1,2</sup>, U. ROHDE<sup>1</sup>, T. RUETHER<sup>2</sup>, A. SIEVERT<sup>2</sup><sup>1</sup>Department IV -Military Ergonomics and Exercise Physiology-, Central Institute of the Federal Armed Forces Medical Services Koblenz, Koblenz, Germany<sup>2</sup>Research Group Epidemiology of Performance, German Sport University Cologne, Cologne, Germany

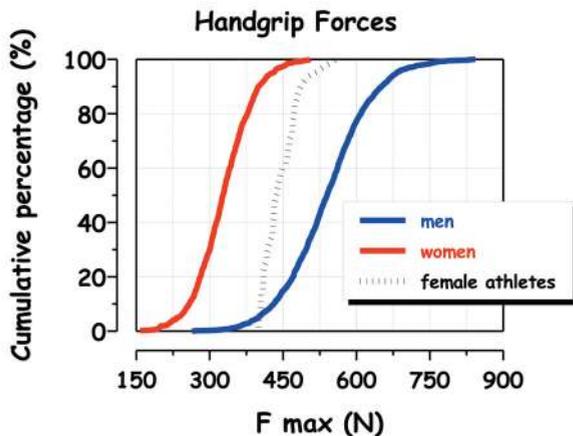
Even in our highly technological society, manual lifting and carrying of loads are still common types of exercise in everyday life. The ability to carry heavy loads often depends on handgrip strength. Physically demanding strength efforts occur during household and leisure time activities as well as in various occupational tasks. Thus, handgrip strength is of highly practical importance not only for seniors and women (e.g. carrying shopping bags, bottle crates) and in some sports (judo, climbing, handball etc.) but also for physically hard working employees (e.g. craftsmen, firefighters, military service). In this context transporting a casualty on a stretcher is a prime example for challenging occupational handgrip strains.

The present article is a review of our previous studies focusing on 1) maximal manual stretcher carriage of ambulance workers (17 men/15 women) and 2) handgrip strength of more than 2000 healthy adults. Aims of our studies were (i) to quantify transport performance and grip force recovery, (ii) to establish epidemiologically relevant normative handgrip strength data, (iii) to assess the influence of gender and to estimate maximal trainability of women by comparing data of young adults with highly trained female athletes.

**METHODS:** Stretcher carriage tests were performed on a treadmill with a velocity of 4.5 km/h. Using both hands for transport, the volunteers had to carry a loaded stretcher –mock-up until exhaustion. Mean load measured at the front handles was some 245 N (25 kg) on each side. Isometric handgrip strength was measured over 15 s using a handheld handgrip ergometer. Maximal (Fmax) and mean handgrip force (Fmean) were derived from the 15 s force tracings.

**RESULTS/DISCUSSION:***1) Performance of male and female ambulance workers*

Maximal stretcher transport time of men (184 s) was almost double the time of women (98 s). Immediately after the exhausting transport, maximal handgrip strength was decreased by 25 % (men) and 14 % (women). Irrespective of gender, complete recovery of handgrip strength required up to 72 h. Eccentric strains probably caused by vertical movements of the stretcher led to muscle damages and explain the slow force recovery.



**Figure:** Distribution of maximal handgrip forces (Fmax) of young men (n=1654), women (n=533) and highly strength trained female elite athletes (n=65)

## 2) Handgrip strength of young men, women and highly strength trained female athletes

As expected,  $F_{max}$  (men: 541 N; women: 329 N) and  $F_{mean}$  (men: 461 N; women: 278 N) differed significantly between both sexes. However, a first surprise was the gender related distribution (see Figure) showing only a small overlap: 90 % of the women did not even surpass the maximal handgrip strength of the 5th percentile (398 N) of male volunteers. The female elite athletes (all volunteers were members of the German national teams in Judo and Handball) were considerably stronger ( $F_{max}$ : 444 N;  $F_{mean}$ : 375 N) than their female counterparts. However, it was another surprise that these values did not even reach the 15th percentile of our cross-sectional male control group. These findings strongly indicate that the strength level of women attainable by longtime and intensive training will not even approximately reach the strength level of an average man.

### LITERATURE:

1. Leyk D, Rohde U, Erley O, Gorges W, Wunderlich M, Rütther T, Essfeld D: Recovery of hand grip strength and hand steadiness after exhausting manual stretcher carriage. *Eur J Appl Physiol*: 96: 593-599, 2006
2. Leyk D, Rohde U, Erley O, Gorges W, Essfeld D, Erren T, Piekarski C: Maximal manual stretcher carriage: Performance and recovery of male and female ambulance workers. *Ergonomics* 50: 752-762, 2007
3. Leyk D, Gorges W, Ridder D, Wunderlich M, Rütther T, Sievert A, Essfeld D: Hand-grip forces of young men, women and highly trained female athletes. *Eur J Appl Physiol* 99: 415-421, 2007
4. Leyk D, Rütther T, Wunderlich M, Heiss A, Ridder D, Küchmeister G, Löllgen H: Sporting activity, prevalence of overweight, and risk factors – cross-sectional study of more than 12500 participants aged 16 to 25 years. *Dtsch Arztl Int*: 105: 793-800, 2008
5. Leyk D, Rütther T, Witzki A, Sievert A, Moedel A, Blettner M, Hackfort D, Löllgen H: Physical Fitness, Weight, Smoking, and Exercise Patterns in Young Adults. *Dtsch Arztl Int* (44): 737–45, 2012

## IP-15

### PHYSICAL TRAINING IN SOLDIERS INVOLVED IN MODERN MILITARY CONFLICTS: PHYSICAL FITNESS FROM NEW RECRUITS TO WARFIGHTERS DEPLOYED ON A BATTLEFIELD

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During the 25 last year's military operations have been profoundly modified in terms of duration, intensity and specificity. Warfighters involved in modern military conflicts have to deal with different physical requirements during deployment (e.g., load carriage patrolling, convoys, preparing forward operating camps, lifting and carrying equipment) implying a good physical fitness.

To prepare a warfighter for the physically demanding tasks performed during military operations, the army physical training is now designed with a modern approach combining endurance and resistance training sessions. This approach needs a periodization of training both to prevent injury and to limit overtraining syndromes development. Because physical training is a basic of soldier profession, we have also to consider a periodization of training through the soldier career from his initial military training to his specialization in a regiment.

To illustrate the evolution of army physical training among different experienced soldiers populations, few results will be presented concerning:

- the physical fitness of new recruits from French alpine troops before and after their initial military training,
  - the physical fitness of warfighters from French alpine troops during a deployment on a battlefield.
- Endurance capacity, muscular strength, military abilities and injuries occurrence depending on both training program and soldiers experience will be discussed.

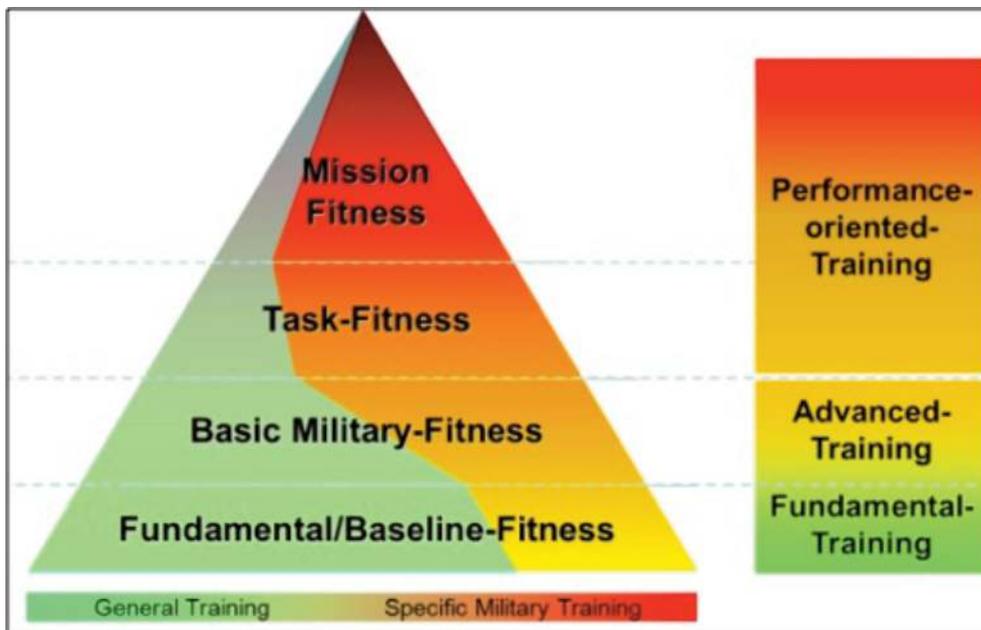
## PHYSICAL FITNESS ASSESSMENT IN THE GERMAN FORCES: BASIS-FITNESS-TEST AND COMPACT-MOVING-TRAIL AS INTEGRATED CONCEPT FOR TRAINING AND MISSION PREPARATION

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Despite technical progress and new mission goals and -requirements in modern armed forces, physical performance is still a key factor for soldiering and mission success. Thus, monitoring of health and performance are prerequisites for maintenance and enhancement of military fitness. The directive "Individual Basic Skills and Physical Ability" by the Chief of Staff of the Bundeswehr defines military fitness as a four-level, integrated concept and stipulates the implementation of regular assessment and valid testing methods<sup>1</sup>.



**Figure:** Four level concept of Military Fitness in the German Bundeswehr<sup>1</sup>.

Suitable methods must capture relevant physiological components, map military demands, require minimal infrastructure, be easily deployable and executable, and deliver valid, reproducible results. They must also map individual basic skills and complex task-related abilities. In this context, the Basis-Fitness-Test (BFT) and Compact-Moving-Trail (CMT) have been developed to assess "Baseline Fitness" and "Basic Military Fitness" as components of military fitness in all branches of service, ranks and occupations.

The BFT was introduced force-wide in 2010 to test Baseline Fitness in three dimensions. It consists of (i) a 1000 m run (endurance capacity), (ii) a flexed arm hang in the chin-up position (upper body strength) and (iii) a 110 m (11x10 m) shuttle run (speed and coordination). Events are timed and must be completed within 90 minutes wearing gym clothes. Analyses of 200.000+ datasets for 2010-2012 have shown the BFT to be a valid tool for cross-sectional and longitudinal evaluation of physical performance and Baseline Fitness. Moreover, results provide important feedback for education, general training and counseling<sup>2</sup>. Additional discriminatory power may be added by the inclusion of body dimensions (height and weight)<sup>2,4</sup>.

The CMT testing is done wearing field uniform (5 kg), ballistic armor (13.4 kg) and helmet (1.6 kg). It combines four crucial military demands<sup>3</sup> into one single, timed test run: (i) 125 m obstacle course with changes in direction, velocity and body position (quick relocation under fire), (ii) 40 m of dragging a 50 kg

load (casualty recovery), (iii) 100 m carrying of two 18 kg jerry cans (load carrying) and (iv) repeated lifting of a boxed 24 kg load to a height of 1.25 m (handling of heavy loads). CMT components were derived from realistic training situations, pre-deployment training and Lessons Learned. Ongoing research to obtain baseline data (deployment of the CMT in selected units and cross reference with physiological parameters) has shown that the CMT yields valid results.

**CONCLUSION:** To ensure adequate performance, regular assessment of physical fitness is necessary in all military personnel. Due to complex military-specific demands, a multi-level, integrative approach is needed. BFT and CMT are tests designed for regular assessment of individual Baseline Fitness and Basic Military Fitness on a force-wide scale. They form the basis of a four-level, integrated concept of military fitness, meet the required criteria of being scientifically verified, easily and ubiquitously deployable, and yielding valid and reproducible results.

**LITERATURE:**

1. Weisung zur Ausbildung und zum Erhalt der Individuellen Grundfertigkeiten: Weisung IGF / Fü S I 5 - Az 32-01-05; 2009.
2. Leyk D, Gorges W, Rohde U, Lison A, Rondé M, Wömpener H, Schlattmann A, Dobmeier H, Rüther T, Wunderlich M. Körperliche Leistungsfähigkeit, Körpermaße und Risikofaktoren von 18-35jährigen Soldaten: Ergebnisse der Evaluierungsstudie zum Basis-Fitness-Test (BFT). *Wehrmed Mschr.* 2010; 54(11-12):278-282.
3. Leyk D, Dobmeier H, Sievert A, Hackfort D. Physical Fitness and Military Fitness: Development of a Pre-deployment Testing Concept. In: Federal Ministry of Defence, ed. *Annual Military Scientific Research Report 2011: Innovative Defence Research for a Future-Oriented Capability Profile of the German Armed Forces*; 2012.
4. Leyk D, Rüther T, Witzki A, Sievert A, Moedl A, Blettner M, Hackfort D, Löllgen H: Physical Fitness, Weight, Smoking, and Exercise Patterns in Young Adults. *Dtsch Arztebl Int* (44): 737–45, 2012

#### SHOULDER AND HANDBALL

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Shoulder of handball player is subjected to high stress on one hand because of the repetition of the action of throwing and on the other hand due to excessive stress during the armed movement - countered, very common in this sport of contacts.

In this discipline, the pathology of the shoulder is common; it is even the most represented in overuse syndrom (Seil 1998, Myklebust 2011) especially multiple types of impingement, rotator cuff pathology and labrum lésion.

It therefore appears necessary to have a good understanding of the factors involved in the occurrence of overuse syndrom of the shoulder in order to provide an effective preventive approach. While the data in the literature do not allow a sufficient level of scientific evidence, a number of physiological adaptation, especially joint and muscle, to overthrowing are identified as potential risk factors.

On the muscular appearance, a prospective study, under the direction of Professor Benedict Forthomme, in collaboration with the FFHB, has been led with three years of follow-up and allows the definition of additional interesting concepts for the understanding of the pathology of the shoulder of handball.

185 players, 139 men and 46 women (150 right handed), agreed to participate in the study. 72.5% were playing, on average, between 7 to 12 hours per week in practice and game, 54% were full back players.

Prior to the season start, all players completed pre-participation forms (previous playing experience questions and information about previous shoulder pain and/or injury). They underwent an isokinetic evaluation for both shoulders (internal (IR) and external (ER) rotators) in supine position, with the arm abducted at 90° in the frontal plane, with a standardized range of motion (120°) and through two concentric speeds (60°/s – 3 repetitions and 240°/s – 5 repetitions) and 60°/s (4 repetitions) in the eccentric mode.

As a result of the retrospective part of this study, 49.7% reported a history of pain and/or injury in the D (dominant) shoulder. The players with full back position ( $p = 0.001$ ) and the offensive role in the team ( $p = 0.0017$ ) mainly suffered from shoulder pain history. No significant difference was found through the isokinetic results between players with and without a shoulder pain history.

During the subsequent competition period, the players ( $n = 171$ ) completed a weekly questionnaire to report any shoulder pain and/or injury. With respect to the in-season follow-up, 17.5% of the players suffered from shoulder pain and/or injury during the on-going season (25 players out of 171 on the D shoulder with 38% of traumatic versus 62% of micro-traumatic injuries). The odds ratios analysis showed that the men ( $p = 0.046$ ) had 4.5 times more risk of suffering from D shoulder pain than women and the full back position increased 3.5 times the risk of suffering from shoulder lesion. Players with D shoulder pain history had 11 times more risk of suffering from traumatic further injury and 6.5 times higher risk of presenting further micro-traumatic lesion.

Concerning the isokinetic results the results of the players with shoulder traumatic lesion on D side during on-going season were significantly weaker ( $p = 0.05$ ) for IR relative peak torque in concentric mode at 240°/s than players without lesion (0.49 +/- 0.08 N.m/kg versus 0.56 +/- 0.14 N.m/kg). Moreover, the players with traumatic injury showed trend ( $p = 0.08$ ) to lower maximal eccentric peak torque for IR at 60°/s than healthy ones (63.88 +/- 11.26 N.m versus 68.77 +/- 20.56 N.m). This could indicate that the previous lesion had not completely healed and this also suggests that criteria for return to play had not been clear enough.

In light of current scientific knowledge, physical trainers or coaches should provide a collective program of physical preparation for preventive based on several lines of support combining:

- Stretch with the objective of limiting reduction in medial rotation (Kibler 1998, Ellenbecker, 2010)
- Strengthening the scapularstabilizing muscles (Kibler 2008, Ellenbecker 2010) and shoulder rotator muscles ensuring optimal balance between medial and lateral rotators,
- Plyometric exercises to promote muscular balance by movement near the throwing motion.

The pathology of the handball player shoulder is complex and multifactorial. It must be a specific program to prevent the frequency of complaints from players. Currently, there is no clear consensus, but it seems that the strategy should include several joint objectives, muscular proprioceptive and functional.

**Ellenbecker TS**, Cools A. *Rehabilitation of shoulder impingement syndrome and rotator cuff injuries: an evidence-based review*. Br J Sports Med. 2010 Apr;44(5):319-27

**Kibler WB**, *The role of the scapula in athletic shoulder function*. Am J Sports Med, 1998. 26(2): p. 325-37

**Myklebust G**, Hasslan L, Bahr R, Steffen K. *High prevalence of shoulder pain among elite Norwegian female handball players*. Scand J Med Sci Sports. 2013 Jun;23(3):288-94

**Seil R**, Rupp S, Tempelhof S, Kohn D. *Sports injuries in team handball. A one-year prospective study of sixteen men's senior teams of a superior nonprofessional level*. Am J Sports Med. 1998 Sep-Oct;26(5):681-7

Friday, September 27, 2013

## PLENARY SESSION – IMAGING IN SPORTS MEDICINE AND TRAUMATOLOGY

IP-18

### MUSCLE INJURIES: ROLE PLAYED BY THE MEDICAL IMAGING FOR THE SERIOUSNESS DIAGNOSIS

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Sporting activities are the leading cause of muscles injuries, which account for a large proportion of all injuries. For example, in professional soccer players, muscle injuries contributed 31% of all injuries and 27% of total injury-related absences from play.

Hamstring injury is the most common musculoskeletal disorder (hamstring = 50% ; quadriceps = 20% ; triceps surae = 20% ; others = 10%) and is prevalent in many sports, most notably those requiring maximal sprint accelerations.

The diagnosis is usually easy to establish based on the occurrence of sudden pain during a sporting activity, muscle tenderness to palpation, and pain upon resisted muscle contraction . As with other sports injuries, evaluating severity is the main objective of the initial evaluation. Severity determines the time to sports resumption . Premature sports resumption may cause a recurrence. We have identified four baseline criteria predicting a time to sports resumption longer than 40 days: visual analog scale (VAS) pain score greater than 6/10, pain during everyday activities for more than 3 days, tenderness to palpation, and greater than 15° motion-range limitation compared to the uninjured side (1).

Imaging studies may not be necessary in all patients to establish the diagnosis and assess the prognosis of hamstring injuries. According to a 2005 literature review (2), MRI and ultrasonography are somewhat helpful (and perhaps unavoidable) in elite athletes but should carry less weight than the clinical assessment. Ultrasonography is being increasingly used by specialists, most notably for the assessment of musculoskeletal disorders. When appropriately used, diagnostic ultrasonography serves as an extension of the physical examination. We have showed that combining a clinical examination with an ultrasonographic assessment was an excellent method for predicting the time to recovery.

What is the best way: clinical examination? ultrasonography? MRI?

1. Guillodo Y, Boutier R, Saraux A. Value of sonography combined with clinical evaluation to determine the severity of skeletal muscle injuries in sportsmen. *J Athl Train* 2011;46(5):527–532
2. Orchard J, Best TM, Verrall GM. Return to play following muscle strains. *Clin J Sport Med*. 2005;15:436-441.

IP-19

### MUSCLE INJURIES: ROLE PLAYED BY THE MEDICAL IMAGING TO ASSESS THE SERIOUSNESS OF THE DIAGNOSIS

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The diagnostic modalities using imaging, for muscle injuries are Ultrasound and Magnetic Resonance Imaging. Ultrasound is a cheap, easily accessible, operator dependant technique whereas MRI is expensive, not easily accessible in short time, but poorly operator dependant.

The paradigm of the muscle injury in Ultrasound is the visualization of an intramuscular or sub-aponevrotic hematoma, seen as a poorly echoic image in or around the muscle. Architectural disorganization of the muscle fibers is more difficult to assess especially in low graded lesions, whereas simple edema

around the muscle fibers is even more difficult to see, because there is poor differentiation between the muscle connective tissue and the edema.

On the other end, MRI offers very good contrast resolution in T2 weighted images between edema and hematoma on one side and muscular tissue on the other side, giving a better diagnosis especially in low graded lesions where hematoma is not present.

Moreover, the hematoma is not hypoechoic in Ultrasound during the first hours (around 12h) after the injury, potentially leading to false negative in too early ultrasound investigations. On the other end, if the lesion is too old, hematoma could be resorbed and not seen either with Ultrasound.

Many grading systems have been described in the imaging of muscular lesions. We use a grading system that we described in 2002 in Ultrasound studies. Grade 0 is when there is no lesion visible. Grade 1 is when there no collected hematoma but only disruption of the fibrillar architecture or dissociation of the fibers (due to edema) or very small hypoechoic zones inside the muscle. Grade 2 is when the hematoma is easily recognized and extends in less than 50% of the thickness of the muscle. Grade 3 is when the lesion is over 50% or a total myotendinous rupture with dissociation of the muscle and its tendon.

Recently, authors have modified this grading system to transpose it to MRI with the same Grades. Grade 0 was no lesion, Grade 1 was diffuse edema, Grade 2 was hematoma in less than 50% of the muscle and Grade 3 was complete full thickness myotendinous lesion. They showed that the return to play in professional soccer players from the teams of the Champion's League accorded well to the discoveries and grading system in diagnostic MRI.

In conclusion, we think than in the vast majority of sportsmen, mainly amateurs, Ultrasound is the easiest and more affordable technique, if performed by an experienced operator to assess the lesion and give a good idea of its seriousness using this simple grading system. With professional sportsmen, however, if available in short term, MRI gives a better evaluation of the subtle low grading lesions. The grading of the lesion, in Ultrasound or MRI, can give a good idea to the referral doctor on the length of the resting time, but doesn't change the therapeutic approach of the rehabilitation.

#### **BIBLIOGRAPHY:**

Petrons P. Ultrasound in muscle injuries. *Eur. Radiol.* 2002, 12, 35-43

Ekstrand J. et al. Hamstrings muscle injuries in professional football. The correlation of MRI findings with return to play. *Br. J. Sports Med* 2012, 46, 112-117

### **IP-20**

#### **WRIST LIGAMENT LESIONS: WHAT KIND OF MEDICAL IMAGING?**

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The Wrist is probably the most complex articulation of the human body and benefited the most recently, from diagnostic and therapeutic modern investigations.

The meticulous dynamic layout of 10 bones and 33 ligaments explains the real difficulty for a classical X-Ray exploration. Statistically, the most frequent lesions involve the intrinsic ligaments (scapho-lunate, luno-triquetral, Triangular Fibrocartilage Complex) but extrinsic lesions can be associated or isolated (midcarpal instabilities...).

For his decision and after a meticulous and systematic clinical exam, the clinician (sports traumatologist or orthopaedic surgeon) will ask several questions to the radiologist:

- is there or not a (or multiple) ligamentous lesion(s)?
- which location and extend?
- consequences on dynamic function of the wrist?
- complications of this lesion (chondromalacia, carpal collapse...)

Classical plain and dynamic X-Ray would help for these answers but will not be generally sufficient.

More complex (and expensive) explorations could be realized by specialized radiologists. Depending on clinical orientation, MRI, arthro-MRI, CT-scan or arthro-CT-scan can be made according to the prescription of the clinician.

The more complex assessment of this pathology is its dynamic aspect and an arthroscopy is sometimes necessary to complete the diagnosis and generally to initiate or complete the treatment.

## PLENARY SESSION – EMERGENCY CARE IN SPORT

IP-21

### CARDIAC EMERGENCIES AND SUDDEN DEATH IN SPORTS

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Acute cardiac emergencies in athletes are a rare but tragic event. Both collapse and sudden death in the arena may be secondary to structural heart disease such as heart muscle or electrical abnormalities.

Acquired heart disease, especially coronary artery disease, is the most common cause of cardiac emergencies in the elderly. Sudden death is most prevalently caused by malignant ventricular arrhythmias.

Prevention of such events requires the following crucial steps: First of all, pre-participation examination (PPE) is strongly recommended for athletes in all age groups, including family history and resting EKG. Secondly, sports arena staff should be trained to effectively perform basic life support (BLS) and to use an AED, on unconscious subjects within 1 to 2 minutes.

Third of all, it is essential that all athletes, e.g. soccer or basketball players, receive regular training (once yearly) in basic life support (BLS) and use of an AED.

In case of an acute collapse of an athlete on the field, bystanders should immediately commence cardiopulmonary resuscitation (CPR). Ideally, a physician, if present in the arena, should be the first provider to commence cardiopulmonary resuscitation (CPR).

Lastly, all leisure time and competitive athletes should be educated on listening to their bodies and recognizing „red flags“ before commencing intense training. Syncope or collapse, new or unusual dyspnoea and moderate to severe chest pain should prompt a thorough clinical examination before return to play.

IP-22

### THE FMSI SPORT EMERGENCY MANAGEMENT MODEL (MOGESS)

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The organizational model for the management of sports health emergencies "MOGESS FMSI" is one of the FMSI protocols for Sports First-Aid (PSS/PSS-D). It is based on the specific health risks of football and aims to be a model of preventive management of First Aid in the facility where sports events take place, in order to deal with any kind of emergency, both traumatic and non-traumatic.

The peculiarity of Sports First Aid (PSS) guidelines lies in the sport-specific risk assessment (VRS). This assessment is carried out through a certificated quality system in agreement with the Istituto Superiore di Sanità (ISS).

VRS is the most essential prevention tool for the organization and the implementation of any intervention, through the use of different systems and tools considered useful.

Actually, having a defibrillator or another emergency device available doesn't guarantee, alone, an effective intervention that needs to be decoded and coordinated with different situations.

A documented security health care plan should take in consideration possible risks related to the sports event, human resources, ways of communication and transportation, an operation center and an ongoing training. It has been shown that this plan should also include an emergency equipment.

In 2011, a study carried out on 190 sport clubs (135 of "Serie A" teams) in 10 European countries and published by the European Heart Journal, has shown that only 2/3 of the clubs examined have a documented health care plan in the sports facility used.

This document aims to provide a tool to coordinate the activity of health professionals during competitive football matches all over Italy.

The elaboration of the FMSI PSS/PSS-D Plan is coordinated and directed by the FMSI Match Doctor, a competent medical doctor specialized in Sports Medicine, who will prepare and subscribe the document of sport risk assessment (DVRS) for each stadium.

The FMSI match doctor works within the CONI system, he has to respect all sports regulations and he is subject to disciplinary actions by the FMSI. The FMSI provides its match doctors with a continuing professional education.

The area designed for the sports activity is provided with two groups of health care operators; their main task is to protect athletes in this area, supporting the medical staff of the two teams.

The FMSI Match Doctor is specialized in Sports Medicine and he is in charge of all the interventions taking place in the sports activity area. However, these interventions are previously arranged with the team physician.

The aim is to be able to manage cardiopulmonary emergencies, Major trauma (concussion, facial trauma, spinal injury, thorax injury, abdominal injury) stabilizing the athlete on the field and providing an assisted medical transportation to the nearest Emergency and Admission Department (DEA).

The MOGESS Organizational Model, included in the FMSI PSS/PSS-D Plan, must be incorporated in all the stadia and must be integrated with the existing General Security Plan, arranged with Sport Clubs through team physicians and security deputies.

## PARALLEL SESSION – HIP ARTHROPLASTY RESURFACING IN YOUNG ATHLETES

IP-23

### HIP RESURFACING FOR YOUNG AND ATHLETIC PATIENT

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The resumption of low or medium impact sports seems consistent with the implantation of a conventional hip arthroplasty (THA). On the other hand, apart from sports without any impact (cycling, swimming ...), the practice of high impact sports seems not possible. The reasons are sometimes due to the surgeon, sometimes related to lack of patient motivation ... To date there is no consensus for the possibility to return to high or medium impact sports activities after the implantation of a hip arthroplasty. But in 2013, the functional and sportive questions have become increasingly important. The current patient commonly called "millennium patient" by the Anglo-Saxon colleagues became more and more demanding regarding the quality of life after the arthroplasty implantation and led the surgeon with a new challenging deal. In this way, modern surgical techniques (mini invasive approach, quick rehabilitation...) and new design of implants emerged to face with this new problem. The surgical approaches have evolved to more and more minimally invasive versions allowing a dramatic reduction of muscle injury and improved functional recovery. Postoperative rehabilitation is now more focused on new issues like articular proprioception, restoration of abductor muscle function.... Reducing the lesion of surgical soft tissue has also led the development of "a bone minimally invasive hip surgery" called hip resurfacing (RSA). Similarly, the introduction of new bearing has reduced the rate of wear and loosening avoiding the problem of polyethylene wear in younger patients and / or assets. This was authorized by new bearing friction called as "hard on hard" because of the chemical composition of the alloys: ceramic on ceramic, ceramic on metal or metal on metal. Due to the composition and resistance of the metal on metal bearing, the concept of "large diameter head has emerged. This means that the prosthetic head diameter exactly reproduced the diameter of the native femoral head of the patient. For example, an osteoarthritic patient with a native femoral head diameter of 52mm and operated with a hip resurfacing, has a prosthetic head diameter of 52mm. This point appears as a crucial element for the recovery function. The restoration of the true head diameter led the possibility to increase the articular proprioception without disturbing the hip biomechanics. This data reduces the risk of dislocation to near zero and with a hip resurfacing, the risk of hip instability totally disappears. The corollary was that the restrictions for physical and /or sports activities significantly reduced. According to the lack of instability risk, the movements previously considered at risk of dislocation have been authorized by this concept. The movement of the lower limb has been totally freed from the risk of instability and allowed patients to return to their old practices without any fear of this complication.

Another hard on hard bearing concept was introduced with the ceramic on ceramic bearing but faces the problem of alumina ceramic which does not allow the production of large diameter head prosthetic. In addition, low but present in athletes' patient the risk of ceramic fracture has led many surgeons to dramatically reduce activities impact in these patients.

The development of the second generation of RSA have significantly modified the possibility of physical and sports activities after implantation of a hip arthroplasty. The profile of the patient, the type of arthritis and especially the nature of the arthroplasty (conventional prosthesis, resurfacing, friction torque...) are parameters to fully understand before authorizing or not the practice of sports without restriction high impact.

Three months after a RSA implantation, the return to sport activities (whatever the impact) is very high, up to 98% (1, 2). In a population of runners (more than 40km/week preoperatively or more than 4h/week treated by hip resurfacing, 91,6% of them return to running activity without any significant difference in

term of time or km devoluted to run between the preoperative and last follow up period (3). These rates are excellent and are unequalled by THA. High-impact sports seem to be compatible with RSA, although no long-term studies have analysed the impact of these activities on wear and/or aseptic loosening.

1. Banerjee M, Bouillon B, Banerjee C. Sports activity after total hip resurfacing. *Am J Sports Med* 2009;38:1229-1236.
2. Girard J, Foulleron N, Miletic B. Hight impact sports activity after hip resurfacing: a prospective study. *Inter Orthop* 2013
3. Foulleron N, Wavreille G, Endjah N, Girard J. Running activity after hip resurfacing arthroplasty: a prospective study. *Am J Sports Med* 2012;40:889-94.

## PARALLEL SESSION – BOTULINUM TOXIN THERAPY IN SPORTS MEDICINE

IP-24

### MODE OF ACTION OF BOTULINUM TOXIN

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Several formulations of botulinum toxin type A have been approved for use in therapy. Depending on the manufacturers, they include toxin (i.e. a complex -up to 900 kDa- comprised of a neurotoxin molecule associated with non-neuro-active proteins: non-toxic-non-hemagglutinating protein and several hemagglutinating components) or purified bi-chainal neurotoxin of 150 kDa, to which are added various excipients. Therefore, all the commercial products share a very same neuro-active entity: the neurotoxin.

Molecular and cellular mechanism of botulinum neurotoxin. In muscles, neurotoxin type A binds to the motor nerve terminal membrane –and sensitive fibres too- by the C-terminal half of its heavy chain. Two co-receptors are recognized: a protein (SV2) and a ganglioside. Internalization of neurotoxin inside nerve terminals exploits the recycling -by endocytosis- of the empty synaptic vesicles. The translocation into cytosolic compartment of the neurotoxin light chain is caused by acidification of the recycling vesicles containing the neurotoxin and reduction of the di-sulfide bridge linking it to the heavy-chain. Light chain is a zinc metalloprotease that specifically cleaves SNAP-25, an essential protein of the transmitter release machinery. By cleaving SNAP-25, neurotoxin type A prevents the fusion of the synaptic vesicles with the presynaptic membrane, which decreases the release of acetylcholine and induces myo-relaxation.

Duration of effect. In the extracellular space neurotoxin molecules are quickly eliminated (few days). Their intracellular half-life is of more than a month: As long as light chain molecules persist in the neuronal cytosol, they continue to cleave SNAP-25. Recovery of synaptic function only occurs when the neurotoxin light chain molecules have been eliminated.

Atrophy induced by botulinum neurotoxin. Following their paralysis, muscle fibres develop very quickly atrophy. This is an indirect effect caused by any situation inducing synaptic silencing. Muscle atrophy is reversible and correlates in intensity to that of the paralytic effect of the neurotoxin. Not all muscles are susceptible to atrophy after toxin injection. Muscle fibre atrophy is associated with significant increases in the sarcolemma electrical resistance that makes the atrophic fibres better responding to motor synaptic inputs. This latter effect antagonizes neurotoxin myo-relaxing effect.

Spreading of botulinum toxin injected in therapy. Since, the toxin complexes rapidly dissociate (half-time of less than 1 min) at plasma pH the neurotoxin is the only entity responsible for the spreading of the toxin effects beyond the site of injection, whatever is the initial formulation of toxin. Muscles and all tissues susceptible to be injected with toxin for therapeutic purpose are comprised of defined compartments (e.g. the different fascia in large muscles) that are insulated each other. Each of them contains nerve-endings that may be desirable to submit to the action of botulinum neurotoxin without multiplying the sites of injection. The mechanical dissection produced by injecting diluted toxin favours local diffusion. Spreading of neurotoxin from injection site by the blood capillary network and vascular tree permits its haematogenous dissemination inside large muscles. However, if large amount spreads out the injected site, adverse manifestations may occur.

Distant effects unrelated to haematogenous dissemination of toxin. Change in reflexes and central effects have been reported following therapeutic use of botulinum toxin/neurotoxin. Since the botulinum neurotoxins molecules do not cross the brain blood barrier, central actions may refer to i) axonal retrograde ascent of botulinum neurotoxin molecules followed by trans-synaptic passage, or ii) change in proprioceptive peripheral information and central plasticity. In the clinical practice, intra-muscle injection of botulinum

toxin/neurotoxin causes effect on alpha-motor-neurons nerve terminals but not on the spindle gamma-nerve terminals, which are insulated from neurotoxin by the spindle capsule (which acts as a diffusion barrier). The changes in proprioceptive information can quickly lead to functional alterations (cortical plasticity) of the upper levels of the motor system, which in turn, can be manifested in the periphery by change in motor behaviour of non-injected muscles.

## IP-25

### BOTULINUM TOXIN IN LATERAL EPICONDYLITIS AND PLANTAR FASCIITIS

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**INTRODUCTION:** For the treatment with Botulinum toxin A (BoNT-A) in established applications, like the treatment of focal spasticity, is additional to the muscle relaxant an analgetic effect known. In animal models an anti-inflammatory effect has been proven and, for the treatment of enthesiopathies, positive experiences with BoNT-A for chronic lateral epicondylitis (tennis elbow) and chronic plantar fasciitis were made.

**Lateral epicondylitis (tennis elbow):** This, often harmless and self-limiting, disease sometimes gets chronic. These patients complain considerable burden of suffering. In cases in which the usual conservative treatment measures, such as physical therapy, immobilization, corticosteroid injections, extra corporal shockwave therapy and acupuncture do not lead to appropriate pain relief, BoNT-A injections showed promising results in controlled trials [1-3]. However, in the available literature this effect is discussed controversial [4,5].

**Plantar fasciitis:** In chronic plantar fasciitis, especially after unsuccessful conservative therapy trials, more and more frequently BoNT injections are used. But the results of prospective, controlled studies are inconsistent [6-8]. Due to different dose, injection site and -technique, the data are hardly comparable. A positive clinical response is elicited at approximately 80% of patients. Compared to standard treatment with local corticosteroids the risk profile for the treatment of plantar fasciitis with BoNT-A is better. For repetitive injections, however, is only experience for individual cases proven.

**PURPOSE OF PRESENTATION:** Additional to the analysis of the current study situation takes the practical presentation of the injection technique, as well as examination and documentation procedure, place.

#### REFERENCES

1. Espandar, R.; Heidari, P.; Rasouli, M.R.; Saadat, S.; Farzan, M.; Rostami, M.; Yazdanian, S.; Mortazavi, S.M., Use of anatomic measurement to guide injection of botulinum toxin for the management of chronic lateral epicondylitis: A randomized controlled trial. *CMAJ: Canadian Medical Association journal = journal de l'Association medicale canadienne* 2010, 182, 768-773.
2. Placzek, R.; Drescher, W.; Deuretzbacher, G.; Hempfing, A.; Meiss, A.L., Treatment of chronic radial epicondylitis with botulinum toxin a. A double-blind, placebo-controlled, randomized multicenter study. *The Journal of bone and joint surgery. American volume* 2007, 89, 255-260.
3. Wong, S.M.; Hui, A.C.; Tong, P.Y.; Poon, D.W.; Yu, E.; Wong, L.K., Treatment of lateral epicondylitis with botulinum toxin: A randomized, double-blind, placebo-controlled trial. *Annals of internal medicine* 2005, 143, 793-797.
4. Hayton, M.J.; Santini, A.J.; Hughes, P.J.; Frostick, S.P.; Trail, I.A.; Stanley, J.K., Botulinum toxin injection in the treatment of tennis elbow. A double-blind, randomized, controlled, pilot study. *The Journal of bone and joint surgery. American volume* 2005, 87, 503-507.
5. Lin, Y.C.; Tu, Y.K.; Chen, S.S.; Lin, I.L.; Chen, S.C.; Guo, H.R., Comparison between botulinum toxin and corticosteroid injection in the treatment of acute and subacute tennis elbow: A prospective, randomized, double-blind, active drug-controlled pilot study. *American journal of physical medicine & rehabilitation / Association of Academic Physiatrists* 2010, 89, 653-659.
6. Babcock, M.S.; Foster, L.; Pasquina, P.; Jabbari, B., Treatment of pain attributed to plantar fasciitis with botulinum toxin a: A short-term, randomized, placebo-controlled, double-blind study. *American journal of physical medicine & rehabilitation/Association of Academic Physiatrists* 2005, 84, 649-654.
7. Huang, Y.C.; Wei, S.H.; Wang, H.K.; Lieu, F.K., Ultrasonographic guided botulinum toxin type a treat-

ment for plantar fasciitis: An outcome-based investigation for treating pain and gait changes. *Journal of rehabilitation medicine: official journal of the UEMS European Board of Physical and Rehabilitation Medicine* 2010, 42, 136-140.

8. Peterlein, C.D.; Funk, J.F.; Holscher, A.; Schuh, A.; Placzek, R., Is botulinum toxin a effective for the treatment of plantar fasciitis? *The Clinical journal of pain* 2012, 28, 527-533.

## IP-26

### CAN BOTULINUM TOXIN BE USED TO TREAT CHRONIC EXERTIONAL COMPARTMENT SYNDROME?

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Chronic exertional compartment syndrome (CECS) is characterised by two criteria, a exertional pain in the involved compartment and a paraclinical objective criterion : an abnormally high intramuscular pressure (IMP) after exercise within the affected compartment.

The only curative treatment currently available for CECS, and considered as the gold standard, is a surgical fasciotomy or fasciectomy. However, the postoperative recurrence rate varies from around 3 to 17% and may reach 35% in partial fasciectomy. Therefore, finding a less invasive alternative may be of interest.

Given the proposed role of muscle hypertrophy within the compartment, botulinum toxin A (BoNT-A) could help the management of CECS. BoNT-A showed favourable and promising results in the treatment of masseter hypertrophy and gastrocnemius hypertrophy. Likewise, its use for analgesic purposes in painful hypertrophy of the calf muscles and painful muscle contractures associated with myofascial syndromes has also been described. However, the effects of BoNT-A have never been investigated in CECS. Therefore, we studied the effects of intramuscular injections of BoNT-A on IMP and pain in CECS involving the anterior and anterolateral compartments of the leg because they are the most commonly affected and are safe for exploration [1].

**METHODS:** IMP are measured 1 minute (P1) and 5 minutes (P5) after the exercise was stopped, before and after BoNT-A injection in CECS patients. The BoNT-A (Dysport®) muscular injected dose ranged from  $76 \pm 7$  to  $108 \pm 10$  Units per muscle, depending on which of the 5 muscles in the 2 compartments were injected. Primary endpoint: IMP (P1, P5), the only objective diagnostic criteria of CECS. Secondary endpoints: exertional pain, muscle strength, and safety. Follow-up: up to 9 months.

**RESULTS:** 25 anterior compartments and 17 lateral compartments were injected in 16 subjects. The average interval time between the BoNT-A injection and post BoNT-A injection IMP measurement was  $4.4 \pm 1.6$  (3-9) months. At this average interval time the IMP measured in the 42 compartments was 59% to 69% lower than the pre-injection values, with a significance level of 0.01 to 0.00001 depending on the compartment. IMP values returned to normal in the majority of subjects (87.5%, n=14). The exertional pain was totally eliminated in 15 subjects (94%). In 5 subjects (31%), the strength of the injected muscles measured with the Medical Research Council score remained normal. In 11 subjects (69%), it transiently dropped from 4.5/5 to 3.5/5 ( $p < 0.001$ ), although without functional consequences. No adverse effects were observed in 15 patients.

**DISCUSSION:** plausible pathophysiological mechanisms of BoNT-A in CECS are difficult to know because the pathophysiology of CECS is poorly understood and probably multifactorial. The first hypothesis is based on the known action of BoNT-A resulting in muscle hypotonia which may cause moderate amyotrophy in muscles injected over a long period. Therefore, a reduction of the hypertrophy, even if only minimal, should help reduce the CECS. The second hypothesis is based on the muscle relaxation induced by BoNT-A. The muscle hypotonia obtained may prolong the duration and reduce the muscular pressure of the relaxation phase, thereby improving the blood flow to the muscles, leading to reduced IMP and pain relief because one of the pathophysiological hypotheses of the CECS is the presence of muscle ischemia resulting in

oedema inside the compartment which in turn explains the rise in IMP and in pain. The third hypothesis is related to the analgesic action of BoNT-A. This action could explain the elimination of pain, but cannot explain the post-treatment reduction of IMP. These three modes of action of BoNT-A are not necessary exclusive and could work together.

**CONCLUSIONS:** In this case series, BoNT-A produced a statistically significant reduction in the IMP and eliminated exertional pain in anterolateral CECS of the leg for up to 9 months after the intervention. A randomised controlled study should be carried out to determine whether BoNT-A can be used as a medical alternative to surgical treatment.

1. ME Isner-Horobeti , SP Dufour , C Blaes, J Lecocq. Intramuscular Pressure before and after Botulinum Toxin in Chronic Exertional Compartment Syndrome of the Leg: a preliminary study. *Am J Sports Med.* In Press

## IP-27

### BOTULINUM TOXIN FOR THE TREATMENT OF ARTHROPATHIES

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Botulinum toxin (BTX) has long been used for the treatment of spasticity. Currently, its indications have been enlarged to the musculoskeletal system and particularly to the management of arthropathies.

Its use for this indication is based on the different mechanisms of action of BTX. By inhibiting the excessive release of acetylcholine and inducing a neuromuscular block, BTX allows decreasing the muscle tone. Moreover, when BTX is administered for the treatment of spasticity, pain relief precedes muscle relaxation. This clinical observation led to the idea of using BTX also for analgesic purposes (as a pain-killer) in joint disorders. Indeed, BTX is transported by axons to the central nervous system and to neighbouring neurons and thus has an analgesic and anti-nociceptive action by inhibiting the release of algogenic neuropeptides 1. Accordingly, intra-muscular injection of BTX may represent an interesting alternative for the management of reactive periarticular muscle contractures in patients with joint disorders, of stiffness after joint replacement surgery or of agonist/antagonist muscle imbalance. Indeed, in the framework of chronic knee pain and patellofemoral pain syndromes, the literature data report pain decrease and functional improvement after BTX intramuscular injection to the quadriceps 2 and to the vastus medialis, respectively 3. BTX intramuscular injection is also used for the management of joint stiffness after joint replacement. For instance, injection to the hamstring and triceps sural muscles of patients with joint stiffness after knee arthroplasty 4 led to recovery of the joint range of motion by decreasing the periarticular muscle tone. Similar observations were reported for refractory joint stiffness after hip arthroplasty where BTX injection to the hip abductors and iliopsoas 5 allowed the recovery of enough joint range of motion to ensure hip mobility.

In parallel to this effect on muscle known since its use for spasticity, BTX can also be administered by intra-articular injection with effective and original results. The group from Minneapolis was the first to publish the results of an open-label study showing significant pain decrease after BTX intra-articular injection in refractory chronic arthritis joint pain 6 with analgesic results maintained over time without adverse effects 7. Other studies concerning patients with osteoarticular joint pain reported significant analgesic effects after BTX injection into the sacroiliac joints, posterior facet joints, or the sterno-costo-clavicular joints. In the case of intractable rheumatoid arthritis of the shoulder, BTX intra-articular injections produced pain relief and functional gain. The literature also reports some controlled randomized studies showing the higher analgesic effect of BTX intra-articular injections compared to corticosteroids in chronic knee pain, chronic shoulder joint pain due to osteoarticular conditions or rheumatoid arthritis 8, sacroiliac joint pain 9 and refractory pain after knee arthroplasty 10.

Overall, BTX intra-articular injection appears to be an interesting therapeutic alternative particularly in case of failure of joint infiltration with corticosteroids. Nevertheless, the physiopathological mechanisms and the effects of BTX delivered by intra-articular injection for these indications remain to be precisely determined.

The effects of BTX intra-articular injection have been investigated in animal models. A study carried out using a rabbit model of osteoarthritis suggests that BTX slows down the development of osteoarthritis phenomena and thus may have a chondroprotective effect by limiting the alterations of the cartilage structures 11. Another study that used a mouse model of inflammatory arthritis 12 reported analgesic effects through inhibition of pain mediators. These effects were not observed in acute disease, suggesting that BTX intra-articular injection might have promising therapeutic effects, but only for chronic inflammatory arthritis.

In conclusion, BTX use and indications for osteoarticular conditions are steadily increasing and concerns not only degenerative and inflammatory arthritis, but also refractory joint stiffness after arthroplasty. BTX represents an interesting therapeutic alternative both for intramuscular injection in case of periarticular muscle contractures and for intra-articular injection, although its intra-articular effects need to be better defined by further studies.

## REFERENCES

1. Yuan RY, Sheu JJ, Yu JM, Chen WT, Tseng IJ, Chang HH, Hu CJ. Botulinum toxin for diabetic neuropathic pain: a randomized double-blind crossover trial. *Neurology* 2009;72:1473-1478.
2. Singer BJ, Silbert PL, Song S, Dunne JW, Singer KP. Treatment of refractory anterior knee pain using botulinum toxin type A (Dysport) injection to the distal vastus lateralis muscle: a randomised placebo controlled crossover trial. *Br J Sports Med* 2011;45:640-645.
3. Singer BJ, Silbert PL, Dunne JW, Song S, Singer KP. An open label pilot investigation of the efficacy of Botulinum toxin type A [Dysport] injection in the rehabilitation of chronic anterior knee pain. *Disabil Rehabil* 2006;28:707-713.
4. Seyler TM, Jinnah RH, Koman LA, Marker DR, Mont MA, Ulrich SD, Bhave A. Botulinum toxin type A injections for the management of flexion contractures following total knee arthroplasty. *Journal of surgical orthopaedic advances* 2008;17:231-238.
5. Santamato A, Ranieri M, Panza F, Solfrizzi V, Frisardi V, Lapenna LM, Moretti B, Fiore P. Botulinum toxin type A in the treatment of painful adductor muscle contracture after total hip arthroplasty. *Orthopedics* 2009;32.
6. Mahowald ML, Singh JA, Dykstra D. Long term effects of intra-articular botulinum toxin A for refractory joint pain. *Neurotoxicity research* 2006;9:179-188.
7. Singh JA, Mahowald ML, Kushnaryov A, Goelz E, Dykstra D. Repeat injections of intra-articular botulinum toxin a for the treatment of chronic arthritis joint pain. *Journal of clinical rheumatology : practical reports on rheumatic & musculoskeletal diseases* 2009;15:35-38.
8. Mahowald ML, Krug HE, Singh JA, Dykstra D. Intra-articular Botulinum Toxin Type A: a new approach to treat arthritis joint pain. *Toxicon* 2009;54:658-667.
9. Lee JH, Lee SH, Song SH. Clinical effectiveness of botulinum toxin A compared to a mixture of steroid and local anesthetics as a treatment for sacroiliac joint pain. *Pain Med* 2010;11:692-700.
10. Singh JA, Mahowald ML, Noorbaloochi S. Intraarticular botulinum toxin A for refractory painful total knee arthroplasty: a randomized controlled trial. *J Rheumatol* 2010;37:2377-2386.
11. Namazi H. Botulinum toxin as a novel addition to anti-arthritis armamentarium: an experimental study in rabbits. *International immunopharmacology* 2006;6:1743-1747.
12. Anderson S, Krug H, Dorman C, McGarraugh P, Frizelle S, Mahowald M. Analgesic effects of intra-articular botulinum toxin Type B in a murine model of chronic degenerative knee arthritis pain. *Journal of pain research* 2010;3:161-168.

## PARALLEL SESSION – FATIGUE AND RECOVERY

### IP-28

#### RECOVERY STRATEGIES FOR PERFORMANCE IN SPORT

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The importance of the recovery period cannot be overstated. Failing to respect the athlete's recovery needs may lead to an inappropriate accumulation of fatigue, resulting not only in reduced workload tolerance and hence decreased performances, but also to an increased risk for injuries and cognitive and mood disturbances (irritability, difficulty concentrating, poor sleep) which may lead to a non functional overreached state. Coaches and the athletes themselves must, imperatively, pay close attention to the onset of signs of excessive physical and psychological fatigue in order to avoid reaching this state; a non functionally overreached athlete then requires long periods of complete rest in order to fully recover and return to training, losing valuable periods of training and competing. The different physiological constraints linked to muscular exercise lead to adaptation of the body, which contributes to improved aptitude, and thus, to better performance levels. Physical training therefore consists in exposing the body to higher workloads than usual in order to improve the functions necessary for completing these tasks. In high-performance athletes, who have particularly intense training regimes, the link between performance and training quantity is not so clear. The capacities of an individual to adapt to training loads can, effectively, have limits. In addition, the level of solicitation can be such that, in confirmed athletes, a complex combination of local and central effects can cause marked reductions in performance levels over the days or weeks following an intense training period. The accumulation of excessive workloads with inadequate recovery periods can lead to a state of persistent fatigue that only several weeks of rest can improve.

What, when and how much to eat and drink, when and how to use each type of therapy, how much rest and sleep are needed, are all many questions that gain complexity as training and competition schedules become busier, and the athlete or coach can be left unsure about how to optimize the quality of recovery periods given the imposed constraints. Although some aspects must be customized to each athlete, it is important to first understand the rationale supporting each component of recovery, and each modality of therapy, to then know which strategies to adopt, and when to apply them. Ultimately, it is through an improved quality of the recovery periods that athletes will be able to further raise the bar of high level performance. As coaches already focus very much on planning and customizing training schedules and workloads for each of their athletes, those able to also incorporate realistic yet highly optimized recovery sessions into these schedules will likely be the ones rewarded with stronger, less injured, and, likely, better athletes.

This talk therefore covers a multitude of strategies for optimizing this recovery process, aiming to benefit the athlete and to optimize his or her training time. The recovery process in sport is strategic; its application is structured, organized, efficient and applied to meet the goals, needs and constraints encountered at the highest level of performance.

### IP-29

#### NEUROBIOCHEMISTRY OF CENTRAL FATIGUE

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Serotonin has been linked to fatigue because of its well-known effects on sleep, lethargy and drowsiness and loss of motivation. Several nutritional and pharmacological studies have attempted to manipulate cen-

tral serotonergic activity during exercise, but this work has yet to provide robust evidence for a significant role of 5-HT in the fatigue process. The original central fatigue hypothesis suggested that an exercise-induced increase in extracellular serotonin (5-HT) concentrations in several brain regions contributed to the development of fatigue during prolonged exercise. However, it is important to note that brain function is not determined by a single neurotransmitter system and the interaction between brain 5-HT and dopamine during prolonged exercise has also been explored as having a regulative role in the development of fatigue. This revised central fatigue hypothesis suggests that an increase in central ratio of 5-HT to DA is associated with feelings of tiredness and lethargy, accelerating the onset of fatigue, whereas a low ratio favors improved performance through the maintenance of motivation and arousal. Convincing evidence for a role of dopamine in the development of fatigue comes from work investigating the physiological responses to amphetamine use, but other strategies to manipulate central catecholamines have yet to influence exercise capacity during exercise in temperate conditions. Recent findings have, however, provided support for a significant role of dopamine and noradrenaline in performance during exercise in the heat. As serotonergic and catecholaminergic projections innervate areas of the hypothalamus, the thermoregulatory centre, a change in the activity of these neurons may be expected to contribute to the control of body temperature whilst at rest and during exercise. Fatigue during prolonged exercise clearly is influenced by a complex interaction between peripheral and central factors. The aim of this presentation is to examine evidence for the role of neurobiological mechanisms of fatigue and thermoregulation.

#### REFERENCE:

Meeusen R, Watson P, Hasegawa H, Roelands B, Piacentini MF. Central Fatigue – the serotonin hypothesis and beyond. *Sports Med.* 36(10): 881-909

#### IP-30

### NUTRITION DURING RECOVERY FROM INTENSE EXERCISE

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Elite athletes perform heavy physical exercises, either during their training program or competitions that require high levels of performance. Training programs commonly involve multiple workouts on the same day and competitions can include series of events or stages. Nutrition plays a key role to restore homeostasis after heavy exercise and contribute significantly to a full and complete adaptation to physiological stress.

Full restoration from heavy exercise includes nutritional processes that aim to restore muscle and liver glycogen stores, replace fluid and electrolytes lost in sweat, and facilitate the repair of exercise-induced muscle damage.

Following an exercise bout that depletes glycogen stores, there is a rapid restoration phase lasting about one hour, but high rates of muscle glycogen synthesis are mainly dependent on provision of a dietary source of carbohydrate. The main dietary factor involved in post-exercise refuelling is the amount of carbohydrate consumed. Glycogen storage in the first two hours after exercise appears to be saturated with a carbohydrate intake of  $\sim 1$  g per kilogram of body mass (BM) per hour; the total carbohydrate requirement over a day is typically within the range of 3–10 g/kg BM depending on the athlete's training or competition schedule. Moreover, it has been hypothesised that the type of carbohydrate foods may affect the rate of glycogen restoration, based on its ability to enhance blood glucose availability or increase insulin concentrations. Indeed, moderate and high glycaemic index carbohydrate-rich foods and drinks have been shown to promote greater glycogen storage than an equivalent amount of carbohydrate from low glycaemic index choices. The mechanisms that explain this finding probably include factors such as the malabsorption of low glycaemic index foods, reducing the amount of available carbohydrate. Several researches indicated that glycogen synthesis was enhanced by the addition of protein to carbohydrate snacks consumed after exercise. Although such findings remain a matter of debate, it is now accepted that benefits for muscle glycogen storage may occur limited to the first hour of recovery or to situations where the amount of carbohydrate intake remains below the threshold for maximal glycogen synthesis.

Athletes are advised to consume carbohydrate as soon as possible after the completion of exercise to enhance refuelling. There is a potential for high rates of muscle glycogen storage during the first 2–4 h after exercise as a result of the depletion-activated stimulation of glycogen synthase and insulin sensitivity. However, this potential can only be realised if carbohydrate is consumed; if not, refuelling rates are very low. But even in the face of carbohydrate intake, refuelling rates decline after 2–4 h. The corollary of delaying carbohydrate intake is that there will be very low rates of glycogen restoration until feeding occurs.

Protein synthesis plays a large role in the adaptation or recovery from most exercise bouts, including long-term exercises, since it encompasses among other proteins the synthesis of new myofibrillar tissue in response to resistance exercise, the repair of damaged tissue and the synthesis of sarcoplasmic and mitochondrial proteins in response to endurance or intermittent high-intensity exercise. Although most of the research on protein synthesis and exercise has concentrated on resistance exercise, similar responses also occurs to other forms of exercise, with protein synthesis targeting specific proteins that contribute to that particular activity.

In the period immediately after exercise, there is a substantial increase in rates of muscle protein synthesis, especially in trained individuals. This is most evident in the hours immediately after the bout, and in trained subjects, it may not return to basal levels until at least 24 h of recovery. However, while exercise reduces the degree of negative protein balance, breakdown remains higher than protein synthesis unless the athlete consumes a source of protein. A dose–response study showed that the maximal protein synthetic response to a resistance exercise bout is achieved with the intake of ~20–25 g of high-quality protein. Protein consumed in excess of this increases rates of irreversible oxidation.

It is important to consider the type of protein that is consumed and its timing of intake in relation to training. Milk protein has been shown to be superior to an equivalent amount of soy protein. The amino acid composition and rate of digestion of the protein may determine its overall effect on protein synthesis. The maximal protein synthetic response to exercise occurs when there is good availability of plasma essential amino acids just at the end of exercise. Muscle protein synthesis was increased when proteins were ingested soon after a workout. Young men who consumed a source of protein immediately after resistance training gained a greater increase in muscle fibre hypertrophy and lean mass compared with a group who delayed their intake by 2 h but consumed equal energy and macronutrients over a day.

Even when athletes are able to consume fluid during a bout of exercise, in most situations they can expect to be at least mildly dehydrated by the end of the session. Ideally, the athlete should fully restore fluid losses after one exercise session so that the next workout can be commenced in fluid balance. The success of rehydration strategies depends on how much the athlete drinks and then how much of this fluid is retained within body fluid compartments. The flavouring of drinks is known to contribute to voluntary fluid intake, with studies reporting greater fluid intake during post-exercise recovery with sweetened drinks than with plain water. Intake of sodium also helps to preserve thirst, thus increasing intake, while the temperature of drinks also affects intake. Cool drinks (15°C) are more likely to be consumed quickly and in larger quantities. Because sweating and obligatory urine losses continue during the rehydration phase, athletes must replace more than their post-exercise fluid deficit to achieve fluid restoration. Early replacement of large volumes of fluid was associated with better restoration of fluid balance during the first hours of recovery despite an increase in urinary output.

## PARALLEL SESSION – ETHICS IN SPORTS MEDICINE

IP-31

### CONCUSSION IN SPORT: ETHICAL, POLICY AND PRACTICE PROBLEMS

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In their recent article “Sports Medicine and Ethics” Testoni et al. (2013) essentially update previous wide ranging discussions of many of the ethical issues arising in a sports medicine. In their discussion of the ethical issues arising from concussion diagnosis and management, we argue that they cite data and re-describe arguments that are often (i) outdated; (ii) in tension with other citations; and (iii) without resolving disputes or analysing them in the light of recent policy and practice developments in the field (McRory, 2013). In this presentation we offer a critique of their research, and related guidelines, that is structured around three dimensions: (i) policy-relevance; (ii) epistemic; and (iii) ethical concerns.

#### REFERENCES

McCrory, P., et al. (2013). Consensus statement on concussion in sport: the 4th International Conference on Concussion in Sport held in Zurich, November 2012. *British Journal of Sports Medicine* no. 47 (5):250-258.

Testoni, D., Hornik, C.P., Smith, P.B., Benjamin, D.K., and McKinney, R.E. (2013) *Sports Medicine and Ethics*. *American Journal of Bioethics*. forthcoming.

## PARALLEL SESSION – TENDINOPATHIES

### IP-32

#### REHABILITATION OF ACHILLES TENDINOPATHY

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#### INTRODUCTION

Runners and football players show a high prevalence of Achilles tendinopathy . it is assumed that the frequency of lesions found is correlated with the magnitude of the mechanical load borne by the tendon during the race can go up to 12.5 times the body weight. Intrinsic and extrinsic risks factors may cause the Achilles tendinopathy. The area between 2 and 5 cm above the calcaneus insertion is the least well vascularized portion .Most of the failures happen in this area or the tendon is narrowed portion. After un good clinical examination and ultrasonography, the first treatment to practice is rehabilitation with a physiotherapist.

#### TREATMENT

It has two aims: 1) the vascularization revival to obtain a good tendon healing. 2) the recovery of bio-mechanical properties of the muscle – tendon complex by the eccentric treatment for return to sport without risk of recurrence . The vascularization revival can be effective using 4 mainly methods : the shock wave therapy (SWT) the neurocryostimulation therapy , the microcurrent electrical therapy (MET), the Low-Level Laser Therapy (LLLT).

A lot of authors has shown that eccentric rehabilitation gives good results (1). It has been assess that the effect of this treatment can be efficient for more years.The Triceps Sural stretching must be used in two way ; passive method for the muscle and ballistic method for the Achill tendon. But today what is the most effective is the association of several treatments and it must be used in all medical sport professional center. But the other treatment (PRP...) are proposed after the rehabilitation if the pain persist.

#### SUMMARY

The tendinopathy is a pathology of " overuse ". An excess of mechanical constraints leads a scar failure ending in the pathological tendon. Others intrinsic and extrinsic factors enter in the arisen of tendinopathies..Current physiopathological knowledge underline the importance of the neovascularization. The eccentric training describes by Alfredson seems to be the most effective treatment. The use of the other Parallel techniques would allow to optimize the effects of eccentric work and to hope for a resumption of faster sport.

#### BIBLIOGRAPHY

(1) Alfredson H, Pietilä T, Jonsson P, Lorentzon R: Heavy-load eccentric calf muscle training for the treatment of chronic achilles tendinosis. Am J SportMed 1998 ; 26 : 360-6

### IP-33

#### REHABILITATION STRATEGIES: ACHILLES AND PATELLA TENDINOPATHY

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#### BACKGROUND

Patellar and Achilles Tendinopathy are typical functional overload injuries affecting athletes who submit their lower limb intense and repeated loading. The aetiology of lower limb tendinopathy is not clearly understood, however it is generally agreed that overuse and overload of the tendons are triggering factors.

There is also a school of thought which suggests that the fat pad may also play a role in the onset of tendinopathy. Tendinopathy is now the preferred term used to describe tendon pathologies including para-tendonitis, tendonitis and tendonosis. Tendinopathy is difficult to treat and if treatment fails it can bring an athlete's career to an end. The treatment conundrum presents with a myriad of treatments described in the literature on the treatment and management of the painful tendon, which to choose and choosing the best rehabilitation strategy presents physiotherapists with a challenge.

The importance of early identification of athletes diagnosed with tendinopathy calls for implementation of appropriate management and treatment which has shifted from anti-inflammatory strategies towards rehabilitation with eccentric tendon strengthening, load management and consideration of biomechanical correction. Most studies suggest that eccentric training has a positive effect however our ability to recommend a specific rehabilitation protocol remains limited.

#### **AIM**

The aim of this discussion is to address the key issues surrounding the safe and effective application of eccentric exercise at different stages of painful tendon pathology. Currently protocols for eccentric exercise are poorly understood with little evidence on safe guidelines. This discussion aims to address tendon rehabilitation issues, integrating the available evidence based research together with practical examples and case studies to give physiotherapists, and members of the multidisciplinary team clear guidelines on the safe and effective application of eccentric exercise in the treatment of Achilles and Patella tendinopathy.

#### **DISCUSSION**

Physiotherapists are faced with the paradox of loading and offloading in their approach to treatment and rehabilitation of the Achilles and Patellar tendon. On one hand of the argument it is acknowledged that excessive loading in association with the stretch shortening cycle is a key factor in the onset of tendinopathy and on the other hand the evidence has demonstrated that the tendon should be loaded for repair and to help stimulate tendon remodelling and normalisation of fibre arrangement. There is little research to clearly demonstrate the optimal eccentric exercise protocols for the treatment of tendinopathy particularly in relation to intensity, duration and frequency of eccentric exercise, which should be applied to achieve safe and optimal results. Factors that can contribute to the failure of rehabilitation programmes are discussed and should be avoided.

More recently it has been proposed that there is a continuum of tendon pathology identifying three stages; reactive tendinopathy, tendon dysrepair (failed healing) and degenerative tendinopathy, this clear classification of tendon pathology has a direct implication on our exercise prescription for the treatment of this condition. It is therefore essential to evaluate the stage of tendinopathy of pathology and identify the site of pathology within the tendon (musculo – tendinous junction/ mid substance or entheses) prior to implementing an eccentric rehabilitation exercise program.

The core principles of rehabilitation should be incorporated into a progressive loading eccentric rehabilitation program for Achilles and Patella tendinopathy by creating high-tension load within the tendon by use of controlled eccentric exercises, there is evidence to support that this method of treatment is effective. Recommendations and guidelines for effective rehabilitation strategies based on evidenced research are discussed, with reference to activity level and loading, appropriate exercise application and technique with examples of use of the decline board with single leg squatting for rehabilitation of the Patella tendon and heel drop techniques for the Achilles tendon. Practical guidelines for the staged loading progression with recommendations for the intensity, frequency and duration of exercise are presented based on key parameters that should be considered: length, load and speed. Guidelines on kinetic chain rehabilitation with biomechanical correction strategies are also described, for example correcting flexor/ adductor dominance during single leg squats and translating this technique into correct landing technique and over pronation associated with Achilles tendinopathy.

#### **CONCLUSION**

High load eccentric exercise results in a positive outcome in the treatment and rehabilitation of Achilles and Patella Tendinopathy, however exercise protocols need to be applied safely and effectively, ensuring that sufficient load is being applied to ensure recovery in the shortest time possible and at all times avoiding overload and causing further damage. Moving forwards physiotherapists give further consideration to: (a) Eccentric Exercise Techniques with appropriate levels of effective loading (b) Methods to correct poor biomechanical alignment and techniques with a view to reducing inappropriate loading of the tendon.

In light of current evidence based studies identifying eccentric exercise as being one of the most effective methods of reversing abnormal tendon. We are presented with evolving, and exciting challenges to further

refine and develop our exercise protocols. The more we investigate our exercise application and constantly strive to improve our methods of generating high tendon load with correct biomechanics, the more effective treatment outcomes will be in ensuring a faster and effective resolution of tendinopathy.

**IP-34****SURGICAL TREATMENT OF CALCANEUS INSERTIONAL TENDINOPATHY**

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Calcaneus tendon lesions are common in runners. Several studies have reported the epidemiology of these lesions in athletes and in particular in runners. Kujala found signs of calcaneus tendinopathy in 29% in runners compared to only 4% in the global population. It is important to distinguish between damage concerning the body of the tendon and that of insertion, because treatments differ and so do their results.

According to Van Dijk et al., it is necessary to distinguish between insertional tendinopathy and retrocalcaneus bursitis, and to exclude the terms Haglund's disease, Haglund's syndrome, Haglund's deformity and pump bump, which are confounding factors. It is possible to suffer from pain of insertion without tendon damage (pure osseous conflict), but there can be more or less significant tendon damage associated with it, with a weakened insertion or, even worse, a loss of substance.

31 (7 women – 24 men) patients underwent calcaneus insertional tendinopathy surgery performed by a senior surgeon. All patients had been reviewed by an observer who was independent of the operator. All data were prospectively collected at 3, 6, 12 and at the last long-term examination, in the frame of a longitudinal follow-up, but without a control group. Each patient was reviewed with a minimum follow-up observation of 1 year after surgery. We analysed pre and postoperatively the distribution of the type and level of sport.

MRI was used to confirm the diagnosis by local inflammation at the tendon insertion. The tendon damage was classified into two groups:

- Pure conflict/minor tendon damage group: including no tendon damage or tendon injury smaller than 50% of the diameter of the tendon, with or without conflict.
- Major tendon damage group: including damage beyond 50% of the diameter of the tendon and loss of tendon substance.

Clinical evaluation included the American Orthopaedic Foot and Ankle Society (AOFAS) score at the pre-operative stage and at the last long-term examination.

**RESULTS**

The average follow-up was 26 months [12-61]. The pre- and post-operative AOFAS scores were 60 and 92/100 respectively. The pre-operative AOFAS scores were statistically different, depending on the severity of tendon damage.

The average elapsed time to running practice was 8,5 months [6-18]. In case of pure conflict/minor tendon damage, the average recovery time was 6 months [5-7] months. When the tendon surgery was necessary (major tendon damage), the average time increased to 12 months [91-17]. The level of sports recovery at the last long-term examination was the same compare to preoperative period in 84% of cases. No patients suffered from skin or septic complications. Two patients required surgical re-intervention to achieve a neurolysis of the sural nerve, and to treat a post-operative intra-tendon cyst.

#### DISCUSSION

It seems fundamental to analyse the state of the tendon on the pre-operative MRI, so as to plan or not an associated tendinous surgery, which can increase recovery delays. In the event of severe tendon damage, the pre-operative AOFAS score is statistically lower in our series. The surgical management insertional tendinopathy is relatively typical and usually requires a simple debridement of fibrotic lesions of the tendon, a bursectomy and osteotomy of the postero superior calcaneus exostosis, sometimes arthroscopically.

Biomechanical and clinical studies have shown that the risk of tendon rupture was not increased when more than 50% of the tendon persisted after debridement. If more than 50% of the tendon is excised, it may be justified to plan a tendon reinsertion or a strengthening graft. We use the aponevrosis of the sural triceps, derived from the technique of Bosworth, which has been used in chronic tendon calcaneal rupture. The results of this series are comparable to those published in the literature.

Series outlining surgical results of calcaneus insertional problems that address recovery to sports in its entirety do not systematically specify which sport is concerned and the level of performance. Thus, Krishna et al. offers a return to light physical activity for 6 weeks and then to all sporting activities after between 5 and 6 months, but not competition before 6 months.

This work allows us to highlight the precise elapsed time for returning to the same sport and at the same level (Fig 1) for the same pathology. Surgical treatment gives good results in case of medical treatment failure in insertional tendinopathy. AOFAS score improvement is significant with an average gain of 31 points. The resumption of sport at the same level is effective for almost 84% of our patients with an average period of recovery in performance to 8.5 months. Achilles insertional tendinopathy surgery results in few complications with good functional results if the surgical technique is adapted to the type of tendon injury.

Preoperative sport level	Same sport level	Lower sport level	Increased sport level
Elite N=5	<u>5</u>	0	0
National N=10	<u>7</u>	<u>2</u>	<u>1</u>
Regional N=5	<u>5</u>	<u>0</u>	<u>0</u>
Leisure N=11	<u>6</u>	<u>3</u>	<u>2</u>

Fig 1: Pre-post sport level evolution.

## PARALLEL SESSION – HEALTH PROBLEMS OF NUTRITIONAL SUPPLEMENTS

IP-35

### NUTRITION AND DIETARY SUPPLEMENTS: USE BY ATHLETES, BELIEFS AND ISSUES

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The reality is that many elite, but also non-professional and amateur athletes embark upon a quest to improve performance, to accomplish more than what is attainable through their own efforts alone. They search for dietary supplements and ergogenic aids, or substances that enhance work performance. Dietary fads are known from 500–400 B.C., when athletes and warriors used products such as lion heart to impart certain benefits, hoping that consumption would produce speed and strength. But, most evidence for the ergogenic effects of dietary supplements to improve performance stems from the early 20th century.

One of the first questions that arises, is to specify a clear and acknowledged definition of dietary supplements. Dietary or nutritional supplements are intended to provide nutrients that are not consumed in sufficient quantities to meet specific nutrient requirements. For most purposes, sports drinks, energy bars, gels, and other sports foods are excluded from the definition of supplements.

Dietary supplements are consumed by a large proportion of the general population, but their rate of use is even higher among athletes and people who regularly participate in sports. The pattern of use varies between sports and with the level of competition. Rates of use vary from 1.7 supplement products per elite track and field athletes (Tscholl et al. 2010), to 1.3 supplements per player during the 2002 and 2006 FIFA World Cups (Tscholl et al. 2008).

Most athletes are aware that the use of some supplements can bring benefits that include improved adaptations to training, enhanced performance, and the potential for health preservation. The reasons athletes use nutritional supplements are mainly to aid recovery from training, maintain good health, improve performance, and prevent an illness. However, athletes likely remain unaware of the negative consequences that may arise from the use of some supplements or from the inappropriate use of supplements that may be helpful in some circumstances, but detrimental to performance in others.

Dietary supplements have been classified into four groups according their effectiveness and safety (Australian Institute of Sports), AIS. The group A of nutritional supplements have been shown to benefit performance when used according to specific protocol and in a specific situation in sport. Within this group of substances, creatine has been shown to enhance the performance of exercises involving repeated bouts of high-intensity exercises. It is likely that the acute effects of creatine supplementation on muscle PCr concentrations decrease with the training status of athletes. However, the long-term effects of creatine use remain unknown. Protein supplements such as whey protein are effective in the period immediately after exercise to enhance the availability of amino acids, and then to increase the rates of muscle protein synthesis, especially in trained individuals. A dose–response study showed that the maximal protein synthetic response to a resistance exercise bout is achieved with the intake of ~20–25 g of high-quality protein. The amino acid composition and rate of digestion of the protein may determine its overall effect on protein synthesis.

According to the AIS classification, the group B of supplements comprises dietary supplements that deserve of further research (carnitine, HMB, quercitin, etc.). These substances could be of particular interest to athletes, but additional researches are needed for further consideration. Group C supplements have only little proof of beneficial effects and are not provided to athletes to date. This group includes supplements that have not been proven to provide an enhancement of sports performance, or that the likelihood of benefits is very small (ribose, coenzyme Q10, most of vitamin supplements, most of herbal supplements, ginseng, etc.).

Finally, group D supplements are banned or are of high risk of being contaminated with substances that could lead to a positive drug test (ephedrine, sibutramine, herbal stimulants, prohormones, etc.).

The biggest concern for athletes who are liable to testing for the use of drugs that are prohibited in sport is the possibility that a supplement may contain something that will result in a positive doping test (Maughan et al., 2011). Recent evidence suggests that these concerns may apply to some foods as well as to supplements (Geyer et al., 2004). Many published studies show that contamination of dietary supplements with prohibited substances is common. A wide range of stimulants, steroids, and other agents that are included on WADA's prohibited list have been identified in otherwise innocuous supplements. In spite of these problems, it remains true that the majority of dietary supplements are safe and will not result in either health problems or violations of the doping code. However, a significant minority of products on sale to athletes carry such risks. That is why efforts are being made to address the problems and to minimize the risk of inadvertent doping by athletes by identifying products that athletes may use with confidence.

#### REFERENCES

- Australian Institute of Sports; <http://www.ausport.gov.au/ais/nutrition/supplements/>
- Geyer, H., Parr, M. K., Mareck, U., Reinhart, U., Schrader, Y., & Schänzer, W. (2004). Analysis of non-hormonal nutritional supplements for anabolic-androgenic steroids – results of an international study. *International Journal of Sports Medicine*, 25, 124–129.
- Maughan, R.J., Greenhaff P.L., & Hespel, P. (2011). Dietary supplements for athletes: emerging trends and recurring themes. *Journal of Sports Sciences* 29 Suppl 1, S57-S66.
- Tscholl, P., Alonso, J. M., Dolle, G., Junge, A., & Dvorak, J. (2010). The use of drugs and nutritional supplements in top-level track and field athletes. *American Journal of Sports Medicine*, 38, 133–140.
- Tscholl, P., Junge, A., & Dvorak, J. (2008). The use of medication and nutritional supplements during FIFA World Cups 2002 and 2006. *British Journal of Sports Medicine*, 42, 725–730.

#### IP-36

### NUTRIVIGILANCE: A NECESSARY FIELD?

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The *food supplement* has been defined by the European Parliament in Directive 2002/46/EC and in France by the Decree of 20 March 2006: "Food supplements means foodstuffs, the purpose of which is to supplement the normal diet and which are concentrated sources of nutrients or other substances with a nutritional or physiological effect, alone or in combination." Food supplements can contain plants, vitamins, minerals, or other substances. Unlike drugs, food supplements do not require a marketing authorization – based on a prior scientific assessment – for each product.

The French Nutrivigilance has been launched in 2009 because of the steady increase in the consumption of food supplements in recent years ; the presence of pharmacologically active ingredients in some products ; reports of adverse effects registered by other vigilance systems not specifically dedicated to food (i.e. pharmacovigilance or poison centers). The system aims at collecting (1) and analyzing the side effects suspected to be due to the consumption of four food types: food supplements, fortified food or drinks, novel foods, foodstuffs intended for particular nutritional uses (infants, patients with food intolerances,...), and among them athletes who are considered as having specific nutritional needs (2). Some of the reported side effects contribute to the detection of non conformity of sport food supplement in the sense of the norm NF V 94-001 (3).

Up to the 31<sup>st</sup> December 2012, among the 346 cases spontaneously declared, 267 involved food supplements. The cases which could be linked with sportive/performance intention have been extracted. We considered both products: those which target the sportive population and those that, without targeting sportive population, could be used by sportspersons who expect a specific physiological effect. It is noteworthy that sportive population even belongs to general population and is therefore exposed to all the potential supplement use-related risks.

In this context, 8 cases were associated with the consumption of 6 products (5 food supplements and one foodstuff intended for particular nutritional uses), intended for sportsmen (body-builders). All con-

sumers were men aged from 18 to 52 (median: 34). The reported side effects were mainly tachycardia, arrhythmia, cerebrovascular accident, rhabdomyolysis, dizziness). The imputability score as defined by Anses (4) was found as 1 (doubtful) for 3 cases, as 2 (possible) for 3 cases, and as 3 (likely) for 2 cases.

Along with these products, sportspersons can expect to enhance their performances by consuming other products without direct sport claim as defined by the European legislation (5), such as slimming food supplements (containing L-carnitin, caffeine or synephrin), "tonic" products (containing "adaptogens" such as ginseng, *Eleutherococcus senticosus*, *Ashwagandha*, *Maca*, *Rhodiola rosea*, *Schisandra chinensis*) or "immunostimulating" products (containing spirulina or *Cordyceps sinensis*). These products are involved in 36 cases for which the reported side effects are mainly hepatic (hepatitis, hepatic cytolysis) and cardio-vascular (tachycardia, cardiac arrests, high blood pressure,...). The imputability score was found as 1 (doubtful) for 7 cases, as 2 (possible) for 10 cases, as 3 (likely) for 17 cases and as 4 (very likely) for 2 cases.

The *Citrus* extracts are emblematic of the borderline ingredients, as far as they can be both considered as common natural food and as a source of synephrine having - as an adrenergic agonist - a pharmacological effect similar to ephedrine. One should be acquainted with the fact that synephrine is not mentioned on the food supplement label. Among the 17 cases related to the consumption of products containing *Citrus* extracts, the Nutrivigilance system detected 3 cases of sportsmen who consumed products including *Citrus* extracts together with caffeine and experienced respectively a tachycardia, a cardiac arrest and a cerebrovascular accident. The risk assessment for synephrine consumption associated with other molecules or not, is currently ongoing by Anses.

The nutritional vigilance scheme has been created to improve consumer safety by rapidly identifying potential adverse effects associated with, primarily, the consumption of food supplements. To reach this goal, everyone is invited to collaborate to the Nutrivigilance system by declaring every side effect which can be suspected to be due to the use of these products. To date, the number of declarations involving sport products steadily increases.

#### REFERENCES

1. Anses – Nutrivigilance declaration website: <http://www.ansespro.fr/nutrivigilance/>
2. Afssa (2005). Evaluation d'une proposition de directive prise en application de la directive cadre n° 89/398/CEE du 3 mai 1989 relative aux denrées destinées à une alimentation particulière, sur les aliments adaptés à une dépense musculaire intense, surtout pour les sportifs.
3. AFNOR (2012) NF V 94-001. Doping prevention in sports – Food supplements and other foodstuffs intended for sports people – good development and manufacturing practices aimed at ensuring the absence of doping substances.
4. Anses (2011) Avis relatif à la construction d'une méthode d'imputabilité des signalements d'effets indésirables de nutrivigilance.
5. EC (2006) Regulation No 1924/2006 of the European Parliament and of the council of 20 December 2006 on nutrition and health claims made on foods.

## PARALLEL SESSION – FOOTBALL MEDICINE: PUBALGIA

IP-37

### SPORT'S PUBALGIA (GROIN PAIN) WHAT IS AND WHAT IS NOT

M. BOUVARD

Pau

The pubalgia (groin pain) is a disease affecting all locomotor structures the anterior part of the pelvic belt. Its distribution is universal, almost exclusively male. There is still no consensus on its nosology and its management therapy. The disease develops most often on a chronic progressive mode installation, but there are acute forms, traumatic. The diagnosis of pubalgia will be retained after the removal of many differential diagnoses. Should not be considered pubalgia : articular hip injuries, bone injuries of the pelvis, abdominal diseases, genital or urinary, spinal injuries, rheumatic and medical symphysis diseases.

Four clinical forms of pubalgia are regularly intertwined: 1: reaching the symphysis pubis and its annexes 2 lesions of the lower part of rectus abdominal close to their insertion; 3: the tendon of the body and the insertion of adductor can be complicated nerve entrapment shutter; 4 reaching the inguinal canal wall and default neurological pain ilioinguinal and iliohypogastric. Two clinical examinations, including a the waning of time effort, begin the diagnostic strategy before radiographs conventional. A decision tree specifies the diagnostic strategy. An unfavorable evolution of three months must question again diagnostic. In difficult cases, the realization of an anesthetic block is a valuable contribution of diagnosis.

IP-38

### THE SURGICAL TREATMENT OF GROIN PAIN IN FOOTBALL

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**GOAL:** Understand the principles that guide different surgical techniques used in the surgical treatment of groin pain.

**BACKGROUND:** Groin pain is a frequent complaint in sports as football, that involve acceleration, sharp turns, twisting, pivoting and kicking. Up to 5% of the players will complaint of groin pain during the season. The pain is exacerbated with physical activity.

Groin injuries can be acute or chronic. When the pain becomes chronic, after clinical examination, ultra sound and MRI, the underlying causes can be classified into 3 categories : adductor dysfunction, sportsman's hernia and osteitis pubis, the different causes can be associated.

The treatment needs first rest and physio. When the conservative treatment has failed after 6 to 8 weeks the surgical treatment must be considered.

Numerous publications cope with the surgical treatment of groin pain. They wonder how to have a rational approach in practice, and to offer a reliable procedure to the athlete.

It's necessary to have a good knowledge of the surgical anatomy to understand what happens and what we have to do.

After having been looking for the aetiology of groin pain, and in front of the failure of conservative measures, two types of procedure can be proposed, alone or associated : the strengthening of the abdominal wall or the adductor's tenotomy.

Stengthening the abdominal wall require to use the techniques of hernia repair with some modifications. The big debate is between the mesh repair and the suture repair.

For us, the use of mesh has to be avoided in young people because the potentiality of long term com-

plications, and those mesh implies a high percentage of post op chronic pain ! Suture techniques have to be chosen. Reporting on the lesions inventory, a four layers procedure as Shouldice, or a minimal repair in two layers, according to Muschaweck , is done.

Adductor's tenotomy deals with adductor's enthesopathy, but the high risk of post op adhesences impose a preventive mobilization at every moment. The debate here is between the use of tenotomy or not, and the systematic bilateral procedure or not.

There is no consensus for the treatment of pubic ostéo arthropathy. Direct surgical procedures are inefficient and often associated with debilitating complications. Resting the symphysis through a combination of both, a bilateral parietal strengthening and a bilateral adductor's tenotomy is recommended.

**CONCLUSION:** there is no prospective study backed by level 1 or 2 evidence. That would allow us to choose what seems the best surgical solution, taking in account acquired experience and the mastering of the different techniques. Thus groin pain treatment is an EBM ( Expert Base Medecine and not Evidence Base Medecine).

**Saturday, September 28, 2013**  
**PLENARY SESSION – PREVENTION OF ACL INJURY**

**IP-39**

**MECHANISMS OF ANTERIOR CRUCIATE LIGAMENT TEARS**

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Anterior cruciate ligament (ACL) tears occur when the force of a movement exceeds the ligament's capacity for resistance.

The underlying mechanism can be elementary or complex, with the knee flexed or extended. In general, the injury occurs during a weight-bearing movement, the foot on the ground. The energy level involved may be quite variable.

Classically, two mechanisms are described for isolated ACL tears: forced internal rotation (knee flexed 20-30°, weight-bearing foot on the ground) and non-weight-bearing hyperextension.

In clinical practice however, other mechanisms are known to produce isolated ACL tears: valgus-flexion-external rotation; sports trauma; hyperflexion of the knee during a fall in the crouching position; varus-internal rotation with slight flexion.

**Forced internal rotation**

Internal rotation of the knee is stabilized passively by the ACL and, to a lesser degree, by the anterolateral elements (capsule, fascia lata, gracilis). The biceps femoris and the fascia lata provide active stability.

When the foot is implanted solidly on the ground with cleated shoes or attached to a ski stuck in the snow, torsion of the trunk and the thigh transfers the weight of the body onto the lateral compartment of the knee joint. In 20-30° flexion, sudden internal rotation of the knee tears the ACL which, in this position, lies against the lateral aspect of the medial condyle.

**Non-weight-bearing hyperextension**

This mechanism is observed in several sports movements: soccer kick, handball jump, forward fall on skis, karate leg throw, etc.

The movement pulls the ACL over the roof of the intercondylar notch, causing a partial or full-thickness tear.

ACL injuries can be isolated or complicated by peripheral lesions that often remain infraclinical: isolated tears of the posteromedial corner (PMC) or combined injury of the PMC and the posterolateral corner (PLC).

**Other mechanisms**

- Valgus-flexion-external rotation is generally a non-weight-bearing mechanism that can occur in various, often ordinary, situations: slipping with the weight-bearing knee slightly flexed; change in direction on an exterior weight-bearing foot; etc. Theoretically, this mechanism first affects the PMC and/or the medial collateral ligament (MCL). Pull out of the peripheral insertion of the medial meniscus can follow. It is only then that the ACL tear occurs. Actually, in many cases, the mechanism leads to an isolated tear of the ACL.
- Varus-flexion-internal rotation.
- Hyperflexion due to a fall in a crouching position
- Trauma by quadriceps contraction to straighten up from a backward position. This mechanism is observed almost exclusively in skiers who find themselves in a "critical" backward position on a descending slope. Skiers with sufficient muscular force can raise themselves up from the posterior inclination, more or less with the help of a hand behind the back, by contracting their quadriceps against the tibia held in the ski boot. This exceptional performance carries a certain risk since the tibia is necessarily displaced anteriorly in relation to the femur, an ideal position for an ACL tear. The risk is increased if the knee is

already in internal rotation. One of us has pointed out that this mechanism “occurs only in competition skiers with very above average muscular force, otherwise they would not be able to recover from such a posterior inclination. In this situation, beginning skiers inevitable fall.”

**IP-40****RISK FACTORS FOR ANTERIOR CRUCIATE LIGAMENT INJURY: GENDER  
LES FACTEURS DE RISQUES DE RUPTURE DU LIGAMENT CROISE ANTERIEUR:  
LE GENRE**

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**INTRODUCTION**

Ligament reconstruction of the anterior cruciate ligament (ACL) is one of the most frequent arthroscopic procedures. According to the Technical Agency for Information on Hospitalizations (ATIH) 41,122 ligament reconstructions were performed in France in 2012. Treatment of the injury is costly and not always successful at returning patients to their preinjury activity level. Identification of all factors associated with increased risk of ACL injury during sport is important to provide an appropriate level of counseling and programs for prevention. These factors have been categorized as intrinsic (inherent to the individual athlete) or extrinsic (external to the athlete).

**INTRINSIC RISK FACTORS**

Female athletes have been identified at increased risk of injuring their ACL during certain sports, with reported injury rates that are 3.6 times greater for basketball and 5.1 times greater for handball when compared with male athletes who participate in these sports at similar levels of play. Anatomic, neuromuscular, genetic and hormonal factors may account for these sex-ratios

The hormonal theory is based on several reports of elevated ACL tear rates in pre- as compared to postovulatory phase. A recent study conducted by Lefevre et al in a large population of female recreational skiers found a significant correlation between menstrual cycle phase and ACL tear, which was more frequent in the follicular or ovulatory than luteal phase.

A familial predisposition to noncontact ACL tears was evoked and 3 genetic factors were identified by Posthumus et al in a case-control study performed in a South African population.

Several anatomic risk factors have been identified, mainly an increased anterior-posterior knee laxity, a smaller intercondylar notch width, a greater posterior-inferior tibial plateau slope and a greater condyle offset ratio.

Previous ACL reconstruction is a risk factor for ACL injury, both in the contralateral knee and for reinjury of the ACL graft. For Orchard et al, compared to uninjured patients, the injury rate was 11.3 times greater in case of ACL injury within the previous 12 months and 4.4 if ACL injury was prior to the previous 12 months.

Higher than average body mass index is an ACL injury risk factor for women.

Neuromuscular and biomechanical risk factors are also involved. Studies examined the risk of ACL injury in relation to measures of neuromuscular control. Zazulak et al have shown in female, but not male, athletes that factors related to core stability on one hand and impaired core proprioception in the other hand predicted knee injury risk.

**EXTRINSIC RISK FACTORS**

Several extrinsic factors seem increase the risk of ACL injury: competition, wet and rainy weather, the type and number of cleats, the design of the shoe, the type of grass, artificial grass or floor surface.

**MULTIVARIABLE RISK FACTOR ANALYSIS**

Given the multiplicity of risk factors it seems important to develop multivariable models but very few studies have followed this approach. Hashemi et al and Uhorchak et al focused exclusively on anatomic variables. Ruedl et al have investigated the interaction of potential intrinsic and extrinsic risk factors in ACL injured recreational female skiers and showed that extrinsic factors were more strongly involved than intrinsic ones.

## CONCLUSION

Intrinsic and extrinsic risk factors act in combination to increase the risk of ACL injury. The identification of these factors has led to the development of appropriate prevention programs with good but still insufficient results. Optimizing prevention requires the organization of large cohort studies for each sport, involving all participants. A generalization of multivariate statistical analyzes would take into account the possible interactions and to quantify the risk for each factor. Comprehensive prevention programs specific to each sport, incorporating all the factors, could then be offered.

## IP-41

### INFLUENCE OF THE TIBIAL SLOPE AND THE SIZE OF INTERCONDYLAR NOTCH IN THE RUPTURES OF ANTERIOR CRUCIATE LIGAMENT

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**INTRODUCTION:** Numerous factors that increase the risk of ACL injury have been proposed. These factors can be categorized as extrinsic or intrinsic. Extrinsic factors can be directly modified by targeted intervention e.g. the type of sporting activity, the athlete's conditioning i.e. hamstring and quadriceps strength, proprioception, and neuromuscular control, while intrinsic factors are non-modifiable e.g. ligament structure and the anatomic variation within the tibio-femoral joint. A narrow notch width index (NWI) and an increased posterior tibial slope (PTS) are proposed to increase the risk of ACL injury. The aim of this study was to establish why conflicting reports exist on their significance.

**PATIENTS AND METHODS:** To be included in this case-control study patients had to have undergone MRI evaluation of the knee, be skeletally mature, had no previous ligamentous knee injury or knee surgery and had no radiographic evidence of osteoarthritis of the knee. Fifty patients who had an isolated recent (within 1 year) complete rupture of the ACL formed the case group (Group 1). The control group (Group 2) included fifty patients who consulted for knee pain-this was secondary to a traumatic meniscal tear in forty two patients and patello-femoral pain syndrome in eight. Each patient was assessed using the same specific imaging protocol. All patients had antero-posterior, lateral weight-bearing, Schuss views (PA weight bearing in 20-30° of flexion), a true lateral of the knee and lower limb under fluoroscopic control and an MRI of the knee. The functional tibial slope described by Julliard et al was used to determine the PTS (figure 1). The Notch Width Index (NWI) as described by Souryal et al was used to evaluate the width of the intercondylar notch (Figure 2). The Pearson's product-moment correlation test was used to investigate the correlation between NWI and the PTS in the overall population. A multivariate logistic regression was performed to evaluate the influence of the NWI and the PTS on the ACL rupture.

**RESULTS:** The group with ACL rupture had a statistically significant increased PTS ( $p < 0.001$ ) and a smaller NWI ( $p < 0.001$ ) compared to the control group. When a high PTS and /or a narrow NWI, were defined as risk factors for an ACL tear 80% of patients had at least one risk factor present, only 24% patients had both factors present. In the overall

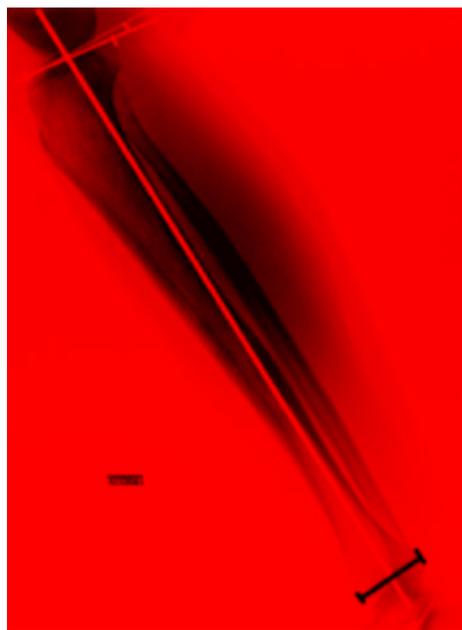


Figure 1: Functional tibial slope: Angle formed by the tangent to the medial tibial plateau and the perpendicular to the lateral mechanical axis.

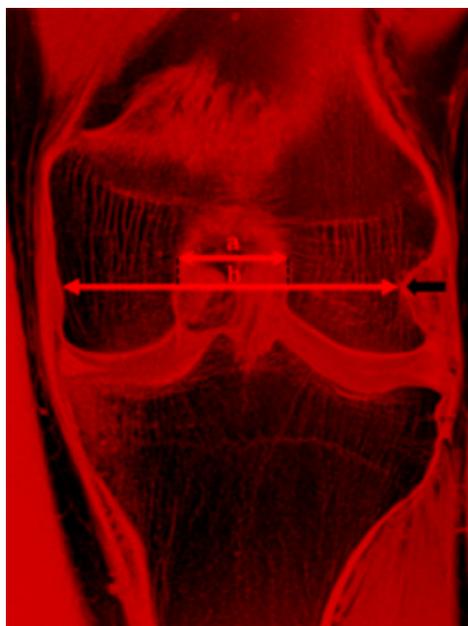


Figure 2: The notch width index (NWI) is the ratio of the intercondylar notch (a) to the width of the distal femur (b) at the level of the popliteal groove (white Arrow):  $NWI = a/b$

population, the PTS was negatively correlated to the NWI (Correlation Coefficient = - 0.28,  $p = 0.0052$ ). Using univariate model, PTS and NWI appear correlated to ACL rupture. Using a logistic regression model, the PTS ( $p=0.006$ ) and the NWI ( $p=0.00004$ ) remain significant risk factors.

**CONCLUSION:** This study provides a new insight into the possible reason for the many contradictory conclusions on the link between PTS and the intercondylar notch to the risk of ACL injury. In our study the population with ACL injury had a significantly increased PTS or a narrow NWI. As a correlation exists between these two factors future studies should consider these anatomical variables in combination rather than in isolation.

#### IP-42

### HAZARD FACTORS OF ACL RUPTURE: NEUROMUSCULAR FACTORS

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Injuries to the anterior cruciate ligament (ACL) of the knee are disabling, often associated with other intra-articular damages and increase the risk of early onset of osteoarthritis. It is very probable that multiple risk factors act in combination to influence injury risk. It is important to have a comprehensive understanding of these ACL risk factors, whose neuromuscular factors, even if investigations on neuromuscular factors reported to date do not provide a complete understanding of ACL injury risk.

According to several recent studies, the neuromuscular control of joint biomechanics during a specific activity seems to represent a predicting factor of an ACL injury, by quantifying the intersegmental forces and moments generated about the tibio-femoral joint. Laboratory studies have shown that landing from a jump performs cutting and pivoting maneuvers with less knee and hip flexion, increases knee valgus and internal rotation of the hip coupled, with increased external rotation of the tibia and quadriceps muscle activation (especially in women). It has been hypothesized that these movement patterns increase the strain in the ACL during activity and that the large difference in knee injury incidence rates between males and females (1/4.5) may be attributed to neuromuscular differences and resultant mechanics. Although studies have shown that the position of the knee and the magnitude and sequence of muscle contraction can increase ACL strain values, it is hard to exactly correlate these movements to what occurs during activity and sport and at the time of ACL injury.

Recently, a simpler assessment tool has been validated and is able to be administered in a clinic-based testing environment. Consequently, the screening for ACL injury risk could be performed on a more widespread population.

Athletes who went on to a primary ACL injury also demonstrated significant side to side differences in lower extremity biomechanics as well as reduced relative lower extremity flexor activation relative to an uninjured control population during the vertical drop jump. Similar mechanisms of injury risk have been identified in athletes medically cleared to return to sport after ACL reconstruction. These seminal findings indicate that these abnormal and asymmetrical biomechanical and neuromuscular control profiles are likely both residual to, and exacerbated by, the initial injury.

A study revealed that a fatigue-induced protocol altered the latency as well as the magnitude of reflex responses of the hamstring muscles and the tibial translation only in women. The authors of various studies have suggested that the hamstring muscles play an important role in maintaining knee stability and that they protect the ACL during movements of the tibia relative to the femur. Therefore, decreased reflex responses of the hamstring muscles and in turn an increased the tibial translation might contribute to the pathomechanics of the ACL injuries. It is therefore conceivable that the fatigue-induced decrease of the hamstring neuromuscular function may increase the tibial translation and probably contributes to the higher incidence of ACL injuries, especially in women.

A preventive approach to decrease ACL injuries could integrate muscle imbalances as a risk factor. If it has been scientifically validated that the muscle strength profile determined by an isokinetic testing offers a predictive value on the hamstring lesion occurrence, similar studies have not permitted such a conclusion about ACL injury. The isokinetic assessments after ACL reconstruction have allowed us to observe, on the healthy contralateral knee, a higher frequency of reduced hamstring/quadriceps ratios. A possible pre-existing weakness in the hamstring and the occurrence of an ACL injury is therefore possible but only a difficult prospective approach due to the multifactorial nature of ligament injuries could clarify that point.

In conclusion, a functional analysis of the landing of a jump and an isokinetic muscle strength assessment have been suggested to represent predictive elements of an ACL rupture, but further studies are needed to have a stronger evidence of their predictive qualities of injury.

## IP-43

### PREVENTION OF ACL INJURIES: PREVENTION PROGRAMS IN A COUNTRY: LUXEMBOURG

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The epidemic of ACL injuries is about to reach incidence values of severe internistic or infectious diseases. They represent the most frequent severe sports injuries with potential long term functional and professional drawbacks for the patients as well as heavy economic consequences for healthcare systems. Therefore, specific efforts should be undertaken to provide the athletes with a healthy and safe environment, especially in youth sports. Prevention of ACL injuries should be multifactorial and requires efforts to understand the causes and mechanisms of injuries. Furthermore, it implies the participation of many different stakeholders to set up prevention strategies. Currently, there is sufficient evidence that ACL injury prevention is highly effective if it is performed in a specific setting, where athletes, coaches and medical staff recognize the problem and adhere to the prevention programs.

According to Van Mechelen et al.<sup>1</sup>, the first step of sports injury prevention is to define the extent of the problem. This can theoretically be done on the 2 ends of the chain, i.e. on the athletic side through the implementation of sports injury surveillance "on the field", and - on the medical side - by registering the number of operated patients in clinics and hospitals.

In Luxembourg, we have introduced several steps to implement this strategy. An injury surveillance system was designed to record sports injuries during a 3-year prospective follow up in a public sports school with over 200 athletes aged 12-18, from different sports disciplines. 1450 injuries were registered, of which 81 (6%) were severe knee injuries and 14 were ACL injuries (1%). The most interesting finding was that the amount of sports injuries decreased significantly in the 3d year of observation, possibly through in-

creased injury awareness in this young population. Our results also indicate that ACL injuries represent the tip of the iceberg of sports injuries and that sports injury surveillance should not exclusively be limited to ACL injuries, especially in the younger population. For adults, we are planning to introduce a surveillance of severe sports injuries in high-risk pivoting sports.

The second step consisted in the implementation of an intra-hospital ACL registry with 440 recorded lesions over the 2 first years of the program. These lesions included operative and nonoperative injuries and allowed for the determination of individual patient profiles as well as the identification of specific and so far unknown risk factors. This information may help to better identify patients at risk.

Finally, it is well known that a previous ACL injury represents the highest risk for a re-injury. The reasons for this are multifactorial. On the one hand, they may be related to biological and surgical factors, but on the other hand, an insufficient functional recovery after ACL injury or surgery may be responsible for re-injuries as well. For these reasons, we developed objective functional criteria after ACL surgery to allow for an improved comparison of the patients' individual rehabilitation profile within a general patient population. We assume that this strategy of secondary prevention will help to reduce recurrent ACL injuries. However, this needs to be proven in future studies.

The presentation will give an overview of our different findings in the fields of sports injury prevention, with a special emphasize on ACL injuries. Our current strategy shows that injury prevention needs to be undertaken on many different levels which can be implemented even before specific athletic intervention programs will be initiated.

#### REFERENCES

<sup>1</sup>Van Mechelen W, Hlobil H, Kemper HC. Incidence, severity, aetiology and prevention of sports injuries. A review of concepts. *Sports Med.* 1992 Aug;14(2):82-99.

#### IP-44

### PREVENTION PROGRAMS OF ANTERIOR CRUCIATE LIGAMENT (ACL) INJURIES. STUDY OF EFFICIENCY IN SOCCER PRACTICE AND POSSIBILITY OF WIDESPREAD IMPLEMENTATION

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According to the regular increasing number of participant in soccer and growing incidence of ACL notably in female population. Research has recently focused on prevention of ACL injury. Best knowledge of intrinsic and extrinsic risk factors leads to the implementation of preventive strategies. Multimodal programs show better results than single component preventive programs. They must incorporate in various proportion: plyometric training, dynamic balance and dynamic strengthening, stretching, body awareness and decision making, core stability and control, sports-specific agility drills and landing techniques. These points act in a measurable manner to reduce landing forces, knee valgus forces and to increase muscle activation. Compliance to the programs is a key point of their implementation and efficiency. It can be enhanced when it is practiced on the soccer field, without any other material needed but those necessary for usual training, leading to a wider diffusion (at any levels). Systematic practice before each training may be possible if the program includes enough exercises to replace the traditional warm-up. Programs targeting both prevention of ACL injury and enhancement of athletic performance increase compliance additionally.

Nevertheless up to that day, efficiency of these programs has been demonstrated only in young amateur soccer players to prevent non-contact ACL injuries. Further studies are needed to study the efficiency of such programs in older participants, in male population and high level soccer players. The program "the 11" has inconstantly proved its efficiency to prevent over-all knee injury and not toward ACL specific injury. In the "11+" Program, exercises has been added to provide variation, progression and structured running exercises. Review of literature showed that "Harmoknee" and "11+" reduce significantly knee injury risk. Prevent Injury and Enhance Performance' (PEP) was the most effective at reducing ACL injuries up to 72% less injury during the last weeks of the season.

Duration of the programs widely varies from 6 weeks to nine months. Further research is needed to determine the minimum participation period needed to provide protection against injury.

**KEYWORDS:** anterior cruciate ligament, injury prevention, neuromuscular warm-up strategies

## IP-45

### ANTERIOR CRUCIATE LIGAMENT INJURY PREVENTION IN HANDBALL PLAYER

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Handball is a sport with pivot and contact especially seeking lower limbs. It is therefore logical to find out that lower limb injuries and more specifically the knee and ankle injuries are the most common (Seil, 1998, Olsen 2006). Ligament pathology is at the forefront of lesion diagnosis: lesion of the anterior cruciate ligament, synonymous with serious knee sprain and thus a prolonged shutdown, deserves our attention, especially among women.

The ACL injury appears preferentially in a non-contact injury with both main circumstances of occurrence which are sidestep maneuver and jump landing (Olsen 2004). According to the literature, several biomechanical factors, intrinsic risk factors, are clearly identified: the sudden movement of knee valgus (Olsen 2004 Koga 2010), rarely isolated, but most often associated with a rotational movement of the knee (Olsen 2004 Koga 2010) and sometimes compounded by a lack of neuromuscular control of the trunk responsible for excessive tilt it (Hewett 2009). Other intrinsic factors (anatomical, hormonal, neuromuscular) must also be taken into consideration to determine the best preventive strategy.

Based on these findings, several authors have evaluated the effectiveness of injury prevention program of the lower limbs in handball. In a prospective study over 3 years conducted with 60 women's handball clubs, Myklebust et al (2003) showed that the incidence of non-contact injuries is significantly reduced after the implementation of the ACL injuries prevention program. Olsen et al (2005) also showed a decrease of 50% of all injuries of the knee and ankle after making a program to prevent injuries in young players aged 16-17.

Regarding the content of prevention programs, the need to combine different types of exercises to develop the qualities of neuromuscular and postural control, should be emphasize to ensure the effectiveness of the prevention program (Hewett 2006, Yoo 2010). The conclusion of the meta-analysis of Hewett et al (2006) underscores the need to involve plyometrics, balance and muscle strengthening to achieve this preventive program at least once a week for at least 6 weeks. In these exercise protocols referred to neuromuscular, Yoo et al (2010) emphasizes the importance of integrating plyometrics especially since they have a positive impact on performance. This last point is of great interest if one wishes to optimize the compliance of the players to preventive programs (Hewett, 2006, Yoo 2010).

While it is now clearly recognized that it is possible to reduce the risk of ACL injury through a program of prevention, it remains difficult to integrate this preventive approach as a real part of the preparation of the handball player: it remains the best guarantee of efficiency against ACL injuries. The Norwegian experience in this area is a very interesting education regarding to the potential impact of a campaign to prevent the risk of ACL injury in a Sports Federation (Myklebust 2013).

#### REFERENCES

- Hewett TE, Ford KR, Myer GD. Anterior cruciate ligament injuries in female athletes: Part 2, a meta-analysis of neuromuscular interventions aimed at injury prevention. *Am J Sports Med.* 2006 Mar;34(3):490-8. Epub 2005 Dec 28
- Hewett TE, Torg JS, Boden BP. Video analysis of trunk and knee motion during non-contact anterior cruciate ligament injury in female athletes: lateral trunk and knee abduction motion are combined components of the injury mechanism. *Br J Sports Med.* 2009 Jun;43(6):417-22
- Koga H, Nakamae A, Shima Y, Iwasa J, Myklebust G, Engebretsen L, Bahr R, Krosshaug T. Mechanisms for noncontact anterior cruciate ligament injuries: knee joint kinematics in 10 injury situations from female team handball and basketball. *Am J Sports Med.* 2010 Nov;38(11):2218-25.

- Myklebust G, Engebretsen L, Braekken IH, Skjøberg A, Olsen OE, Bahr R. Prevention of anterior cruciate ligament injuries in female team handball players: a prospective intervention study over three seasons. *Clin J Sport Med.* 2003 Mar;13(2):71-8.
- Myklebust G, Skjøberg A, Bahr R. ACL injury incidence in female handball 10 years after the Norwegian ACL prevention study: important lessons learned. *Br J Sports Med.* 2013 May;47(8):476-9
- Olsen OE, Myklebust G, Engebretsen L, Bahr R. Injury mechanisms for anterior cruciate ligament injuries in team handball: a systematic video analysis. *Am J Sports Med.* 2004 Jun;32(4):1002-12.
- Olsen OE, Myklebust G, Engebretsen L, Holme I, Bahr R. Exercises to prevent lower limb injuries in youth sports: cluster randomised controlled trial. *BMJ.* 2005 Feb 26;330(7489):449. Epub 2005 Feb 7.
- Olsen OE, Myklebust G, Engebretsen L, Bahr R. Injury pattern in youth team handball: a comparison of two prospective registration methods. *Scand J Med Sci Sports.* 2006 Dec;16(6):426-32.
- Seil R, Rupp S, Tempelhof S, Kohn D. Sports injuries in team handball. A one-year prospective study of sixteen men's senior teams of a superior nonprofessional level. *Am J Sports Med.* 1998 Sep-Oct;26(5):681-7.
- Yoo JH, Lim BO, Ha M, Lee SW, Oh SJ, Lee YS, Kim JG. A meta-analysis of the effect of neuromuscular training on the prevention of the anterior cruciate ligament injury in female athletes. *Knee Surg Sports Traumatol Arthrosc.* 2010 Jun;18(6):824-3

#### IP-46

### PROTOCOL FOR THE PREVENTION OF ACL TEARS IN GIRLS: IMPLEMENTATION AT THE FRENCH FOOTBALL FEDERATION POLE, FRANCE

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In 1998, to support the development of high level women's football, the French Football Federation opened a National Women's Football pole consisting of 25 to 37 players aged 15 to 19 years.

According to studies, tears of the anterior cruciate ligament are one of the most common football injuries; however the risk in girls is 3 to 6 times higher than in boys.

These ACL tears occur more often without contact and after a literature review one found that major risk factors neuromuscular adaptation with female pattern "quadriceps dominant" and biomechanics with a valgus tibial axis increased with jump landing.

Between August 1998 and June 2005 12 ACL tears occurred with girls from the National Football Institute (2 to 3 per year).

Seven affected the non-dominant side. Ten injuries occurred during a match while two during training.

This represents an incidence rate of 0.12 in 1000 hours of practice, and one ACL tear per match for 1000h.

Given the frequency of this injury Dr. Franck LEGALL, physician of the National Football Center from 1994 to 2008 and Phillippe GUILLOTEAU, coach of national women's football pole, reviewed some literature and discussed with colleagues from the French handball and basketball federations to set up a protocol to prevent ACL injuries based on four areas of work:

- Proprioceptive training and dynamic sheath with use of Swiss ball (1 session of 45 mins per week for 6 weeks. 4 to 5 cycles per year.)
- Work with plyometrics low work control and jump landing forces valgus (8-10 series of 10 jumps reception on the forefoot valgus stabilization and control required, one session per week...)
- Screening and restore muscle imbalances hamstring by systematic isokinetic evaluation early in the season with building work in the event of severe
- Assessment of workload and fatigue testing

In August 2003 preventive exercises were implemented.

Between August 2003 and November 2011, zero ACL injuries occurred in the population study.

This involved 100 players during this period.

We had two ACL ruptures during the 2011/2012 season with two players having common constitutional laxity and hypotonia characteristics during work sheathing. Psychological fatigue in the weeks prior to their injury was also noted.

Prevention programs need to be effective in the duration of time.

Starting this education before puberty increases efficiency.

it requires motivation and perseverance from the players as well as coaches.

Therefore it is important that the exercises are simple to implement and can easily fit into a warm-up or a training session.

These results confirm the importance of close collaboration between medical and technical staffs for better efficiency in work injury prevention.

For eight years ACL tears have disappeared at the national sports center of the French Football Federation. The implementation of a prevention program based on research data and literature confirms the efficacy of these protocols in young women and the prevention of non-contact ACL injuries in football.

## PLENARY SESSION – NEW TRENDS IN MUSCLE INJURIES

IP-47

### PROXIMAL HAMSTRINGS INJURIES: NEW TRENDS

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Muscle strain injuries are common in sports but are often misdiagnosed and maltreated. Their significance is often underestimated because most athletes can continue their daily activities soon after the injury. For these reasons the muscles strains and especially proximal hamstrings strains have attracted greater attention in recent years because the latter have a high incidence which is approximately 9-42%. Furthermore, about 50% of all sports injuries of the lower extremities involve strains and ruptures of the hamstring muscles and among those, approximately 70% are reported for biceps femoris muscle, more often at the musculotendinous junction of the long head. Hamstrings strains are common in sports requiring fast acceleration or deceleration. A common site is at the musculotendinous junction which is 12cm at the ischial tuberosity but they can occur at every site of the muscle. More common are the 1st and 2nd degree strains that are treated conservatively. Complete ruptures and avulsion injuries are rare and require surgical intervention for preventing chronic pain and disability. The main injury mechanism includes concentric muscle contraction, forced hip flexion and knee extension.

The differential diagnosis among the main symptom which is posterior thigh pain includes sciatica, sacroiliac joint disease, ischiogluteal bursitis, piriformis syndrome, compartment syndrome, bone tumors, stress fractures and deep vein thrombosis.

In addition to the complex origins of the hamstrings muscles at the ischial tuberosity and the anatomical variations: The biceps femoris and the semitendinosus muscles share the same proximal origin, the common head. Semitendinosus muscle contributes more muscle fibers to the common head. The muscle fibers of the semitendinosus muscle attach obliquely to the tendon of the biceps femoris.

In conclusion, pennation angle of semitendinosus muscle fibers is expected to increase during contraction and results in an increase of the shear forces in the fascicles and of the vulnerability to strains. The semitendinosus muscle is more susceptible to injury due to the pennation angle at which it is attached to the common tendon. Since the majority of the proximal muscle mass belongs to semitendinosus muscle it is proposed that the term -proximal biceps strain- should be re-considered especially for strains during forced eccentric contractions.

#### REFERENCES

- Papastergiou SG, Koukoulias NE, Tsitouridis I, Natsis C, Parisis CA. Circumflex femoral vein thrombosis misinterpreted as acute hamstring strain. *Br J Sports Med.* 2007 Jul;41(7):460-1.
- Kellis E, Galanis N, Natsis K, Kapetanos G. Validity of architectural properties of the hamstring muscles: correlation of ultrasound findings with cadaveric dissection. *J Biomech.* 2009 Nov 13;42(15):2549-54.
- Kellis E, Galanis N, Natsis K, Kapetanos G. Muscle architecture variations along the human semitendinosus and biceps femoris (long head) length. *J Electromyogr Kinesiol.* 2010 Dec;20(6):1237-43.
- Battermann N, Appell HJ, Dargel J, Koebeke J. An anatomical study of the proximal hamstring muscle complex to elucidate muscle strains in this region. *Int J Sports Med.* 2011 Mar;32(3):211-5.
- Kellis E, Galanis N, Natsis K, Kapetanos G. In vivo and in vitro Examination of the Tendinous Inscription of the Human Semitendinosus Muscle. *Cells Tissues Organs.* 2011 Aug 9. [Epub ahead of print]
- Kellis E, Galanis N, Kapetanos G, Natsis K. Architectural differences between the hamstring muscles. *J Electromyogr Kinesiol.* 2012 Aug;22(4):520-6

## IP-48

**PRP AND MUSCLE INJURY. WHERE ARE WE IN 2013?**

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Muscle damage affecting several million people each year. The skeletal muscle has important natural repair capacity. The muscle fibers then regenerate but the connective tissue produces a scar. The interface between these two tissues (myo-fascial and tendon-muscle injury) can cause serious problems functional quality over the medium term with recurrences up to 30% including the hamstrings, gastrocnemius and adductors. The uses of PRP in the treatment of muscle injuries have fundamental work and animal biology. 4 case series have been published. In 2005, 21 cases by Sanchez and 16 by Cugat. In 2012, 48 cases by Jaadouni. In 2013, 17 cases by Wetzel. The four authors report good results. This year finally saw the first controlled study. 30 professional athletes suffering from acute muscle injury are divided into two groups with either conventional conservative treatment or injection of PRP under ultrasound in addition to conventional treatment. Ultrasound, pain, function and range of motion are then evaluated from D1 to D28. At the end of the study the reduction of pain was 93% vs 80. Function and amplitude are the best in the "PRP" group ( $p < 0.05$ ), but there is no difference in pain during a contraction resisted. The return to sport is  $10 \pm 1.2$  days vs.  $22 \pm 1.5$ . We are awaiting confirmation of the good results of this study at the same level with impatience. The name "PRP" must be booked at plasma whose wealth growth factors is greater than that of blood and has neither white blood cells nor red blood cells. The use of PRP in muscle injury must follow a rigorous diagnostic approach, respect for contraindications. Aseptic measures should be maximum and the systematic use of ultrasound guidance. The use of anti-inflammatory and anesthetic is not recommended. The aim of the therapist must remain the quality of the scar and restore good function and not the quest for ever more rapid resumption of sporting competition.

## IP-49

**RETURN TO SPORT AFTER MUSCLE INJURIES**

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Skeletal muscle injuries are among the most common and frequently disabling injuries sustained by athletes. The majority of acute muscle injuries are partial thickness tears. Skeletal muscle injury and repair are complex processes, including well-coordinated steps of degeneration, inflammation, regeneration, and fibrosis. Muscle regeneration initiated shortly after injury can be limited by fibrosis which affects the degree of recovery and predisposes the muscle to reinjury. Typical time to return to sport varies but can be prolonged with recurrence. Return to full activity is usually allowed when the patient is pain free, has full range of motion, and full strength. If an athlete attempts to return to their sport before these criteria are met, there is a high chance of re-injuring the muscle and sustaining a setback. Mild, grade 1 injuries may require only 2-3 weeks before an athlete can return. More severe injuries may require significantly more time. Such a long period of lost playing time is less than ideal for professional and elite athletes, and some have advocated more aggressive treatment in this group. Lack of clinical studies is most probably attributable to the fact that there is not only a high heterogeneity in the severity of injuries, but also the injuries take place in different muscles, making it very demanding to carry out clinical trials. Accordingly, the current treatment principles of muscle injuries have either been derived from experimental studies or been tested empirically only. Treatment options for muscle injuries are; pharmacological, biological, physical and surgical. Structural healing after an injury is not enough for a safe return to sport and functional rehabilitation is important to prevent recurrences. The goal of any rehabilitation is to return the athlete to sport at the previous level of performance while attempting to minimize the rate of injury recurrence. Therefore, optimizing rehabilitation program and establishing a sound base criteria for return to sport (RTS) is essential. However, an exact, evidence-based rehabilitation protocol has yet to be studied.

## PARALLEL SESSION – MOLECULAR MEDICINE IN SPORTS AND EXERCISE

### IP-50

#### EXERCISE AND SARCOPENIA PREVENTION (BIOLOGICAL ASPECTS)

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Skeletal muscle is the most abundant tissue in the human body. The age-related impairment of its mass and function indicates the clinical diagnosis of sarcopenia that is associated to an increase risk of frailty. Before aging exerts its influence, skeletal muscle fibers display plasticity of their biochemical and morphologic properties when they are exposed to different functional demands, exercise training for example. Identifying the underlying molecular mechanisms of age-related skeletal muscle impairment that are potentially altered by exercise training is critical to transfer the exercise training induced skeletal muscle plasticity among older subjects as a countermeasure against sarcopenia (in primary and tertiary prevention).

General influence of exercise training on protein anabolism/catabolism pathways, oxidative stress, inflammation, regenerative capacity and cell death process will be stated before its extension to the sarcopenic process and among humans will be discussed. The original molecular pathway supporting apeline as a positive factor for skeletal muscle function will be highlighted; its potent role in the sarcopenic process and how it can be altered by exercise training will be discussed.

### IP-51

#### THE BIOLOGICAL EFFECTS OF EXERCISE IN PATIENTS WITH HEART FAILURE

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A hallmark in patients with heart failure is the progression of exercise intolerance. Several clinical studies provided evidence, that exercise training has the capability to counteract exercise intolerance and improve quality of life significantly. During the last decade molecular mechanisms how exercise training evoke its beneficial effect could be identified. It became evident that several organ systems are involved. Among these organs the skeletal muscle, the vascular system, the heart, and the respiratory system are primarily affected. In the skeletal muscle exercise training affects mainly the catabolic/anabolic balance, the inflammatory situation, energy production and fibre type composition. In the myocardial system mainly the calcium handling via modulation of key regulatory proteins is affected by an exercise intervention. Also modulations in the respiratory system, especially in the diaphragm are observed. Preliminary results from our group could show, that exercise training attenuated the loss in diaphragmatic force by inflammatory cytokines.

During the session the main alterations elicited by exercise training in the skeletal muscle, the vasculature, and the diaphragm will be discussed.

IP-52

### PHYSICAL ACTIVITY INTERVENTION FOR THE PREVENTION AND TREATMENT OF OBESITY IN YOUTH

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It is estimated that 40 to 45% of French children do not reach the current physical activity recommendation and one third do not engage in any kind of supervised physical activity (PA) [1]. The time spent in PA (PA level) further declines during adolescence especially in girls, resulting in chronic positive energy balance and increased risk of excessive fat mass accumulation. It is now well admitted that PA level, and especially the time spent in moderate to vigorous intensity PA, is associated with decreased risk of obesity and associated cardiometabolic disorders, whereas the amount of sedentary activities increases these risks. The achievement of a PA level that matches the recommendation is therefore considered as a cornerstone in the prevention and treatment of obesity in youth. Recent meta-analysis of randomized controlled trials have referenced over 60 studies in obese children and adolescents [2] and over 300 studies in subjects of all body mass under 16 years old [4], that examined the efficacy of interventions that aimed to increase PA (PA interventions) to prevent and treat pediatric obesity. The effect of PA interventions, estimated using meta-analytic procedures, on total daily PA level appears to be marginal to small in the general population (Effect Size (ES) for change from pre- to post- PA intervention: 0.12,  $P < 0.01$ ) [2,4] and although small, tends to be larger in overweight/obese youth (ES: 0.22,  $P = 0.07$ ). The effect on Body Mass Index (BMI,  $\text{kg}\cdot\text{m}^{-2}$ ), the most commonly used index of obesity, is also trivial (ES: -0.02, NS) in both overweight/obese youth [3] and the general population [2].

A number of factors can explain the somewhat disappointing effects of interventions based on physical activity alone. Methodologically, BMI appears less sensitive than direct measurement of body fat and fat free mass, which are not performed in all studies. Indeed, when such measurements are available a moderate treatment effect of PA interventions on adiposity is observed (ES = -0.52,  $P < 0.001$ ) [2]. Then, only a limited number of studies have objectively measured change in overall PA level using accelerometry to assess the effect of PA interventions, while others used less reliable questionnaires. These examples underline the need for investigators to carefully consider the outcomes assessed and the sensitivity of methods they are using.

Children's behavioral responses to imposed physical activity may counteract the increase in energy expenditure and explain why some PA interventions have small or no detectable effects:

According to the *activitystat* hypothesis children who engage in more imposed activity at one time, such as during supervised PA intervention, compensate later by decreasing their spontaneous PA, so that the overall PA level remains unchanged.

An increase in energy intake consequent to increased hunger and decreased satiety that compensates for the increase in exercise induced energy expenditure can result in a lack of change in energy balance and as a consequence, a lack of change in body composition. However, large interindividual variability has been reported regarding the extent of energy intake compensation, which may explain why PA works to decrease adiposity in some obese subjects, while it fails in others.

The presentation will focus on these factors and how they determine the efficacy of PA interventions in terms of changes in body composition, PA levels and health outcomes.

#### REFERENCES:

1. Casey R., et al. Spatial accessibility to physical activity facilities and to food outlets and overweight in French youth. *Int J Obes (Lond)*. 2012 ; 36:914-9.
2. Kamath C.C., et al. Clinical review: behavioral interventions to prevent childhood obesity: a systematic review and metaanalyses of randomized trials. *J Clin Endocrinol Metab*. 2008; 93: 4606-15.

3. McGovern L., et al. Clinical review: treatment of pediatric obesity: a systematic review and meta-analysis of randomized trials. *J Clin Endocrinol Metab.* 2008; 93: 4600-5.
4. Metcalf B., et al. Effectiveness of intervention on physical activity of children: systematic review and meta-analysis of controlled trials with objectively measured outcomes (*EarlyBird 54*). *BMJ.* 2012; 27;345:e5888.

**IP-53****CARDIORESPIRATORY ISSUES OF SPORT IN CHILDREN**

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Cardiorespiratory (or aerobic) fitness may be defined as the ability to deliver oxygen to the muscles and to utilise it to generate energy to support muscle activity during exercise. Peak oxygen uptake (peak  $\dot{V}O_2$ ), the highest rate at which oxygen can be consumed during exercise, is widely recognised as the best single measure of young people's cardiorespiratory fitness. Peak  $\dot{V}O_2$  increases with growth, age and maturation. Boys' peak  $\dot{V}O_2$  is higher than that of girls prior to puberty and the gender difference increases during adolescence. Peak  $\dot{V}O_2$  limits the rate at which oxygen can be provided during exercise and a high peak  $\dot{V}O_2$  is a pre-requisite of elite performance in many sports but it does not describe all aspects of aerobic fitness. In both sports and everyday life intermittent exercise and the ability to engage in rapid changes in exercise intensity are at least as important as peak  $\dot{V}O_2$ . Under these conditions, it is the transient kinetics of  $\dot{V}O_2$  which best describe the relevant component of aerobic fitness. The primary time constant of the  $\dot{V}O_2$  kinetics response to moderate and heavy intensity exercise slows with age and the  $\dot{V}O_2$  kinetics response to heavy intensity exercise is faster in boys than in girls. Furthermore, during sustained exercise lactate accumulates within the muscle and diffuses into the blood to provide an estimate of the relative aerobic and anaerobic contribution to the exercise. Blood lactate therefore provides a valuable indicator of aerobic fitness with reference to the ability to sustain sub-maximal exercise. There is a negative correlation between lactate threshold as a percentage of peak  $\dot{V}O_2$  and age but differences related to maturation or gender remain to be proven. Young athletes have a higher peak  $\dot{V}O_2$ , a faster primary time constant of  $\dot{V}O_2$  kinetics, and accumulate less blood lactate at the same relative exercise intensity than their untrained peers. Children's cardiorespiratory fitness and responses to exercise have been investigated for over 75 years but their interpretation in relation to age, growth, maturation and exercise training remain shrouded in controversy. This presentation will explore children's cardiorespiratory fitness during growth and maturation in relation to sports performance and analyse the effects of exercise training on subsequent performance.

**IP-54****DOPING AND DOPING BEHAVIOUR AMONG YOUNG ATHLETES**

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**DEFINITIONS**

The use and abuse of performance-enhancing drugs in sports concerns substances registered on a particular list, updated annually, namely "The Prohibited list. International standard" (World Anti-doping Code, World Anti-Doping Agency), and other drugs such as tranquillizers, painkillers or creatine. The first case is qualified as 'doping'.

The concept of doping-behaviour was proposed in order to nuance the concept of doping itself, for it is too simplistic to be functional in the area of prevention. Doping-behaviour is the use of a substance in order to improve performance to face an obstacle (either real or imagined) which is perceived as real by the user or by the people around him. The "obstacle" can be different in nature: a sports competition, a school examination, a job interview, etc.

#### **PREVALENCE**

An important part of the population, adolescents, have had recourse to doping behaviours, according to various studies usually undertaken by face-to-face interviews or by questionnaires, but sometimes also by participant observation or biological samples analysis.

Thus, a few percent of pupils in secondary schools state to regularly take vitamins in order to enhance their schoolwork. In Canada, 3% of adolescents from 11 to 18 years use androgenic anabolic steroids, hormones derived from testosterone, with an aim of increasing their musculature to enhance their physical appearance.

Among adolescent athletes, 3 to 5% say to have already taken prohibited substances, whatever their practiced discipline and their level in competition. For instance, a nationwide study among 6,400 French young athletes from 14 to 18 years and doing on average 10 hours of sport per week showed that 4.5% of them had already resorted to doping. This use begins early, since, according to a study undertaken among 3,500 preadolescents, 1% of the 11 years old young had taken doping agents at least once in the preceding 6 months, and this had risen to 3.0% 4 years later.

Usually, the use of doping agents is linked to the number of hours of practice per week, intention to use, use of other drugs, and psychological variables such as self-esteem or trait anxiety. The prevalence of "doping" is higher among boys, those involved in competitions and, among them, high level athletes

#### **PERCEIVED EFFECTS**

In our studies, of those who had used doping agents, 4% reported that they had experienced a health problem related to doping. Various hypotheses could explain this result: there are adverse health effects, but 1) very few, 2) they are denied or minimized by young athletes, or 3) they are identified, but youth fail to establish links between the effect and their drug use.

It must be noticed that, on average, 40-50% reported that they had won at least one sports event as a result of using the drug.

#### **PREVENTION**

There has been a great interest for prevention actions based on health education and reinforcement of psychosocial competence through life skills, defined by World health Organization as the abilities for adaptive and positive behavior that enable individuals to deal effectively with the demands and challenges of everyday life. Life skills can be addressed by education to contribute to the promotion of personal and social development, the projection of human rights, and the prevention of health and social problems. One of the purposes of life skills education is to reinforce existing pro-social and health skills and behavior, and to prevent or reduce risky behaviors.

For instance, self-assertion based actions have shown effectiveness in achieving the reduction of psychoactive substances use and abuse, like alcohol or tobacco, but also doping behavior among young athletes.

# Free Oral Communications

Thursday, September 26, 2013

ORAL PAPERS OP1 – MEDICAL TRAUMATOLOGY-1

OP-01-01

## ANALYSIS OF HELSINKI 2012 EUROPEAN ATHLETICS CHAMPIONSHIPS INJURIES AND ILLNESSES SURVEILLANCE

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**OBJECTIVE:** The objectives of this study were 1) to evaluate the improvement in the medical surveillance system, and 2) to continue the identification and analyses of the incidence and characteristics of newly incurred injuries and illnesses during track and field international Championships, in order to discuss injury risk factors and future prevention strategies.

**DESIGN AND METHODS:** Using the methodology of injury and illness surveillance validated by the IOC, and implemented by the IAAF during international track and field competitions, during the 2012 European Athletics Championships in Helsinki, incidence and characteristics of new injuries and illnesses were recorded prospectively by physicians and physiotherapists from national teams and local organising committee in 1342 registered athletes.

**RESULTS:** Regarding the medical surveillance system, all countries with more than 15 registered athletes (n=30; 60% of 50 national teams) participated in this study covering 1244 athletes (92.7% of 1342 registered). A total of 136 injury and illness report forms were returned, representing a response rate of 90.7%. Only 0.3% (n=4) of data in the report forms were missing. That shows a constant improvement since the first studies.

Regarding the incidence and characteristics of newly incurred injuries, 131 injuries were reported, representing an incidence of 97.6 injuries per 1000 registered athletes, and 61 (47%) resulted in time-loss from sport. The injury incidence was lower than during previous Athletics Championships surveillances. Characteristics of injuries were in agreement with previous studies: main injury diagnoses were hamstring strain, ankle sprain, lower leg strain, and trunk muscle cramps. 89% of injuries affected the lower limb. Hamstring strain was the main diagnosis and 60% resulted in absence from sport. Overuse (38%) was the predominant cause, but non-contact trauma represent 25% of injury causes. Injury risk was higher in male and increased with age. Injury risk during finals was significantly higher than during qualifying rounds. The highest incidences of injuries were found in combined events and middle- and long-distance events.

Regarding the incidence and characteristics of newly incurred illnesses, 27 illnesses were reported, signifying an incidence of 20 per 1000 registered athletes. The illness incidence was lower than during previous Athletics Championships surveillances. Upper respiratory tract infection was the most common reported diagnosis (33%), followed by gastro-enteritis/diarrhoea (26%). Illness risk factors remains unclear.

**CONCLUSIONS:** The injury and illness surveillance system seems to have improved since the first track and field studies. During elite Athletics Championships, the gender, age, finals and some disciplines seem to be injury risk factors. Illness risk factors remains unclear. Such as previous recommendations, preventive interventions should focus on overuse injuries, hamstring strains, and adequate rehabilitation of previous injuries, and to decrease the risk of infectious diseases transmission we should focus on appropriate event scheduling, appropriate sports clothes on weather conditions and heat acclimatization.

**Table 1 Athletes, exposure, injury and illness in different event groups**

	Sprints	Hurdles	Middle distances	Long distances	Jumps	Throws	Combined events	Total
<b>Population</b>								
Registered athletes	670	149	125	97	251	232	52	1342 <sup>1</sup>
Competing athletes (including DNS)	508	130	105	89	234	207	45	1318
Athletes participations	852	242	159	89	331	303	359	2335
<b>Injuries</b>								
Number of injuries	45	6	19	16	23	11	12	132
Training	8	3	0	2	6	3	0	22
Competition	37	3	19	13	16	8	12	108
N/A				1	1			2
Injuries per 1000 registered athletes	67.2	40.3	152.0	164.9	91.6	47.4	230.8	98.4
Injuries per 1000 competing athletes (including DNS)	88.6	46.2	181.0	179.8	98.3	53.1	266.7	100.2
Injuries per 1000 athlete participations	52.8	24.8	119.5	179.8	69.5	36.3	33.4	56.5
Injuries in competition per 1000 competing athletes (excluding DNS)	73.4	23.3	182.7	147.7	69.0	39.0	266.7	82.6
<b>Time-loss injuries*</b>								
0 days	16	5	12	7	15	6	6	67
1-7 days	15	0	2	4	5	2	3	31
8-28 days	8	1	3	2	3	3	3	23
> 4 weeks	4	0	2	2	0	0	0	8
Time-loss injuries per 1000 registered athletes	40.3	6.7	56.0	82.5	31.9	21.6	115.4	46.2
Time-loss injuries per 1000 competing athletes (including DNS)	53.1	7.7	66.7	89.9	34.2	24.2	133.3	47.0
Time-loss injuries per 1000 athlete participations	31.7	4.1	44.0	89.9	24.2	16.5	16.7	26.6
<b>Illnesses**</b>								
Number of illnesses	12	3	2	1	4	2	2	27
Illnesses per 1000 registered athletes	17.9	20.1	16.0	10.3	15.9	8.6	38.5	20.1
Illnesses per 1000 competing athletes (including DNS)	23.6	23.1	19.0	11.2	17.1	9.7	44.4	15.3
Illnesses per 1000 athlete participations	14.1	12.4	12.6	11.2	12.1	6.6	5.6	5.0
Number of time-loss illnesses***	1	0	0	0	2	2	0	6

\*Information on time-loss is missing for 3 injuries.  
 \*\*Information on event is missing for one illness and time-loss illness.  
 \*\*\*Information on time-loss is missing for one illness.  
 N/A Information on the circumstance of injury is missing for 2 injuries.  
<sup>1</sup>Since some athletes competed in more than one discipline, this is not the sum of registered athletes in each different event groups but the total number of registered athletes.

**OP-01-02**

**ALTERATIONS OF QUADRICEPS MUSCLE DYNAMICS AFTER FRICTION MASSAGE AND PATELLAR MOBILIZATION**

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**INTRODUCTION:** The delay between onset times of EMG and force has been used to assess the changes in the dynamics of muscles after various training exercises (1-4). Friction massage and patellar mobilization of quadriceps femoris (QF) muscle-tendon unit (MTU) is frequently used by physical therapists in rehabilitation of patello-femoral problems. It is thought that friction massage might change the dynamics of QF.

**AIM:** The aim of this study was to investigate the changes in the electro-mechanical properties of QF immediately and 20 days after friction massage and patellar mobilization. In order to fulfill the aim, the delays between electromyography (EMG) and mechanomyography (MMG) and force were measured.

**DESIGN AND METHODS:** Lower extremities of healthy participants (n=14) were positioned on custom made device, adjustable to different knee angles. Surface EMG and MMG of Rectus Femoris (RF) and Vastus Medialis (VM) were recorded synchronously with force (F) during voluntary contraction at 15°, 30° and 45° knee flexion angles, before and immediately after 15 min friction massage and 5 min patellar mobilization. Force was measured by a load cell (0-500 N) at the level of distal part of moment arm of tibia. Retest was done after 20 days of friction massage. Delays between EMG and MMG, EMG and F, and MMG and F were analyzed using a program written in MatLab. Statistical analysis was performed using Student's T test.

**RESULTS:** At 15° knee flexion, the delays for EMG-MMG, EMG-force and MMG-force significantly increased immediately after the application of the massage in both RF and VM. At 30° knee flexion, the delay for only EMG-MMG increased significantly immediately after the massage in RF, while delays for EMG-MMG, EMG-force and MMG-force were significantly longer in VM immediately after the massage. At 45° knee flexion, the delay for EMG-MMG increased only immediately after the massage in RF, while there were no changes in the delays in VM. 20 days treatment did not have any significant effects on the delays at any cases.

**CONCLUSIONS:** The important finding of the present study is that friction massage of MTU and patellar mobilization lengthens the delay between EMG-MMG, EMG-force and MMG-force immediately after the massage and that effect appears at 15° and 30° of knee flexions. Increase in delay implies that muscle becomes less stiff (1,3). Thus the results indicate that the rehabilitation effect of the applied massage might occur by decreasing stiffness of the muscle. Also increased electromechanical delay at 15° and 30° of knee flexion is of high importance because at these angles patellar mechanics are controlled by soft tissue extensibility and contractibility. The results also show that there are no long term effects of massage on the delays showing that friction massage and patellar mobilization could be effective as a single intervention.

#### REFERENCES:

1. Grosset JF, Piscione J, Lambert D. Eur J Appl Physiol. 2009. Jan; 105(1):131-139
2. Reeves ND, Narici MV, Maganaris CN. Muscle Nerve. 2003 Jul; 28(1):74-81
3. Huang SY, Di Santo M, Wadden KP. J Strength Cond Res. 2010 Jul;24(7):1917-24
4. Kubo K, Kanehisa H, Fukunaga T. J Appl. Physiol. 2001 Jul;91(1):26-31

#### OP-01-03

### FACTORS ASSOCIATED WITH BONE DENSITY OF CALCANEUS MEASURED BY QUANTITATIVE ULTRASOUND (QUS) IN JAPANESE MALE JUNIOR HIGH SCHOOL ATHLETES ACCORDING TO TYPE OF SPORT

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**OBJECTIVE:** For the prevention of osteoporosis, maximizing bone mass accumulation (peak bone mass) during puberty is important. Strength-based and high-impact sports seem to be associated with higher bone density, whereas non-weight-bearing sports have a neutral or negative relationship. We conducted a large-

scale cross-sectional study to elucidate factors associated with bone density using quantitative ultrasound measurements (QUS) according to type of sport.

**DESIGN AND METHODS:** Japanese male junior high school students (n=8,680, 13-14 years old) were analyzed according to type of sport. We measured bone density (osteosono-assessment index: OSI) using AOS-100 (Aloka Co., Ltd. Japan). We further divided the study population into three tertiles according to the values of OSI (tertile 1: <2.536; tertile 2: 2.536-2.768; tertile 3: >2.768). We compared factors influencing OSI according to tertiles. A self-administering questionnaire on the students' lifestyles (dairy products, milk, small fish, vegetables, breakfast, fast foods, sports activity inside/outside of school, type of sports, walking time, sleep duration, etc.) was also employed. To control confounders such as weight and height, multivariate stepwise logistic regression analysis was also applied to assess factors associated with bone density according to type of sport (basketball, soccer, tennis, volleyball, table tennis, track and field, baseball, judo, kendo). Statistical analysis was performed using SAS 9.1.3 software.

**RESULTS:** In overall multivariate analysis, weight (OR 1.044, 95%CI 1.039-1.050), height (1.038, 1.031-1.045), dairy products (1.436, 1.324-1.558), sports activity outside of school (1.165, 95% CI 1.070-1.268) showed significant association with bone density. Furthermore, different patterns of factors were significantly demonstrated according to type of sport; soccer: dairy products (1.304, 1.026-1.658) and walking time (1.427, 1.077-1.890); tennis: fast foods (0.644, 0.424-0.979); table tennis: dairy products (1.301, 1.023-1.655); baseball: dairy products (1.338, 1.086-1.649) and so on.

**CONCLUSIONS:** Lifestyle factors significantly influenced bone density in Japanese male junior high school athletes, adjusted by confounders. Moreover, since different lifestyle factors significantly related to bone density according to type of sports, trainers should consider athletes lifestyle according to type of sport with regard to healthy bone growth.

## OP-01-04

### EFFECTIVENESS OF BOTULINUM TOXIN FOR TREATMENT OF CHRONIC LATERAL EPICONDYLITIS: A DOUBLE BLIND RANDOMIZED CONTROLLED TRIAL DURING ONE YEAR

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**INTRODUCTION:** Lateral elbow tendinopathy is a common pathology. This pathology can become very disabling during transition to chronicity. After a year of evolution, the surgery that is sometimes proposed mainly consists in detaching the extensor carpi radialis brevis to its proximal insertion. Some authors have proposed an alternative treatment based on the injection of botulinum toxin A in the extensor carpi radialis brevis. The benefit of this therapy remains to be confirmed, especially the long-term effectiveness.

**METHOD:** This is a randomized double-blind placebo controlled trial. Treatments compared are active treatment (40ui of botulinum toxin A Dysport diluted in 0.4 ml saline solution injection) with 0,4ml of a saline solution injection : placebo). The injection is controlled by an EMG muscle stimulation in the extensor carpi radialis brevis. The main objective is to assess the analgesic effect of botulinum toxin A injection after 3 months. Primary outcome was the number of patients whose pain is relieved by over 50% compared to the initial pain. Secondary outcomes are to examine, in the short term, the duration of pain relief provided by this therapy and in the medium term, to assess the rate of recurrence after initial relief. We followed up two groups of 30 patients for one year.

**RESULTS:** The two populations are comparable in terms of age, initial pain VAS and duration of the tendinopathy. There are 15 out of 29 patients relieved by over 50% in the toxin group and 6 out of 28 patients relieved by over 50% in the placebo group at 3 months. The analgesic effect of botulinum toxin is significant ( $p = 0.0015$ ). The pain reduction was also significant between day 0 (day of injection) and the assessment of pain at 3 months. The effectiveness of the treatment was confirmed after six months and one year. The

recurrence rate at one year in the botulinum toxin group was 4.2%. The side effect was weakness of the third finger, which lasted à 3 months. He appeared in only 10 % of patients.

**CONCLUSION:** In agreement with the literature, our study shows that botulinum toxin is an effective treatment in the lateral epicondylar tendinopathy muscle refractory to medical treatment well led. This is a non-invasive treatment, without significant side effects. There are very few of recurrence after treatment with botulinum toxin in this indication in a year follow up.

## OP-01-05

### CLINICAL AND DIAGNOSTIC PARALLELS IN BOXERS WITH TRAUMATIC BRAIN INJURY

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**AIM:** To examine the clinical and diagnostic features of traumatic brain injury in boxers.

**MATERIALS AND NETHODS:** The study involved 158 amateur boxers high skill level who have had a history of repeated traumatic brain injury. Age of participants was 16-35 years, the number of boxing matches ranged from 25 to 375, the total number of traumatic brain injury in the form of knockdown (knockout) depending on the duration of sports career ranged from 1 to 15. Boxers were divided into two groups: 1 (n=90) – candidates for the master of sports and sport masters, 2 (n=68) – master of sports of international class and honoured master of sports. The control group consisted of 30 people aged 18 to 29 who are not engaged in boxing and had a history of traumatic brain injury transferred.

All boxers analyzing complaints and clinical symptoms in order to highlight neurological syndromes, conducted neuropsychological testing, magnetic resonance imaging of the brain. Conducted genetic testing – defined gene polymorphism of apolipoprotein E.

**RESULTS:** After a thorough survey of boxers and neurological examination was allocated 12 neurological syndromes. Often diagnosed autonomic dysfunction syndrome, cephalgia, cerebrasthenic syndrome, rarely met hypertensive syndrome, disseminated neurological symptoms.

According to the neuropsychological study the highest values of neuropsychological tests have been reported in the control group, the lowest – in the boxers 1 and 2 groups. We found no marked difference in values of neuropsychological tests between the two boxers groups, indicating that approximately the same number of received traumatic brain injury and, therefore, the same risk of cognitive impairment.

MRI brain changes frequently detected in boxers with repeated traumatic brain injury than in the control group. In boxers higher qualifications (group 2) were found more frequently expanding cavum septum pellucidum and expansion convexital spaces.

The results of genetic testing revealed the presence of three allelic variants (e2, e3, e4) and four genotypes (e2e3, e3e3, e3e4, e4e4) investigated apolipoprotein E gene locus. The frequency in the group of boxers and the control group dominant allele e3 (67,8% and 75%, respectively), in the group of boxers were common alleles e2 (14,9%) and e4 (17,3%) compared to the control group (10% and 15% respectively). In both groups dominant genotype e3e3 (53,5% - boxers, 66,7% - control group). Among the boxers compared with the control group were more common genotypes e2e3 (20,9% and 13,3% resectively) and e3e4 (20,9% and 20%). If the control group had never met patients with genotype e4e4, then boxers under their frequency was 4,7%, and it is with genotype e4e4 values of neuropsychological tests was low.

**CONCLUSIONS:** Boxers who have suffered repeated traumatic brain injury, it is necessary to conduct a comprehensive survey of the use of clinical, neurological, neuropsychological and neuroimaging methods to prevent possible long-term effects injury. Proved communication apolipoprotein E, including allele e4, with the

development of cognitive impairment in boxers, after suffering mild traumatic brain injury. For genetic testing to predict the possibility of complications from the side of the nervous system after suffering traumatic brain injury.

OP-01-06

## RELIABILITY OF AN ANKLE JOINT ROTATION CORRECTION METHOD FOR ASSESSMENT OF ACHILLES TENDON DISPLACEMENT DURING ISOMETRIC CONTRACTION

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**OBJECTIVE:** To transfer and absorb forces, the Achilles tendon (AT) requires an optimal level of material and mechanical properties, such as stiffness and elongation.<sup>1</sup> Measurement of these properties is currently biased by the ankle joint rotation (AJR) during maximum voluntary isometric contraction (MVIC). Correction methods exist, but for longitudinal studies their reliability is unknown. Therefore, the aim of this study was to evaluate inter- and intra-observer reliability of an AJR correction method in measuring AT displacement due to only muscle contraction.

**METHODS:** Nine subjects (6 males/3 females;  $27.6 \pm 2.7$  yrs;  $179.9 \pm 11.1$  cm;  $76.5 \pm 15.3$  kg) performed plantar-flexion MVICs on an isokinetic dynamometer in the prone position. Simultaneously, an electrogoniometer recorded AJR and ultrasound visualized myotendinous junction displacement. After MVIC, the ankle was passively rotated according to the previously recorded AJR and displacement was again imaged. Myotendinous junction displacement during this passive movement was subtracted from the displacement during MVIC to compute "corrected" displacement due to muscle contraction. Inter-observer reliability was a comparison between the observers' displacement measurements of the exact same ultrasound images made from the exact same MVIC tests. Intra-observer reliability was defined as the likeness of the observers' displacement measurements made during the test and retest conducted one week later. Descriptive statistics are described as mean  $\pm$  standard deviation. To evaluate inter- and intra-observer reliability interclass correlation coefficient (ICC 2.1) and Bland-Altman analysis (Bias  $\pm$  limits of agreement [ $1.96 \times SD$ ] (LoA)) were calculated. Inter-observer variability (IRV %) and test-retest variability (TRV %) of total, passive and corrected tendon displacements were also determined.

**RESULTS:** The corrected displacement of AT measured during the initial test was  $1.34 \pm 0.44$  cm, and during the retest,  $1.33 \pm 0.43$  cm. Test results for passive displacement were measured as  $0.44 \pm 0.11$  cm and  $0.4 \pm 0.09$  cm in the retest. Reliability of corrected tendon displacement between observers measured by ICC, IVR% and Bias  $\pm$  LoA was 0.99, 5.19 % and  $0.01 \pm 0.13$  cm, respectively. Test-retest reliability measured by ICC, IVR% and Bias  $\pm$  LoA was 0.77, 20.14 % and  $0.03 \pm 0.82$  cm, respectively. Additionally, test-retest reliability of ankle joint rotation was ICC 0.21, TRV 30.63 % and Bias  $\pm$  LoA  $0.3 \pm 4.10$ . Test-retest reliability of MVIC was ICC 0.79, TRV 15.94 % and Bias  $\pm$  LoA  $-11.36 \pm 44.75$ .

**CONCLUSION:** A high reliability between observers and low to moderate reliability between intra-observation of a test-retest was identified. The results indicate that the limiting factors of the method are the repositioning of the subjects, electrogoniometer, and dynamometer, in addition to the subjects' MVIC repeatability. It is recommended that standardization protocols for ensuring identical repositioning be used.

### REFERENCES

1. Arya, S., Kulig, K. Tendinopathy alters mechanical and material properties of the Achilles tendon. *Journal of Applied Physiology* 3, 108: 670-5 (2010).

## Thursday, September 26, 2013

### ORAL PAPERS OP2 – MEDICAL TRAUMATOLOGY-2

#### OP-02-01

#### **PREDICTIVE FACTORS OF KNEE SPRAIN ON ELITE WOMEN RUGBY PLAYERS. PART 2. ANALYSIS**

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Epidemiological part of this retrospective study on international rugby women players showed an incidence of 38.8% of knee sprain. In particular of 24.5% of Anterior Cruciate Ligament (ACL) sprain needing surgery. In this part of our study we tried to identify factors in order to prevent knee sprain risk.

**MATERIALS AND METHODS:** The study was carried out on 49 players within the elite French championship and already selected in French national teams: XV women (senior and under 20) and Sevens. During training camps at the beginning of the season, players had medical examinations:

- a questionnaire about previous knee sprain (PKS),
- a height and weight measurement to calculate the Body Mass Index and ranking (BMI) rank 0 for BMI <25, rank 1 for 25 < BMI < 30 and rank 2 for BMI > 30
- a morpho-static-dynamic examination of the lower part of the body and ranking (MSD) rank 0 = no foot valgus no knee valgus, rank 1 = physiological dynamic foot valgus no dynamic knee valgus and rank 2 = foot valgus and dynamic knee valgus
- an isocinetic knee quadriceps-to-hamstring ratio evaluation on Contrex<sup>o</sup> and Isocinetic ranking (Croisier's ratio mixte) rank 0 = no muscular risk, rank 1 = low muscular risk and rank 2 = high muscular risk

**RESULTS:** The univalent analysis found: 6 out of 7 cases (85.7%) with BMI rank =2 players had PKS, 11 out of 23 cases (47.8%) with MSD rank =2 players had PKS. The Isocinetic ranking is not statistically significant. The cross ranking analysis with 2 out of 3 ranks found that 100% of 6 cases with BMI=2 + MSD=2 had PKS. The cross ranking analysis with 3 ranks found that 100% of 3 cases with Total of the 3 Ranks (T3R) = 6 and 75% of 4 cases of T3R = 5 had PKS.

**CONCLUSIONS:** From these results we can conclude that BMI and MSD (easy clinical examination) are significantly correlated with PKS. According to recent publications about biomechanical schedule of the lower part of the body, we can confirm that association of foot valgus + knee valgus + high BMI is a predictive factor of knee sprain on elite rugby women players. Isocinetic ranking is not relevant and can't be use as a predictive factor of knee sprain in this population. Further investigation could require a specific analysis of each criterion. During next season we will analyse the MSD with Knee Abduction Moment by filming drop vertical jumps to predict knee sprain on 18 year old rugby women players.

## OP-02-02

**EVALUATION OF ANTERIOR KNEE LAXITY ON MRI**

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**PURPOSE:** Evaluation of the ACL and anterior knee laxity on MR during anterior tibial translation.

**PATIENTS AND METHODS:** Three groups were identified based on clinical and arthrometric (KT-1000) data: normal ACL (n=12), complete tear (n=10) and partial tear (n=20). MRI was performed without and with anterior tibial translation (pneumatic device) with morphological and laximetric analysis: drawer tests and dynamic evaluation of ligamentous tension.

**RESULTS:** Intra- and inter-observer reproducibility was excellent, correlated to arthrometric data and clinical tests (Lachman, pivot shift). The difference between the drawer signs of normal subjects and patients with ACL tear was significant for a threshold value of 1,1mm for the anterior drawer (sensitivity: 93.33%, specificity: 91.7%) and 2.8 mm for the posterior drawer (sensitivity: 86.7%, specificity: 100%). Dynamic evaluation of ligamentous tension was also reproducible, statistically correlated to the MR drawer tests and reliable for the diagnosis of ACL lesions. In this preliminary study, the distinction between complete and partial ACL tears could not be detected.

**CONCLUSION:** Anterior cruciate ligament function can be demonstrated on MR. The predictive value of this morphological and functional association should be determined in the management of patients with partial tears.

## OP-02-03

**INFLUENCE OF RUGBY ON SHOULDER INTERNAL AND EXTERNAL ROTATORS STRENGTH**

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**BACKGROUND:** Rugby players' are frequently concerned by shoulder injuries. Except for traumatic causes, muscular deficiency and/or imbalance of the internal (IR) and external (ER) shoulder rotators are considered as probable mechanisms of shoulder injuries.

**OBJECTIVES:** To investigate whether the rotators strength imbalances occur in rugby players by comparing IR and ER shoulder muscle strength values and the ER/IR ratios between rugby players and nonathletic subjects.

**DESIGN AND SETTING:** Cross-sectional controlled study.

**PATICIPANTS:** 14 rugby players and 19 healthy nonathletic subjects.

**MAIN OUTCOMES MEASURES:** Isokinetic strength of the IR and ER shoulder muscles was evaluated with a Con-Trex® dynamometer, in the seated 45° abducted test position in the scapular plane. Tests were performed at 60°.s-1 and 240°.s-1 angular velocities in concentric mode and at 60°.s-1 in eccentric mode for both sides.

**RESULTS:** Strength values were higher for rugby players than nonathletic ones ( $P < 0.05$ ), but if maximum peak torque was reported to body weight, there were no significant differences on ER and IR muscles strength. There was no statistically significant effect of laterality on the IR and ER peak torque. There was no statistically significant influence of rugby and/or laterality on the ER/IR ratio.

**CONCLUSIONS:** More than an absolute values of shoulder strength higher in rugby players in comparison with nonathletic, our results reported no rotators muscles imbalance in rugby players. Therefore influence of the specific activity of rugby on rotators strength is not likely to lead another risk factor of glenohumeral injury in addition to body contacts and collisions.

#### OP-02-04

### CAN WE DETECT PARTIAL RUPTURES OF THE ANTERIOR CRUCIATE LIGAMENT WITH A DYNAMIC LAXIMETER, THE GNRB®. RESULTS OF A PROSPECTIVE STUDY OF 140 ACL RECONSTRUCTIONS

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**OBJECTIVES:** The repair of ruptures of a single bundle (Anteromedial or Posterolateral bundle) of the ACL is possible in about 20% of patients. The diagnosis of this type of rupture is clinically difficult, an MRI is not always contributive and the decision is often made during the arthroscopy. We used the GNRB® preoperatively to record the elasticity curve of the ACL of each knee.

Is it possible to plan the type of repair, partial or complete, according to the collected data?

**METHOD:** With the GNRB® the lower limb is placed on a composite thermoformed support with the knee at 0° rotation, the patellar pressure being recorded. An electric actuator pushes on the postero-superior part of the calf with a force of up to 300 newtons (N). This force is only exerted in the absence of hamstring muscle contraction. A displacement transducer records the translation of the anterior tibial tuberosity. Each ACL has a specific elasticity curve.

141 unilateral ACL ruptures measured preoperatively were operated on by a reconstruction according to the TLS® technique (Semi tendinosus in 4 strands) between January 2009 and December 2011. According to arthroscopic findings, a partial (31 knees) or a complete repair (110 knees) was accomplished. Information obtained on the side-to-side laxity at 134 N (mm) and the side-to-side slope (mm/N) with the GNRB® were compared with the surgery undertaken. ROC curves were used for identifying the most important thresholds to differentiate the partial from the complete ruptures. In the chosen thresholds, the sensitivity and specificity were estimated. The predictive values of the combination of both measurements were also estimated.

**RESULTS:** The differential laxity threshold  $< 3$  mm at 134 N allows the preoperative diagnosis of single bundle rupture with a sensitivity of 89 % and a specificity of 90 %. The convergence of the two measures: laxity threshold  $< 3$  mm at 134 N and slope threshold  $< 12$  mm/N in consideration of a partial repair had a predictive value of 77 %.

**DISCUSSION:** The KT-1000 and the Telos laximeters are not sufficiently accurate and reproducible to be used in the screening of single bundle ACL ruptures. The GNRB® demonstrates various advantages in comparison: good control of the investigated limb position in rotation, recording of translation in the absence of hamstring muscle contraction, constant speed of pressure, accuracy and automatic recording of measurements.

**CONCLUSION:** The GNRB® enables the planning of a partial repair with a high level of sensitivity and specificity from side-to-side laxity and the slope of the elasticity curves. The combination of these two tests (stretched and slope) allows very good predictive values in the case of convergence.

## OP-02-05

**ASSOCIATION BETWEEN BODY MASS INDEX AND INCIDENCE OF INJURIES AMONG FOOTBALL PLAYERS**

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**OBJECTIVE:** The aim of the study was to examine the association between BMI and incidence of injuries among football players of different ages (18 to 38 years).

**MATERIALS AND METHODS:** A prospective cohort study of 216 players from 12 teams of the Kosovo Football Super- League was conducted during the competitive season 2011/2012. Players were followed up for 1 year, during which time they sustained 165 injuries. They were measured for height, weight, and body fat percentage. Injuries, training and match exposure times for each player, were recorded during all club training sessions and matches throughout the entire season.

**RESULTS:** Data were analyzed using Multiple Logistic Regression. The incidence of injury per 1000 hours of training and playing football was 4.7 per player. There were significant associations between BMI and incidence of injuries among football players. Players with higher body mass index (adjusted odds ratio (OR), 2.60; 95% CI. 1.20-5.71) were significantly associated with increased risk of injuries.

Seventy eight percent of the injuries were occurred in the lower extremities, particularly the knee (28.4%), ankle (23.2%), and groin region (26.5%). Fractures, which accounted for 5.2% of injuries, were most often in the upper extremities.

The most frequent injuries were muscle/tendon represented with 42.8% and ligament/joint complex injuries 36.1%. According to the types of muscle injuries our results revealed that concussions and tractions/ruptures were the most frequent and represented with 48.6%.

**CONCLUSION:** The incidence of soccer injuries in Kosovo Football Super- League is significantly high. It can be reduced by preventive interventions, especially more physical training. The development and realization of preventive strategies to decrease the rate and severity of injury is strongly recommended.

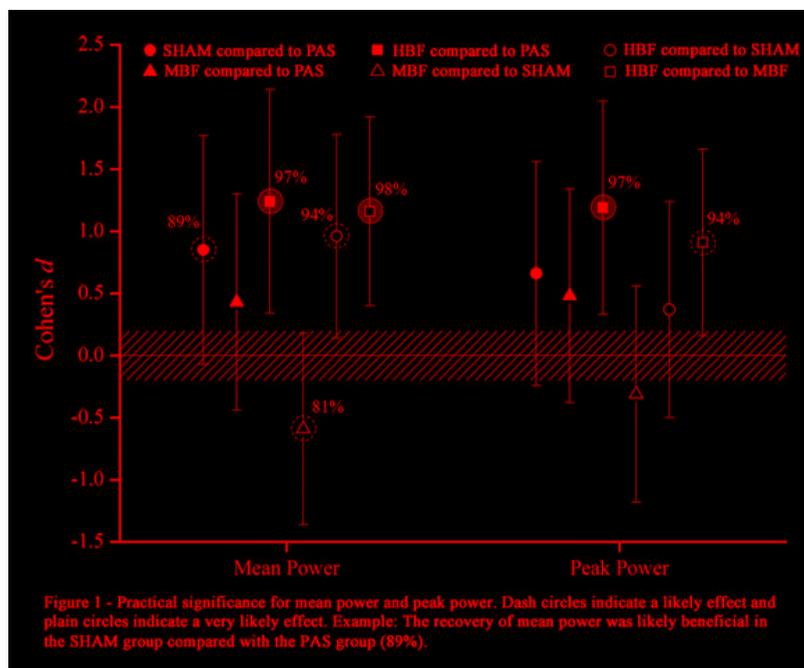
## OP-02-06

**INFLUENCE OF POST-EXERCISE LIMB BLOOD FLOW STIMULATION ON PERFORMANCE RECOVERY**

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**INTRODUCTION:** Elite sport requires athletes to complete multiple bouts of high-intensity exercise with limited rest periods that are not sufficient for full recovery. To facilitate the performance recovery, recovery therapies like active<sup>1</sup>, immersion<sup>2</sup> or Low frequency electromyostimulation<sup>3</sup> (LFES) have achieved very good results. It has been hypothesized that the increase of blood flow with these strategies could accelerate the supply of oxygen rich blood, increase the flush of waste products and help reduce H<sup>+</sup> levels associated with lactic acid build-up. Consequently, the assumption of a strong relationship between blood flow and high intensity performance recovery is often cited although never tested. Therefore, the aim of this study was to test this hypothesis by stimulating the blood flow at three different levels during a 30-min recovery intervention period between two sessions of multiple sprint interval (three 30-s WAnT) exercise.



**METHODS:** Thirty-seven trained athletes participated in a randomized controlled trial. Each session consisted of performing 3 x 30 WanT (bouts 1–3) followed by a randomly assigned 30-min recovery intervention of either: high blood flow (Veinoplus Sport®)(HBF), mild blood flow (Cefar-Compex Theta 500®)(MBF); sham NEMS device (SHAM; that does not stimulate the blood flow) and passive recovery (PAS). A 30-s WanT was then repeated (bouts 4) and compared to bout 1 for peak power and mean power. Measures of blood flow, blood lactate and heart rate were recorded every 3 min throughout the recovery intervention period to monitor physiological responses. Data were analyzed for practical significance using magnitude-based inferences (Hopkins et al. 2009) and ANOVA analysis

**RESULTS:** Blood flow was significantly higher in HBF group compared to PAS, SHAM and MBF groups. Examination of heart rate and blood lactate revealed no recovery effect ( $P > 0.05$ ). The recovery of mean power was likely beneficial in the HBF group compared with the SHAM group and very likely beneficial compared with the PAS group and the MBF group. The recovery of peak power in the HBF group was likely beneficial and very likely beneficial compared with the MBF group and the PAS group, respectively.

**CONCLUSION:** Stimulate total blood flow at a high velocity is a mean of preserving performance when repeating acute exhausting exercise interspaced by short recovery period. However this positive effect is not accompanied by a greater lactate removal.

#### REFERENCES

- Heyman E, et al. (2009) Effects of four recovery methods on repeated maximal rock climbing performance. *Med Sci Sports Exerc* 41: 1303-10.
- Pournot H, et al. (2011) Short term effects of various water immersions on recovery from exhaustive intermittent exercise. *Eur J Appl Physiol* 111: 1287-95.
- Bieuzen F, et al. (2012) Recovery after high-intensity intermittent exercise in elite soccer players using VEINOPLUS sport technology for blood-flow stimulation. *J Athl Train* 47: 498-506.
- Hopkins, W. G., et al. (2009). 'Progressive statistics for studies in sports medicine and exercise science.' *Med Sci Sports Exerc* 41(1): 3-13.

Thursday, September 26, 2013  
ORAL PAPERS OP3 – PHYSICAL ACTIVITY AND HEALTH-1

OP-03-01

**REALISING THE POTENTIAL FOR AN OLYMPIC LEGACY; TEACHING MEDICAL STUDENTS ABOUT SPORT AND EXERCISE MEDICINE AND EXERCISE PRESCRIBING**

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**BACKGROUND:** Physicians are increasingly being called upon to promote physical activity (PA) to patients. However, a paucity of exercise medicine teaching in UK undergraduate medical curricula prevents students from acquiring the necessary knowledge and skills to do so. To address this King's College London School of Medicine (KCLSM) introduced an exercise medicine strand of teaching. This study evaluated the acceptability of exercise promotion behaviour change lectures and explored the knowledge and attitudes of the students who received it.

**METHODS:** Students were invited to complete a 6-item online questionnaire prior to and after exercise medicine lectures. The questionnaire assessed beliefs regarding the importance of PA in disease prevention and management, in addition to their confidence in advising patients on PA recommendations. A focus group (n=7) explored students' attitudes towards and knowledge of PA promotion and exercise prescribing.

**RESULTS:** In total 261 (33%) first and second year MBBS students completed the questionnaire. Students' beliefs regarding the importance of PA in managing disease and their confidence in PA promotion to patients increased after the teaching ( $p < 0.001$ ). More students were able to correctly identify the Chief Medical Officer recommended adult PA guidelines ( $p < 0.05$ ). Students were enthusiastic about the exercise medicine teaching, strongly supportive of its continued inclusion in the curriculum and advocated its importance for patients and themselves as future doctors.

**CONCLUSIONS:** Behaviour change teaching successfully improved students' knowledge of and confidence regarding PA promotion. These improvements are a step forward and may increase rates and success of physician PA counselling in the future.

OP-03-02

**EVALUATION OF THE GENERAL PRACTITIONER PHYSICAL ACTIVITY PRESCRIPTION IN THE CENTRE REGION**

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**KEYWORDS:** sedentary lifestyle, prescription of physical activity, general practitioners, physical activity professionals.

**CONTEXT:** In a development of the industrialization and urbanization context, world population does less and less physical effort. This new behavior called sedentary lifestyle emerges with chronic diseases, premature deaths, growing disabilities and increasing of health expenditure. By reducing this sedentary lifestyle and increasing world population level of physical activity (PA), public authority hopes to reverse this tendency. Recommendations have been introduced. The general practitioner is one of the main players promoting health through physical activity. Currently, in France, their prescription is rare and hardly efficient.

**GOAL:** The Médecine du Sport Centre Val de Loire Regional Corporation conducted a survey to evaluate the general practitioner physical activity prescription in the Centre region in order to meet their expectations regarding valuable support that would be helpful to bring up.

**PROCESS:** Questionnaire was sent to liberal general practitioners in Centre region. 397 answered back. The questionnaire was coded and results analyzed. Cross-referring and statistical analyses were conducted using SAS® v9.3 software.

**RESULTS:** 24% of the doctors responded to this survey. 65% claim to use regular PA and 28% have a training in sport medicine. Doctors inform and advise patients on the practice of physical activity. Sport medicine trained doctors who use regular PA, prescribe it often to very often. 23% of doctors surveyed carry out a personalized prescription. 97.48% of these doctors recommend their patients to walk 30 minutes a day and 4.28% use a pedometer. 61.21% of doctors do not recommend regular PA to their patients because of a lack of motivation and their observance, and 31.74% because of lack of time. 47% of the surveyed doctors, especially the youngest would like to collaborate with PA experts in order to improve this prescription.

**CONCLUSION:** Doctors carry out very few personalized PA prescriptions. And when they do, medical monitoring remains perfunctory. The efforts to remove barriers to PA prescription are not sufficiently supported. The most interested doctors in that PA prescription are these who claim to practice regularly physical activity and who are fully trained in sport medicine. Doctors, the youngest in particular, are willing to collaborate with PA experts in order to improve the prescription.

### OP-03-03

## INFLUENCE OF WHOLE BODY VIBRATION TRAINING ON MOTOR ABILITIES IN ELDERLY PEOPLE

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**INTRODUCTION:** Whole Body Vibration (WBV) training is now widely used in the training of athletes, at the same time a major problem of today's health care is prevention of risk of falls in the elderly. Due to the positive effects of WBV training in athletes, researchers are increasingly examining the effects of WBV training in elderly. Thus, the aim of this study is to examine the effect of WBV training on the motor abilities of the elderly.

**SUBJECTS AND METHODS:** This study included 42 subjects, who were divided in 3 groups. Group A had 16 subjects (70.4 ± 3.2 years old) who exercised on vibration platform, Group B was placebo group, it had 13 subjects (69.1 ± 2.8 years old), they exercised on vibration platform but without vibrations, and Group C was control group with 13 subjects (69.1 ± 3.4) who didn't exercised at all. Exercise protocol lasted 10 weeks, 3 times a week for 40 minutes. It consisted of exercises for the upper and lower limbs and the torso exercises. All subjects were tested 48 hours before and 72 hours after the exercise program.

For assessment of motor abilities next tests were used: flexibility – sit and reach test, trunk rotation test and shoulder flexibility test; balance – star excursion balance test (SEBT); strength – chair stand up test for 30 seconds, arm curl test with 4kg for 30 seconds and agility – 8 foot up and go test.

**RESULTS:** Results shows that subjects from Group A are significantly better on final testing in flexibility - sit and reach test ( $p = 0.021$ ), balance – SEBT test ( $p = 0.014$ ), strength – chair stand up test ( $p = 0.041$ ) than on initial testing. Group A subjects after exercise protocol had significantly better results than Group B subjects in strength - lower extremity test ( $p = 0.043$ ) and agility test ( $p = 0.047$ ). Same subjects had significantly better results in final testing in comparison with Group C subjects in all tests except in flexibility – trunk rotation ( $p = 0.067$ ) and shoulder flexibility ( $p = 0.072$ )

**DISCUSSION:** From the results of this research it can be concluded that WBV training may have significant role in training of elderly people. Particularly important in this study is that group of subjects who had trained WBV protocol have significantly better results than subjects from Group B in balance and lower limbs strength tests, and that besides those two abilities subjects from Group A had also significantly better SEBT test results after exercise program than subjects from Group C, because quality of those abilities is by literature closely connected with risk of falling in elderly.

#### OP-03-04

### EFFECTS OF A SHORT-TERM PERSONALIZED INTERMITTENT WORK EXERCISE PROGRAM (IWEP) ON MAXIMAL CARDIO-RESPIRATORY FUNCTION AND ENDURANCE PARAMETERS AMONG HEALTHY YOUNG AND OLDER SENIORS

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**OBJECTIVE:** The aim of this study was to evaluate the efficiency of a short-term Intermittent Work Exercise Program (IWEP) among healthy elderly subjects.

**STUDY DESIGN AND SETTING:** This longitudinal prospective study took place at the Strasbourg University Hospital geriatric department.

**STUDY PARTICIPANTS:** One hundred and fifty older volunteers, previously determined as being free from cardiac and pulmonary disease, were separated into two age groups: the "young senior" ( $60.2 \pm 3.1$  yr) and the "older senior" groups ( $70.8 \pm 5.2$  yr). These groups were then subdivided by gender into the "young female senior", "young male senior", "older female senior" and "older male senior" groups.

**INTERVENTION:** Before and after the IWEP, all subjects were asked to perform an incremental cycle exercise to obtain their first ventilatory threshold (VT1), maximal tolerated power (MTP), peak oxygen uptake ( $O_2$ peak) and maximal minute ventilation (MM). The IWEP consisted of a 30-min cycling exercise which took place twice a week, and was divided into six 5-min stages consisting of 4 min at VT1 intensity and 1 min at 90% MTP.

**MEASUREMENTS:** An assessment was made of the effects of the IWEP on maximal cardio-respiratory function (MTP,  $O_2$ peak, MM) and endurance parameters (VT1, heart rate [HR] measured at pre-training VT1 and lactate concentrations at pre-training MTP). **RESULTS:** This short-term training program resulted in a significant increase of MTP (from 13.2% to 20.6%),  $O_2$ peak (from 8.9% to 16.6%) and MM (from 11.1% to 21.8%) in all groups ( $p < 0.05$ ). VT1 improved from 21% at pre-training to 27%, while HR at pre-training VT1 as well as lactate concentrations at pre-training MTP decreased significantly in all groups

( $p < 0.05$ ). The post-training values for  $\dot{V}O_{2peak}$  and MM of the "older seniors" were not significantly different ( $p > 0.05$ ) from the "young seniors" pre-training values for the same parameters.

**CONCLUSION:** The most striking finding in this study is that after only 9 weeks, our short-term "individually-tailored" IWEF significantly improved both maximal cardio-respiratory function and endurance parameters in healthy, previously untrained seniors.

**KEYWORDS:** Older subjects, physical activity, fitness, intermittent, training

### OP-03-05

## DIFFERENT MYOELECTRIC MANIFESTATIONS OF FATIGUE IN AMBULATORY MUSCLES OF COPD PATIENTS VS. HEALTHY MALE SUBJECTS

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**BACKGROUND:** Muscle wasting is a common extrapulmonary manifestation in Chronic Obstructive Pulmonary Disease (COPD) patients across all disease stages (Seymour et al. 2010). Peripheral COPD muscle dysfunction is characterized by several metabolic, morphologic and structural muscle abnormalities leading to a significant reduction of ambulatory muscles' performances compared with healthy subjects (Donaldson et al. 2012).

**AIMS:** The aim of the study is to assess quadriceps' myoelectric activation and manifestation of fatigue in COPD patients compared to healthy controls (HC).

**METHODS:** Fifteen COPD males patients ( $67 \pm 5$  years, FEV1  $59.29 \pm 18.49$ , FEV1/FVC  $56.31 \pm 13.53$ , BMI  $28.14 \pm 4.26$ ) and 15 males HC ( $65 \pm 4$  years, FEV1  $113.88 \pm 17.70$ , FEV1/FVC  $102.73 \pm 6.16$ , BMI  $26.56 \pm 2.58$ ) performed tasks position (60deg, 0deg= full extension) at 30%, 50% and 70% of knee extension maximal voluntary contraction (MVC). Initial values and rate of change conduction velocity (CV) were estimated recording surface EMG signals (sEMG) from vastus lateralis (VL) and vastus medialis (VM) muscles of dominant limb, using eight electrodes arrays (5 mm interelectrode distance). Two way ANOVA (group X muscle) was used to relieve changes in rate of change of CV. Finally, Pearson coefficient was used to calculate correlation among dependent and independent parameters.

**RESULTS:** No significant two way interaction was observed in CV rate of change. One way analysis showed CV greater normalized rate of change in severe to very severe COPD patients ( $n=7$ ; FEV1  $44.50 \pm 15.17$ ; FEV1/FVC  $46.2 \pm 12.49$ ) than HC, both in VM (COPD:  $-0.48$  %/s; HC:  $-0.27$  %/s;  $p=0.01$ ) and VL (COPD:  $-0.63$  %/s; HC:  $-0.25$  %/s;  $p=0.03$ ). Significant correlation was found between FEV1 and CV normalized rate of change in both muscles ( $p < 0.01$ ). Same result was observed considering FEV1/FVC ( $p < 0.05$ ).

**DISCUSSION:** Considered the impact of muscle wasting in COPD patients lower limb performances, our analysis of CV normalized rate of change showed higher myoelectric fatigability in ambulatory muscles. Such results were compatible with type II fibres shifting and/or atrophy of type I fibres, as described in the COPD specific literature (Kim et al. 2008). Therefore, our study confirmed the capability of sEMG to assess different neuromuscular recruitment in COPD. Finally, to our knowledge, no other studies were conducted using sEMG in this research field.

**REFERENCES:**

1. Seymour, J.M. et al., 2010. The prevalence of quadriceps weakness in COPD and the relationship with disease severity. *The European Respiratory Journal*, 36 (1), pp.81–88.
2. Donaldson, A.V. et al., 2012. Muscle function in COPD: a complex interplay. *International Journal of Chronic Obstructive Pulmonary Disease*, 7, pp.523–35.
3. Kim, H.C. et al., 2008. Skeletal muscle dysfunction in patients with chronic obstructive pulmonary disease. *International Journal of Chronic Obstructive Pulmonary Disease*, 3(4), pp.637–658.

**OP-03-06****INFLUENCE OF PHYSICAL ACTIVITY ON RECURRENCE AND SURVIVAL OF COLORECTAL CANCER PATIENTS**

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**BACKGROUND:** Colorectal cancer (CRC) predominates in developed countries among sedentary populations. A meta-analysis (MA) showed that physical activity (PA) decreased the incidence of new cases of CRC. The impact of PA on recurrence and mortality of non-metastatic CRC patients is still controversial.

**METHODS:** We performed a literature-based meta-analysis of all published observational studies, using the following keywords (colorectal cancer, physical activity, survival) in PubMed and EMBASE. We searched for a dedicated MA in the Cochrane Library (none found). We cross-checked all references. Pre- and post-diagnostic PA levels were assessed with MET (Metabolic Equivalent Task). Usually, high PA levels corresponded to >17 MET hours/week. Overall survival (OS) and cancer-specific survival (CSS) were assessed by means of Hazard Ratios (HRs) with their 95 % Confidence Interval (CI). We pooled adjusted HRs since the variables of adjustment were almost identical between studies (age, sex, BMI, tobacco use, alcohol and red meat consumptions) and since, rather curiously, the adjusted values were more conservative than raw HRs. By convention, when higher PA levels were associated to an improved survival compared with lower PA levels, HRs for detrimental events were <1. We used EasyMA software. We used fixed effect model whenever possible and random effect model only in case of between-study heterogeneity.

**RESULTS:** Eight studies (11298 participants) published from 2006 to 2013 met the inclusion criteria, representing 3110 males and 3710 females, 3072 colon and 1318 rectum cancers. Mean age was 67 years (range 21-82 years). HR CSS for post-diagnostic PA (higher PA level vs. lower) was 0.61 (CI: 0.44-0.86; random effect model). The corresponding HR for OS was 0.62 (CI: 0.54-0.71). HR CSS for pre-diagnostic PA was 0.80 (CI: 0.69-0.92). The corresponding HR for OS was 0.74 (CI: 0.63-0.86).

**CONCLUSIONS:** This MA is the first to show that higher PA levels are associated with a better CSS, suggesting that sustained PA should be advised for non-metastatic CRC patients. OS also significantly improved, not surprisingly since PA should reduce risk of cardio-vascular events. These findings should be tempered by the rather small number of studies included.

Thursday, September 26, 2013

## ORAL PAPERS OP4 – LOWER LIMB TRAUMATOLOGY

### OP-04-01

#### EPIDÉMIOLOGIE DES ACCIDENTS LORS DE LA PRATIQUE DE L'ESCALADE EN FRANCE DE 2004 À 2011

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**OBJECTIFS:** Etat des lieux de l'accidentologie liée à l'escalade en France entre 2004 et 2011. Proposer un délai moyen de reprise de ce sport après les principaux traumatismes recensés.

**PATIENTS ET MÉTHODES:** Etude épidémiologique rétrospective des déclarations d'accidents d'escalade recensées par la Fédération Française de Montagne et d'Escalade de 2004 à 2011. Inclusion de tous les licenciés de cette fédération, pratiquant l'escalade en sites naturels et artificiels.

**RÉSULTATS:** 1128 accidents ont été recensés en huit ans, avec un taux moyen de blessure de 1,49 pour 1000 heures de pratique. Le pourcentage de grimpeurs accidentés par an était de 0,35% chez les femmes et 0,27% chez les hommes. Durant cette période, les grimpeurs ayant eu un accident étaient âgés de 6 à 75 ans. Ceux âgés de 19 à 30 ans ont présenté le taux le plus élevé d'accidents (0,37% par an). Les traumatismes les plus fréquents étaient les fractures et les entorses (respectivement 39% et 25% pour les hommes, 30% et 34% pour les femmes). Les blessures en Structure Artificielle étaient surtout des entorses (34%, n=242) et des fractures (31%, n=218), et en Sites Naturels des fractures (42%, n=190) et contusions et plaies (24%, n=109). En escalade encordée on observait principalement des fractures (31%, n=234), puis des contusions et plaies (27%, n=204), alors qu'en bloc il y avait 50% d'entorses (n=146) et 31% de fractures (n=91).

Faute de recommandations, les grimpeurs reprennent souvent trop précocement l'escalade. Nous proposons des délais moyens de reprise après les principaux traumatismes recensés, qui intègrent les contraintes biomécaniques spécifiques à ce sport. Ces délais donnent une indication sur la période d'indisponibilité après chaque traumatisme, à pondérer au cas par cas en fonction des complications éventuelles et de la récupération fonctionnelle.

**CONCLUSION:** La faible incidence des lésions traumatiques lors de la pratique de l'escalade remet en cause sa classification dans les sports à risque, comme le sont le rugby, le football ou le handball par exemple. Cela ne doit pas empêcher un renforcement de la prévention afin de diminuer le nombre et la gravité des accidents.

## OP-04-02

**ANALYSE VIDÉO DES RUPTURES DU LCAE DU JOUEUR DE RUGBY PROFESSIONNEL EN FRANCE**Y. BOHU<sup>1,2,3,4</sup>, B. DUSFOUR<sup>4</sup>, P. DECQ<sup>5</sup>, N. LEFEVRE, S. HERMAN, J.C. PEYRIN<sup>6</sup><sup>1</sup>Institut de l'Appareil Locomoteur Nollet, Paris, FRANCE<sup>2</sup>Clinique du Sport Paris V, Paris, FRANCE<sup>3</sup>Racing-Metro 92, Paris, FRANCE<sup>4</sup>Ligue Nationale de Rugby, Paris, FRANCE<sup>5</sup>Hôpital Beaujon, Arts et Métier Paristech, Université Paris 7, Paris, FRANCE<sup>6</sup>Fédération Française de Rugby, Paris, FRANCE

**INTRODUCTION:** La prévention du risque de rupture du LCAE nécessite une analyse de la survenue de la blessure. La description de l'accident au moyen de l'analyse vidéo est un moyen performant d'appréciation. Nous présentons la 1ère étude vidéo d'analyse des ruptures du LCAE au cours de la pratique du rugby. Cette blessure est la 1ère cause de longue durée d'indisponibilité.

**MATÉRIEL ET MÉTHODES:** Entre le 14 août 2012 et le 1er juin 2013, correspondant à la saison 2012 2013 du championnat de rugby professionnel du Top 14 de première division, un groupe d'étude épidémiologique a observé 175 matchs. L'étude a été soumise à la CNIL. 14 équipes professionnelles avec 490 joueurs ont été engagées dans la compétition. 587 blessures sont survenues dont 143 ont entraîné une sortie définitive. Chaque blessure a fait l'objet d'un extrait filmé. Cet extrait a été envoyé au médecin du club du joueur concerné qui a confirmé le diagnostic.

**RÉSULTATS:** Lors de cette période, 9 ruptures du LCAE ont été diagnostiquées. 5 joueurs évoluent au poste d'arrières et 4 au poste d'avant, toutes les blessures ont eu lieu sur des contacts : soit avec un partenaire, soit avec un adversaire. Les blessures ont toutes eu lieu sur la phase de plaquage. Une seule blessure était suite à une faute de jeu de l'adversaire. Le mécanisme était une flexion, valgus et rotation interne dans les 9 cas. Dans 3 cas, le joueur venait de recevoir le ballon est effectué une reprise d'appui.

**CONCLUSION:** L'analyse vidéo des ruptures du croisé antérieur du genou montre que la phase de vulnérabilité est le plaquage. On pourrait proposer une prévention avec une adaptation de la phase de plaquage pour protéger le genou du joueur.

## OP-04-03

**FAUT-IL ORGANISER UN DÉPISTAGE SYSTÉMATIQUE DES LAXITÉS ANTÉRIEURES DE GENOU CHEZ LES SPORTIFS DE HAUT NIVEAU ? ETUDE PROSPECTIVE DANS UN CENTRE DE FORMATION DE FOOTBALL PROFESSIONNEL**N. LEFEVRE<sup>1,2</sup>, S. CASCUA<sup>3</sup>, Y. BOHU<sup>1,2</sup>, S. KLOUCHE<sup>1,2</sup>, S. HERMAN<sup>1,2</sup><sup>1</sup>Institut de l'Appareil Locomoteur Nollet, Paris, FRANCE<sup>2</sup>Clinique du Sport Paris V, Paris, FRANCE<sup>3</sup>Centre de Traumatologie du Sport de la Défense, Puteaux, FRANCE

**INTRODUCTION:** La rupture du ligament croisé antérieur (LCA) est un accident sportif grave et fréquent du jeune joueur de football. L'hyperlaxité du genou est un facteur de risque reconnu de rupture. L'objectif principal de l'étude était d'évaluer l'intérêt d'une évaluation quantitative objective systématique de la laxité différentielle en pré-saison chez le sportif de haut niveau.

**MATÉRIEL ET MÉTHODES:** En début de saison 2011/2012, une étude prospective a inclus l'ensemble des

61 jeunes footballeurs d'un centre de formation classé par la Fédération Française de Football en catégorie 1 classe A. Les critères d'exclusion étaient un antécédent de lésions ligamentaires, cartilagineuses ou méniscales des genoux. Lors de la visite médicale pré-saison, le bilan habituel a été complété par une mesure comparative de laxité des deux genoux avec le système GNRB®. Toutes les mesures ont été effectuées par un même opérateur expérimenté. Selon la littérature, le seuil pathologique de laxité différentielle au GNRB® 250 N est de 1,5 mm. Tous les joueurs ont suivi le même programme sportif (7 entraînements par semaine et un match) et le même protocole préventif (une préparation physique intégrée comprenant un travail de coordination, un entraînement cardiovasculaire et un renforcement musculaire global). Le critère principal de jugement était la survenue d'une rupture du LCA. Sept joueurs ont été exclus en raison d'antécédents chirurgicaux d'un des deux genoux. L'étude a inclus 54 garçons, âgés de 15 à 19 ans.

**RÉSULTATS:** La laxité différentielle moyenne au GNRB® 250 N était de  $0,8 \pm 0,6$  mm. Six joueurs (11,1%) présentaient une laxité différentielle pathologique, en moyenne  $2,1 \pm 0,6$  mm, sans hyperlaxité clinique. Deux patients présentant une laxité de 3,2 et 2,4 mm ont bénéficié d'une IRM qui était normale. Une seule rupture du LCA est survenue en fin de saison suite à un choc direct sévère chez un joueur sans anomalie mesurée au GNRB®. D'autres lésions ont également été notées, 5 lésions méniscales et 2 lésions cartilagineuses, mais aucune chez les joueurs ayant une laxité différentielle pathologique.

**CONCLUSION:** La mesure objective au GNRB® de la laximétrie différentielle des genoux d'une population de sportifs de haut niveau a montré une laxité anormale chez 11% d'entre eux. Cependant, le faible nombre de patients ne permet pas de conclure sur l'intérêt du dépistage systématique de ces joueurs en début de saison comme facteur de risque de rupture du LCAE. Une étude prospective sur une plus grande cohorte et sur plusieurs saisons sportives devra être menée.

#### OP-04-04

### CRITÈRES DE RETOUR SUR LE TERRAIN APRÈS PLASTIE LCA CHEZ LE FOOTBALLEUR PROFESSIONNEL

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**INTRODUCTION:** Après plastie du LCA, la reprise sportive représente un moment attendu mais délicat. L'expérience clinique révèle, lors du retour sur le terrain, des cas de nouvelles lésions ainsi que la difficulté parfois de retrouver le niveau de performance antérieur. La décision d'autoriser un athlète à reprendre entraînements et compétitions devrait donc se fonder sur des critères objectifs. Des travaux scientifiques récents ont abordé la thématique et proposé des pistes de réflexion intéressantes (1,2).

**MATÉRIEL UTILISÉ ET MÉTHODES:** Afin de mieux percevoir les critères utilisés en pratique sur le plan décisionnel, nous avons interrogé 37 médecins responsables de clubs professionnels de football (Ligue 1 française, n = 15; Ligue 2 française, n = 14; division 1 belge, n = 8; expérience moyenne du médecin dans le football professionnel :  $12 \pm 6$  ans). Un questionnaire à réponses fermées, portant sur les critères qu'ils utilisent en pratique quotidienne en vue d'autoriser un footballeur ayant subi une ligamentoplastie du LCA à reprendre l'activité compétitive, a été proposé.

**RÉSULTATS:** L'analyse des résultats situe les critères les plus pertinents selon ces médecins, par ordre d'importance:

1. Stabilité du genou lors de gestes spécifiques,
2. Force musculaire (isocinétisme sur quadriceps et ischio-jambiers + + +)
3. Amplitudes articulaires de flexion / extension acceptables,
4. Sensations subjectives du joueur,
5. Disparition totale des douleurs,
6. Absence de laxité du genou.

Une difficulté semble porter sur l'utilisation de valeurs limites pour guider le choix de reprise. En ce qui concerne l'évaluation isocinétique, il ne semble pas y avoir de consensus quant aux modalités du test ni concernant les limites tolérées pour un déficit.

D'autres critères, tels que le respect d'une durée théorique d'arrêt compétitif, l'analyse de la course ou l'imagerie médicale, apparaissent moins utilisés. Par ailleurs, la prise en compte de l'avis de certains intervenants semble essentielle, particulièrement le kinésithérapeute (97%) et le préparateur physique (91%). L'opinion de l'entraîneur principal de terrain n'est par contre pas prise en compte par la majorité des médecins interrogés (40%).

**CONCLUSION:** Après chirurgie LCA, les médecins de clubs professionnels de football ne semblent pas baser leur décision d'autoriser le retour compétitif uniquement sur une durée théorique postopératoire mais plutôt selon différents critères tels la stabilité dynamique du genou ou la force musculaire. Néanmoins, la mise au point d'une check-list précise reprenant ces critères et les limites de normalité pourrait contribuer à la prévention de récurrence lésionnelle et à optimiser les performances de terrain.

#### RÉFÉRENCES:

1. Kvist J. Rehabilitation following anterior cruciate ligament reconstruction. Current recommendations for sports participation. *Sports Med* 2004;34:269-280.
2. Cascio BM et al. Return to play after anterior cruciate ligament reconstruction. *Clin Sports Med* 2004;23:395-408.

**MOTS CLÉS:** plastie LCA, critères de retour sur le terrain, questionnaire, football, rééducation

#### OP-04-05

### REPRISE DU SPORT APRÈS LIGAMENTOPLASTIE DU LIGAMENT CROISÉ ANTÉRIEUR DU GENOU: VALIDATION TRANSCULTURELLE EN FRANÇAIS D'UNE ÉCHELLE DE MESURE DE L'IMPACT PSYCHOLOGIQUE DU RETOUR AU SPORT, L'ACL-RSI

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**INTRODUCTION:** Des études ont montré que de nombreux patients ne reprenaient pas leurs activités sportives au même niveau après reconstruction chirurgicale du ligament croisé antérieur (LCA) malgré d'excellents résultats objectifs. Une équipe australienne a développé et validé en anglais une échelle à 12 items, l'ACL-RSI, qui évalue l'impact psychologique du retour au sport dans cette population. L'objectif principal de l'étude était de traduire, d'adapter et de valider cette échelle en français.

**MATÉRIEL ET MÉTHODES:** Après accord des auteurs du questionnaire, l'échelle a été traduite par deux orthopédistes et un médecin bilingues puis rétro-traduite en anglais par deux traducteurs natifs ne connaissant pas la version originale. Une réunion d'harmonisation a permis de retenir une version bêta qui fut testée par

10 sportifs opérés d'une rupture de LCA et tirés au sort, puis adaptée aux remarques de la population test. La version finale a ensuite été validée selon la méthodologie internationale COSMIN (CONsensus based Standards for the selection of health status Measurement Instruments). Une étude prospective menée en 2012 par trois chirurgiens a inclus l'ensemble de leurs patients sportifs opérés d'une rupture du LCA ainsi qu'une population témoin constituée de sportifs sans antécédents de traumatisme du genou. Les échelles utilisées comme questionnaires de référence étaient le KOOS et l'IKDC objectif. Les patients ont rempli les trois questionnaires lors de la consultation postopératoire à 6 mois effectuée par le chirurgien. L'échelle ACL-RSI a été renseignée deux fois à 3-4 jours d'intervalle. Des tests statistiques ont évalué: la validité de construit par un test de corrélation de Pearson, la validité discriminante par un test t de Student, la cohérence interne par le coefficient alpha de Cronbach, la fiabilité par le coefficient de corrélation intra-classe et la faisabilité par le pourcentage de réponses manquantes et le temps de remplissage.

**RÉSULTATS:** Pendant cette période, 100 patients opérés d'une rupture du LCA et 100 patients sains ont été inclus. Le score ACL-RSI des patients était fortement corrélé au score KOOS et IKDC subjectif. La moyenne des scores était significativement différente entre les deux populations ( $p < 0,05$ ). La cohérence interne de l'échelle était élevée ( $\alpha > 0,9$ ). La reproductibilité du test-retest était excellente. Le temps de remplissage était de 1 à 3 mn et tous les items étaient renseignés.

**CONCLUSION:** La version française de l'ACL-RSI est une échelle valide, reproductible, sensible au changement et comparable à la version anglaise.

#### OP-04-06

### TRAITEMENT DES TENDINOPATHIES ROTULIENNES CHRONIQUES CHEZ LES SPORTIFS DE HAUT DE NIVEAU PAR INJECTIONS SOUS ÉCHOGRAPHIE DE PLASMA RICHE EN PLAQUETTES. ÉTUDE DE COHORTE PROSPECTIVE

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**INTRODUCTION:** La tendinopathie rotulienne est une pathologie fréquente des sportifs sollicitant leur genou en extension et pour l'accélération. Cette affection est souvent réfractaire au traitement conventionnel.

L'objectif de notre étude est d'évaluer les résultats cliniques et cicatriciels après injections de plasma riche en plaquettes (PRP) sous contrôle échographique chez des athlètes souffrant de tendinopathie rotulienne chronique.

**MÉTHODES:** Il s'agit d'une étude de cohorte prospective ayant inclus 32 genoux chez 28 athlètes dont 17 pratiquaient un sport de niveau international souffrant d'une tendinopathie rotulienne chronique évolutive depuis 18.5 mois en moyenne et réfractaire au traitement conservateur. Ces patients ont été prospectivement inclus après un bilan clinique et IRM, pour recevoir un traitement par injection de PRP en intra-lésionnel sous contrôle échographique. Le protocole comprenait 3 injections avec une semaine d'intervalle, en fonction de l'évolution cicatricielle une ou deux injections supplémentaires étaient réalisés. Un protocole de rééducation en excentrique a été systématiquement réalisé par tous les patients.

L'évaluation fonctionnelle des patients avant et après la procédure était réalisée par le Victorian Institute of Sport Assessment-Patella (VISA-P) score, une échelle visuelle analogique (VAS) pour la douleur et le score de Lysholm genou.

L'évaluation de la cicatrization du tendon était faite par IRM à 1 et à 3 mois après la procédure.

Une analyse statistique descriptive et analytique multi-variée a été réalisée.

**RÉSULTATS:** Après 3 injections échoguidées de PRP en moyenne (3 à 6 injections), tous les scores cliniques avaient significativement progressé au recul de 2 ans. Le VISA-P moyen, la VAS moyenne, le Lysholm genou

moyen étaient tous significativement améliorés, de 39 à 93, de 6 à 0.8 et de 60 à 96 respectivement. 21 des 28 (75%) athlètes avaient retrouvé leur sport initial au même niveau à 3,5 mois en moyenne (2 à 6 mois). Le contrôle IRM avait objectivé une intégrité de la structure du tendon rotulien à 3 mois après la fin de la procédure.

Aucun facteur prédictif fonctionnel ou cicatriciel n'a été retrouvé sur le plan statistique.

**CONCLUSION:** Les injections échoguidées multiples de PRP ont amélioré significativement les symptômes cliniques et la fonction des athlètes de haut niveau souffrant de tendinopathie rotulienne chronique réfractaire au traitement conventionnel et leur ont permis un retour rapide à leur niveau sportif pré-lésionnel.

## OP-04-06 – ENGLISH VERSION

### ARE MULTIPLE PLATELET-RICH PLASMA INJECTIONS USEFUL FOR TREATMENT OF CHRONIC PATELLAR TENDINOPATHY IN ATHLETES? A PROSPECTIVE COHORT STUDY

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**PURPOSE:** To evaluate clinical and radiological outcomes of multiple ultrasound guided Platelet-rich plasma injections for the treatment of chronic patellar tendinopathy in athletes.

**STUDY DESIGN:** Prospective case series.

**METHODS:** Thirty-two knees in 28 athletes, 17 of whom were international professional with chronic patellar tendinopathy refractory to conservative management were prospectively included for ultrasound guided Platelet-rich plasma (PRP) injections into the site of patellar tendinosis. This procedure was repeated 3 times with one week as interval between injection. Victorian Institute of Sport Assessment-Patella (VISA-P) score, visual analogue scales (VAS) for pain and Lysholm knee scale were used for pre- and post-procedure clinical evaluation for all patients. The repair of the tendon was assessed with magnetic resonance imaging (MRI) at 1 and 3 months post-procedure.

**RESULTS:** After a mean of 3 (3 to 6) ultrasound guided injection of PRP, VISA-P, VAS, and Lysholm scores all significantly improved at 2 years follow-up. The average pre-procedure VISA-P, VAS and Lysholm scores improved from 39 to 93, from 6 to 0.8, and from 60 to 96 at 2 years follow-up respectively. Twenty-one of the 28 athletes (75%) returned to their presymptom sporting level at 3.5 months (range 2 to 6 months) post-procedure. Follow-up MRI assessment showed improved structural integrity of the tendon at 3 months post-procedure.

**CONCLUSION:** Multiple ultrasound guided PRP injections showed significant improvement in symptoms and functions in athletes with chronic patellar tendinopathy and allowed fast recovery to their presymptom sporting level.

**KEYWORDS:** Patellar tendinopathy; jumper's knee; platelet-rich plasma; treatment

**WHAT IS KNOWN ABOUT THE SUBJECT:** Patellar tendinopathy is the most common injury in sports characterized by high demands on speed and power for the leg extensors. It is often refractory to treatment.

**WHAT THIS STUDY ADDS:** This study shows improved clinical and radiological outcomes in athletes, after a mean of 3 scheduled ultrasound guided PRP injections at 2 years follow-up.

This procedure allowed athletes to recover their presymptom sporting level at a mean of 3.5 months.

## Friday, September 27, 2013

### ORAL PAPERS OP5 – PHYSICAL ACTIVITY AND HEALTH-2

#### OP-05-01

#### PREVALENCE AND TRENDS OF OVERWEIGHT AND OBESITY IN 6-18 YEAR OLD ITALIAN ATHLETES: VARIATION FROM 2007 TO 2012

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**OBJECTIVE:** To provide current estimates of the prevalence and trends of overweight and obesity in Italian children and adolescents who play sports.

**RESEARCH, METHODS AND PROCEDURES:** This was a study of 2344 athletes (M/F:1682/662) aged 6 to 18 years. Height and weight were measured in a Sport Medicine Clinics in 2007 (1017 subject, 69.5% male) and 2012 (1327 subject, 73.5% male). To classify the athletes were used the International Obesity TaskForce cut-offs (IOTF)1-2. The IOTF classify BMI in children as thin, normal weight, overweight or obese, depending on the child's age and sex, based on adult BMI cut-offs at 18 years. Normal weight or thin for BMI range at 18y <25, overweight for BMI range at 18y from 25 to 30 and obesity for BMI range at 18y >30. The data of 2006 was compared with data of 2011. A probability level of  $p < 0.05$  was used to indicate statistical significance.

**RESULTS:** The prevalence of overweight in 2006 was 22.5% (159) in male and 16.1% (50) in female. The prevalence of obesity in 2006 was 3.4% (24) in male and 2.6% (8) in female.

The prevalence of overweight in 2011 was 24.2% (236) in male and 16.5% (58) in female. The prevalence of obesity in 2011 was 5.8% (57) in male and 3.7% (13) in female (Tab. 1).

We observed an increase of overweight of 1.7% in male ( $\chi^2$  Yates corrected=1.12;  $p=0.2909$ ; odds ratio=1.14) and of 0.4% in female ( $\chi^2$  Yates corrected=0.17;  $p=0.6775$ ; odds ratio=0.89); an increase of obesity of 2.4% in male ( $\chi^2$  Yates corrected=5.38;  $p=0.0204$ ; odds ratio=1.82) and 1,1% in female ( $\chi^2$  Yates corrected=0.30;  $p=0.5825$ ; odds ratio=1.42) (Tab. 2).

**Tab 1. Prevalence of overweight and obesity by years and sex, % (number of observation).**

	2006		2011	
	Male (n=707)	Female (n=310)	Male (n=975)	Female (n=352)
<b>Normal weight</b>	74.1% (524)	81.3% (252)	69.9% (682)	79.8% (281)
<b>Overweight</b>	22.5% (159)	16.1% (50)	24.2% (236)	16.5% (58)
<b>Obesity</b>	3,4% (24)	2.6% (8)	5.8% (57)	3.7% (13)

**Tab 2. Trends of overweight and obesity by sex between 2006 and 2011.**

	Male	Female
<b>Overweight</b>	+1.7 % ( $p=0.290$ )	+0.4% ( $p=0.677$ )
<b>Obesity</b>	+2,4% ( $p=0.020$ )	+1.1% ( $p=0.582$ )

**CONCLUSIONS:** The prevalence of obesity increased significantly in male.

Overweight and obesity are still growing and continue to be a leading public health concern in Italy.

The health strategies implemented were not enough to arrest this continual increase of childhood obesity.

**REFERENCES:**

1. Cole TJ, Bellizzi MC, Flegal KM and Dietz WH. Establishing a standard definition for child overweight and obesity worldwide: International survey. *BMJ* 2000;320:1240-3.
2. Cole TJ, Flegal KM, Nicholls D, Jackson AA. Body mass index cut-offs to define thinness in children and adolescents. *BMJ* 2007;335:194-7.

**OP-05-02**

**EFFECTS OF REGULAR AEROBIC EXERCISE ON CERTAIN OXIDANT AND ANTIOXIDANT PARAMETERS IN TYPE 2 DIABETES MELLITUS PATIENTS**

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**INTRODUCTION:** Diabetes Mellitus (DM) is characterized by insufficient blood glucose control. It is known that the oxidative stress caused by the disease has a role in developing micro and macrovascular complications (1). In our study, we aimed to observe the response of oxidant and antioxidant featured parameters such as Ferric Reducing Ability of Plasma (FRAP), Advanced Oxidation Protein Products (AOPP), Malondialdehyde (MDA) and Sialic Acid (SA) on a single bout of intensive exercise and also on regular aerobic exercise program.

**METHODS:** 31 Type 2 DM patients (HbA1C values between 7,5mg/dl and 9,5mg/dl) were included. A metabolic test was conducted and personal aerobic exercise program (3days/week/12 weeks) was determined upon the heart rate corresponding the anaerobic treshold level measured with gas analyses during the test. Blood samples were collected before and after the Cardiopulmonary Exercise Test (CPET) which was done before the patients start the exercise program and once again after they finish. AOPP, SA and MDA was measured as oxidative stress markers and FRAP was measured as total antioxidant capacity. A "Paired Samples t-test" was used for inter-group comparisons in a package program SPSS 13.0.comparisons in a package program SPSS 13.0.

**RESULTS AND CONCLUSIONS:** In CPET before the exercise program, AOPP ( $p<0,001$ ), FRAP ( $p<0,05$ ) and SA ( $p<0,05$ ) levels increased significantly compared with their basal values after the intensive exercise. When basal values were compared before and after the exercise program, only SA values showed significant increase ( $p<0,01$ ). In statistical analysis of MDA values, we observed significant increase in the values

obtained after CPET, before and after the exercise program. In literature, studies suggest that acute exercise increases the oxidative stress, whereas a regular exercise program –with an adaptation of antioxidant defence system – decreases this stress (2). In this concept, regarding that acute exercise might be a source of oxidative stress, increased response of AOPP and SA to exercise seems reasonable. While SA level raises with antioxidant enzymes that emerges as a result of oxidation increase, it also shows a defensive character with the features of scavenging H<sub>2</sub>O<sub>2</sub> ve OH radicals (3). Therefore we can say that the increase in SA in our study after regular exercise can be considered as an adaptive response to the exercise program applied. We also think that the increase in FRAP levels observed is a compensatory response to oxidative processes during acute exercise.

**KEYWORDS:** exercise, oxidative stress, Diabetes Mellitus, FRAP, AOPP, Sialic acid

#### REFERENCES

1. Lodovici M, Giovannelli L, Pitozzi V, Bigagli E., Bardini G., Rotella CM. (2008). Oxidative DNA damage and plasma antioxidant capacity in type 2 diabetic patients with good and poor glycaemic control. *Mutat Res.* Feb 1;638(1-2):98-102. Epub 2007 Sep 14.
2. Teixeira-Lemos E., Nunes S., Teixeira F., Reis F. (2011) Regular physical exercise training assists in preventing type 2 diabetes development; focus on its antioxidants and antienflamatuary properties, *Cardiovasc Diabetol.* Jan 28;10:12. doi: 10.1186/1475-2840-10-12
3. Lijima R, Takahashi H, Namme R, Ikegami S, Yamazaki M, Novel biological function of sialic acid (N-acetylneuraminic acid) as a hydrogen peroxide scavenger. *FEBS Lett.* 2004 Mar 12;561(1-3):163-6.

#### OP-05-03

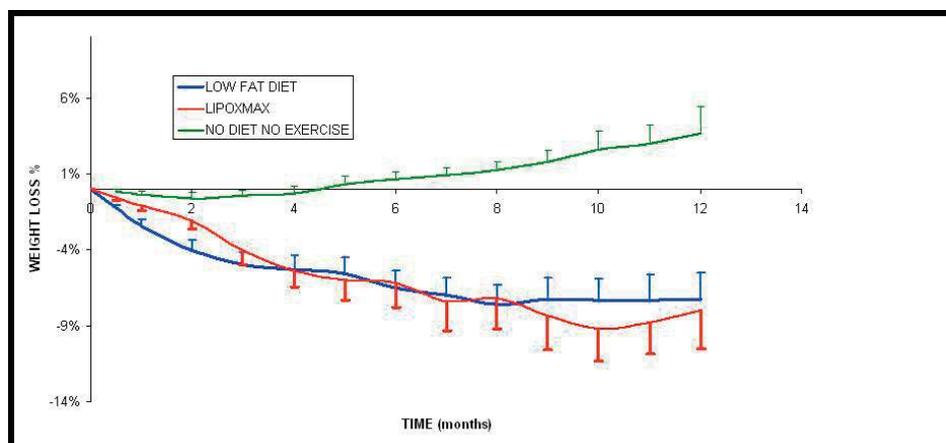
### EFFECTS OVER 1 YEAR OF LOW INTENSITY ENDURANCE EXERCISE TARGETED AT THE LEVEL OF MAXIMAL LIPID OXIDATION

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Low-intensity physical activity targeted at the level of maximal lipid oxidation (LIPOXmax or FATmax) has a similar efficiency to lose weight compared to protocols at higher intensities, whose compliance is lower, and has specific beneficial effects on lipid oxidation and eating behavior. However, the longer published study had only 5 months duration. We present the follow-up over 1 year of 47 subjects (mean BMI 35.08 ± 0.94 (range: 24 to 53) performing this type of exercise training without prescription of restrictive diet (but with initial nutritional assessment highlighting dietary mistakes). Two comparison groups with the same age and BMI were also followed: 45 subjects performing a low-fat diet and 62 subjects who did not



change their habits. After 12 months subjects trained at the LIPOXmax lost on the average  $-7.84 \pm 2.83$  kg (weight change from -23 to 4 kg), compared to  $-8.92 \pm 2.35$  kg in the low fat diet group, while in the absence of changes in lifestyle weight tends to increase ( $0.92 \pm 0.58$  kg).

12% of LIPOXmax-trained subjects lost more than 10 kg and 14% lost between 5 and 10 kg. On Hill's scale of eating behavior they increased their score of satiety ( $2.29 \pm 1.16$   $p < .05$ ). There was a correlation ( $r = 0.379$ ,  $p = 0.05$ ) between weight loss and reduction of nibbling. There was also a gradual increase in weekly exercise volume. These data of follow-up in a condition of 'real life' confirm the efficacy over 1 year of this type of physical activity in obesity, and is consistent with the concept that it is favored by effects on eating behavior (increased satiety and reduced nibbling).

#### OP-05-04

### EFFECTS OF DUTY CYCLE DURATION DURING INTERMITTENT EXERCISE ON METABOLIC DISTURBANCES

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**INTRODUCTION:** Exercise induces marked metabolic variations within skeletal muscle that induce many adaptations to minimize these metabolic disturbances. Endurance exercise training adaptations will be greater with exercise that provokes greater metabolic disturbances.

In the present study, we hypothesized that interval training with different duty cycle duration but similar work/rest ratio and total energy expenditure would be characterized by different metabolic disturbances.

**METHODS:** 8 subjects ( $25 \pm 5$  years,  $71 \pm 8$  kg,  $178 \pm 5$  cm,  $VO_{2max} 42 \pm 6$  ml.kg<sup>-1</sup>.min<sup>-1</sup>) performed three 1h-intermittent exercises with a 1:1 "work:passive recovery" ratio: 60 x 30sec/30sec (30sec), 30 x 1min/1min (1min) and 15 x 2min/2min (2min). The work intensity was set at 70% of peak work rate attained during the incremental exercise.

Breath by breath oxygen consumption and muscle oxygenation using near-infrared spectroscopy were recorded during all exercises. Metabolic disturbances were evaluated by: 1) total energy expenditure, 2) sum of  $VO_2$  differences between nadir and peak for each interval ( $VO_{2sum}$ ), 3) total duration of  $VO_2$  variations higher than 0.05 mL/sec ( $VO_{2var}$ ) and 4) sum of deoxy-hemoglobin differences between nadir and peak for each interval (HHbsum).

**RESULTS:** Overall, energy expenditure was similar between all exercises (respectively for 30sec, 1min and 2min:  $340 \pm 28$ ,  $343 \pm 30$  et  $340 \pm 28$  kJ).  $VO_{2sum}$  was higher in 30sec and 1min vs. 2min (+20,6% and +37% respectively).  $VO_{2var}$  was higher in 1min and 2min vs. 30sec (+41, 9% and +27,4% respectively). HHbsum was higher in 30sec and 1min vs. 2min (+123% and +82,4%, respectively).

**CONCLUSION:** Despite similar energy expenditure, the metabolic perturbations during intermittent exercise are duty cycle duration dependent. Our study support that the time of work during interval of intermittent exercises is a critical factor to induce high levels of metabolic disturbances. Our study suggests that the 1min is the most effective intermittent exercise to induce high levels of metabolic disturbances. A muscle analysis study will be performed to confirm the effectiveness of the 1min exercise to stimulate mitochondrial biogenesis and improve aerobic capacity.

OP-05-05

## VALIDITY OF GLOBAL POSITIONING SYSTEM, AND COMPARISON WITH ACCELEROMETRY, IN THE ESTIMATION OF ENERGY EXPENDITURE DURING HORIZONTAL AND GRADE WALKING AND RUNNING ON THE FIELD

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Accelerometer is largely used to quantify ambulatory physical activity (PA) and to estimate energy expenditure (EE). However, it presents couple of weaknesses such as overestimation of walking EE, inability to estimate precisely walking and running EE against grades. Moreover, the coefficients of determination ( $r^2$ ) computed from regression analyses to predict EE from « counts » (i.e., the arbitrary unit of acceleration given by accelerometers), remain quite variable among available studies. Brooks et al. (2005) reported that speed could be a better predictor of walking EE than accelerometry. In this latter study, speed was measured by chronometry over a standard distance, which remains unsuitable for free-living measurements. Interestingly, Global Positioning System (GPS) has already been validated as a reliable method to measure walking and running speed (Abraham et al., 2012). Another interest of GPS is the measurement of altitude, which enables grade calculation. To date, few studies have focused on the use of GPS to estimate EE (Nguyen et al., 2012; Hongu et al., 2013; Duncan et al, 2013). These recent studies did not systematically test the validity of GPS to estimate EE from a variety of grades and speeds conditions, which limit their external validity. The present project (ClinicalTrials: NCT01805219) aims on the validity of the estimation of outdoor EE using GPS, in comparison with accelerometer, during horizontal and grade walking as well as during horizontal running. This study is still on-going; preliminary results are presented here.

Thirty healthy participants aged 20-25 will be recruited for this study. Each participant has to perform: 1) an inclusion visit; 2) a resting metabolism measurement; 3) an assessment field of maximal oxygen uptake; 4) three walking sessions and two running sessions on an outdoor synthetic track; 5) six walking sessions uphill ( $n=3$ ) and downhill ( $n=3$ ) on a 4% grade; 5) six walking sessions of uphill ( $n=3$ ) and

**Table 1.** Energy expenditure (EE) equations ( $\text{kcal}\cdot\text{min}^{-1}$ ), from GPS measurements of speed ( $\text{km}\cdot\text{h}^{-1}$ ) and grade (%) and from accelerometer measurement of counts, during horizontal walking and running as well as grade walking.

Variables	Equations	$r^2$	SEE
<b>Horizontal walking/running</b>			
Speed <sub>GPS</sub>	$EE = (0.417 \times \text{speed}) + 15.447$	0.84*	0.6
Counts <sub>tip</sub> (AP axis)	$EE = (0.046 \times \text{counts}) + 16.025$	0.51*	1.1
Counts <sub>tip</sub> (V axis)	$EE = (0.019 \times \text{counts}) + 16.366$	0.86*	0.6
Counts <sub>tip</sub> (VM)	$EE = (0.019 \times \text{counts}) + 16.010$	0.87*	0.6
<b>Grade walking</b>			
Speed <sub>GPS</sub> and grade <sub>GPS</sub>	$EE = (0.298 \times \text{speed}) + (0.063 \times \text{grade}) + 16.192$	0.70*	0.4
Counts <sub>tip</sub> (AP axis)	$EE = (0.027 \times \text{counts}) + 16.138$	0.18*	0.6
Counts <sub>tip</sub> (V axis)	$EE = (0.013 \times \text{counts}) + 16.693$	0.27*	0.6
Counts <sub>tip</sub> (VM)	$EE = (0.015 \times \text{counts}) + 16.311$	0.29*	0.6

AP: antero-posterior axis; V: vertical axis; VM: vector magnitude;  $r^2$ : coefficient of determination; SEE: standard error of estimation. \* $P < 0.05$ .

downhill (n=3) walking on a 10% grade. The studying speeds are 2, 3.5 and 5 km/h for walking, 9 and 11 km/h for running. The speed is randomly attributed for each session. Each session lasts six minutes. During all sessions, participants wear a GPS device (DG100, GlobalSat®) at the right shoulder blade, an accelerometer (wGT3X+, Actigraph®) at the right or left hip, and a gas measure exchanges apparatus (K4b2, Cosmed®). Validity of the GPS system and of the accelerometer to predict EE is assessed from linear regression models.

Five subjects (mean±SD: 22±2 years; 174±8 cm; 70.1±11.3 kg; 23.0±2.9 kg.m<sup>-2</sup>; VO<sub>2</sub> max.: 57.3±14.9 ml.min<sup>-1</sup>.kg<sup>-1</sup>) have currently completed the protocol, representing a total of 85 walking/running sessions. Table 1 displays the main results. The r<sup>2</sup> for GPS equations was better for horizontal walking/running than for grade walking (0.84 vs. 0.70). The best r<sup>2</sup> for the accelerometer was always obtained with counts calculated from the vertical axis. For EE estimation during grade walking, a better estimation was found from GPS measurements of speed and grade than with accelerometer (0.70 vs. 0.27). The GPS seems to be a valid tool to estimate EE during horizontal and grade walking and horizontal running.

## OP-05-06

### ACCELEROMETER AS A TOOL TO ASSESS SEDENTARITY AND ADHERENCE TO PHYSICAL ACTIVITY RECOMMENDATIONS AFTER CARDIAC REHABILITATION PROGRAM

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**BACKGROUND:** One of the main challenge of cardiac rehabilitation programs (CRP) is to obtain sustained modifications in lifestyle habits, including nutrition and physical activity (PA). However, the methodology to assess PA is often heterogeneous, favoring the measurement of the volume rather than precise parameters (minutes and exercise intensity). Our purpose was to objectively assess, in stable cardiac patients, the adherence to physical activity (PA) recommendations using an accelerometer at two or 12 months after the discharge of cardiac rehabilitation program (CRP).

**METHODS:** Eighty cardiac patients wore an accelerometer at two months (group 1, n=41) or one-year (group 2, n=39) after a CRP including education about regular PA. PA was classified as "light" (1.8-2.9 METs), "moderate" (3-5.9 METs), or "intense" (>6METs). Energy expenditure (EE, in Kcal) and time (min) spent in these three different levels were measured during a one-week period with the MyWellness Key actimeter (MWK). Motivational readiness for change was also assessed at the end of CRP. Patients were considered as physically active when a minimum of 150 min of moderate PA during the one-week period was achieved.

**RESULTS:** The total weekly active EE averaged 676.7±353.2 kcal and 609.5 ± 433.5 kcal in group 1 and 2, respectively. The time spent within the light-intensity range PA was 319.4±170.9 and 310.9±160.6 min, and the time spent within the moderate-intensity range averaged 157.4±115.4 and 165±77.2 min per week for group 1 and 2, respectively. Fifty-three percent and 41 % of patients remained active in both groups respectively.

**CONCLUSION:** About half of the patients are non-adherent to PA after CRP and do not reach target levels recommended by physicians. The first two months following the discharge of CRP are decisive for lifestyle modifications maintenance.

## Thursday, September 27, 2013

### ORAL PAPERS OP6 – SPORTS MEDICINE

#### OP-06-01

#### SEASONAL VARIATION IN PLASMA 25 (OH) D OF PROFESSIONAL FOOTBALL PLAYERS IN FRENCH LEAGUE 2

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**INTRODUCTION:** Although vitamin deficiency has a high prevalence in the world, few studies have focused on vitamin status of athletes. But: Monitoring seasonal variations in serum 25 (OH) D<sub>3</sub> in a population of professional football.

**MATERIAL AND METHODS:** A prospective study from February 2011 to February 2013 of 54 professional footballers League 2 of the seasonal variation in 25 (OH) D<sub>3</sub> plasma. Blood samples were taken in July and February each year. Data were collected on three seasons. In the third season, all players were supplemented with vitamin D in the month of November 2012 by a course of cholecalciferol 100000IU every 15 days for 2 months.

**RESULTS:** In February 2011, only 13% of the players had normal levels of vitamin D, 43% and 44% hypovitaminosis a severe disability. One hundred percent of patients were black races deficit in February 2011. In July 2011, 86% of players have optimal levels of vitamin and only 14% hypovitaminosis. The following year in February 2012 and June 2012 we found similar numbers. After supplementation in November 2012, 94% of subjects had a higher rate in February 30ng/ml 2013.

**DISCUSSION:** As Galan [1] had already demonstrated in 2012, a serum 25 (OH) D<sub>3</sub> of approximately 48.5 ng / ml is needed in mid-October to ensure sufficient vitamin D > 30 ng / ml at the beginning of February. Intensive practice of outdoor sports does not exclude the risk of vitamin D deficiency, especially as patients are of African origin. It would be interesting to correlate these results with the daily intake of vitamin D and calcium.

**CONCLUSION:** Professional footballers have a high risk of hypovitaminose D, and this risk is higher to footballers of African origin, although they play an intensive sport outdoors. This reflection draws questions about the vitamin status of the athlete. It deserves to continue our study on a possible relationship with injury and against underperformance.

## EPIDEMIOLOGY OF IMMUNIZATION IN PROFESSIONAL YOUNG RUGBY PLAYERS

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**INTRODUCTION:** Over a period of 2 years several cases of epidemics of preventable diseases (mumps and measles) were reported in Top 14 French Rugby championship. We were interested in evaluating the immunization status of young professional rugby players at the French National Rugby sport Center (FNRC).

**MATERIALS AND METHODS:** The study was an epidemiologic review of 59 athletes aged 18 to 19 years who begun at the FNRC in 2011-2012 and in 2012-2013 seasons. We used their medical record. The number of injections was based on 2011 vaccines recommendations of French health care. The vaccines observed were diphtheria, tetanus, polio, whooping cough (DTaP/IPV); measles, mumps and rubella (MMR); hepatitis B and meningitis C.

**RESULTS:** We analyzed a total of 59 players, 29 in 2011-2012 season and 30 in 2012-2013 season.

	DTaP/IPV	MMR	Hepatitis B	Meningitis C
Completed	41 (69%)	43 (73%)	22 (37%)	11 (18%)
uncompleted	14 (31%)	12 (20%)	33 (56%)	44 (75%)
unknown	4 (7%)	4 (7%)	4 (7%)	4 (7%)

Immunization status obtained according to vaccines schedule:

- DTaP/IPV : 41 athletes (69%)
- DTaP/IPV + MMR : 31 athletes (52%)
- DTaP/IPV + MMR + Hep B : 13 athletes (22%)
- DTaP/IPV + MMR + Hep B + Men C : 5 athletes (8%)

**CONCLUSION:** The only obligatory vaccine in France is DTaP, and 69% are immunized. The other vaccines are only recommended.

Mumps outbreak in 2011 and in 2013 stopped several competitions in the rugby national championship. In the meantime the number of measles cases between 2005 and 2009 grew from 40 to 4000 cases per year in France. Hepatitis B is transmitted by blood or corporeal secretions, which could have been contracted whilst playing rugby. These young athletes live in collectivity, have competitions abroad, they should at least be immunized against meningitis, serotype C.

Due to their way of life and contact sport, this population should be immunized against these 4 vaccines, only 8% have this immunity. This is too low. Despite professional athletes having regular Preparticipation Physical Examinations (PPE), the vaccination schedule is not complete. The PPE is often at the beginning of the season, and seems to be the best time to check and do vaccinations. It is far from competitions and intensive training periods. Indeed the immune system depends on the type and duration of exercise. It seems to be more effective with moderate exercise and could be harmful during a period of intensive training. Effective response to vaccination according to training intensity is described as a "J Curve" (1), however it depends on different factors.

This study suggests that the vaccination schedule is too low in this population, and doctors should be more vigilant. It would be a shame to miss a competition because of a preventable disease.(2)

**REFERENCES**

1. Grosset-Janin A, Nicolas X, Saraux A. Sport and infectious risk: A systematic review of the literature over 20 years. *Médecine Mal. Infect.* nov 2012;42(11):533-544.
2. Daly P, Gustafson R. Public health recommendations for athletes attending sporting events. *Clin. J. Sport Med. Off. J. Can. Acad. Sport Med.* janv 2011;21(1):67-70.

**OP-06-03****CYCLING INDUCES A HYPERCOAGULABLE STATE THROUGH CONTACT ACTIVATION**

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**BACKGROUND:** Vigorous exercise can enhance the risk of major vascular thrombotic events, such as deep venous thrombosis, cerebral occlusions and pulmonary embolisms. Since these events are due to a haemostatic imbalance, interactions between coagulation factors, blood cells, the vessel wall and the fibrinolytic system play an important role. In sedentary subjects the risk of thrombotic occlusions after acute exercise is most pronounced, while exercise training is supposed to attenuate the development of these events. However, vascular diseases, including thrombotic and endofibrotic lesions, are reported in trained subjects as well and could be related to changes in haemostatic processes during exercise. Until now evidence for the exercise-induced haemostatic changes in trained subjects is fragmented and the triggers remains unknown.

**AIMS:** To investigate the full haemostatic profile in young professional cyclist after strenuous exercise.

**METHODS:** Venous blood was collected from 17 male cyclists (age:  $22 \pm 2.9$  years) before and after 4 hours cycling (120 km). Whole blood cell count, coagulation factor XIa (FXIa), Cortisol and von Willebrand factor (vWf) levels were determined, platelet reactivity was assessed by Multiplate (collagen, ADP, TRAP, and ASPI), rotational thromboelastography by means of ROTEM (ExTem, InTem and NaTem), thrombin generation through 0 and 1 pM tissue factor (TF) triggered CAT analysis. For measuring coagulation inhibition we measured Thrombin-AntiThrombin (TAT). Fibrinolytic activity was determined by tPA and D-Dimer levels.

**RESULTS:** Compared to baseline, white blood cell count was elevated significant ( $P = < 0.0001$ ) after exercise, which was predominantly caused by an increase in monocytes ( $1.3 \pm 0.45$  fold) and neutrophils ( $2.5 \pm 1.1$  fold). Remarkably, eosinophil's decreased with 52%, cortisol levels were elevated significant after exercise (from  $375.0 \pm 80.95$  to  $440.1 \pm 105.9$ ), causing the changes in white blood cells and elevation in von Willebrand factor (vWf) from  $110 \pm 44\%$  to  $193 \pm 72\%$  after exercise. Hematocrit and hemoglobin levels remained constant, suggesting no plasma volume changes. Platelet aggregation in response to ADP, ASPI and TRAP was enhanced after cycling exercise as indicated by increased maximal aggregation and area under the curve. ROTEM Ex- and InTem were not altered upon exercise, whereas the NaTem analysis was characterized by a shortened clotting time and enhanced clot formation (MCF and alpha), showing increased coagulation activity after exercise. Elevated TAT levels ( $2.006 \pm 0.666$  to  $2.819 \pm 1.701$ ) were found and supporting an increased coagulation activity, but inhibited by AntiThrombin. NaTEM activity showed increased coagulation activity, suggesting the presence of an endogenous trigger of coagulation. This was confirmed by thrombin generation analysis, which was increased in both the absence and

presence of 1 pM TF. Despite inhibition of the TF-pathway through addition of active site inhibited factor VII (ASIS), thrombin generation was still enhanced upon cycling, suggesting the contribution of the intrinsic pathway of coagulation. Significant increased FXIa levels support this. Exercise not only increased coagulation activity, but also fibrinolytic activity rises as a result of elevated tPA levels and resulting in increased D-dimer levels ( $0.2100 \pm 0.065$  to  $0.2459 \pm 0.118$ ).

**CONCLUSIONS:** Cycling exercise induces a hypercoagulable state through both increased platelet reactivity and contact-dependent activation of coagulation. Furthermore, cycling leads to increased fibrinolytic activity. This procoagulant response may contribute to the development of thrombotic diseases.

## OP-06-04

### ASYMPTOMATIC YOUNG ATHLETES WITH VENTRICULAR PRE-EXCITATION HAVE THE SAME RISK OF SUDDEN CARDIAC DEATH OF PATIENTS WITH WPW SYNDROME

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**INTRODUCTION:** Ventricular pre-excitation in children and adolescents is asymptomatic in the 65-90% of the cases. In WPW Syndrome, AV Reentrant Tachycardia (AVRT) or, more rarely, Atrial Fibrillation (AF) occur. An episode of AF can degenerate into ventricular fibrillation and sudden cardiac death (SCD) in case of presence of an accessory pathway with a very low anterograde refractory period. The optimum management of children with ventricular pre-excitation is not known, but evaluation by an electrophysiological study (endocavitary or transesophageal) before allowing participation in moderate-to-severe high intensity competitive sport is recommended. Recent international guidelines about asymptomatic patients with ventricular pre-excitation reported that: 1) an invasive assessment of the Shortest Pre-Excited R-R Interval (SPERRI) during AF is useful in order to stratify the risk in asymptomatic young patients with ventricular pre-excitation; 2) patients with a SPERRI < 250 ms have an increased risk of SCD.

**AIM OF THE STUDY.** To compare the electrophysiological characteristics of children with WPW syndrome and children with asymptomatic ventricular pre-excitation.

**MATERIALS AND METHODS:** Between June 2010 and December 2012, transesophageal atrial pacing, both at baseline condition and during Isoproterenol infusion or exercise testing, was performed in 51 symptomatic (mean age 9.8 years) and 73 asymptomatic (mean age 11.8 years, p 0.002) consecutive children with ventricular pre-excitation.

**RESULTS:** In baseline conditions, AVRT was induced in 12 symptomatic (23.5%) and in 11 asymptomatic patients (15.1%, p NS). AF was induced in 13 symptomatic (25.5%) and in 15 asymptomatic patients (20.5%, p NS). A SPERRI < 250 ms during AF was present in 4 symptomatic (30.8% of children with AF) and in 6 asymptomatic patients (40% of children with AF, p NS). During Isoproterenol infusion or exercise test, AVRT was induced in 31 symptomatic (60.8% of the total patients, 70.4% of the 44 patients studied during adrenergic stimulation) and in 33 asymptomatic patients (45.3% of the total patients, 47.8% of the 69 patients studied during adrenergic stimulation; p 0.018). AF was induced in 12 symptomatic (23.5% of the total patients, 27.3% of the 44 patients studied during adrenergic stimulation) and in 21 asymptomatic children (28.8% of the total patients, 30.4% of the 69 patients studied during adrenergic stimulation; p NS). A SPERRI < 210 ms was present in 6 symptomatic (50% of children with AF) and in 10 asymptomatic patients (47.6% of children with AF, p NS). Of the 32 asymptomatic patients who had undergone transesophageal atrial pacing to participate in competitive sport, only 11 (34.4%) were eligible according to national guidelines (COCIS, 2009).

**CONCLUSIONS:** AVRT is more inducible in symptomatic children with ventricular pre-excitation than in

asymptomatic ones, but, between these two groups of patients, there is no differences in term of atrial vulnerability and parameters related to the risk of SCD. Then, on the basis of our data, transesophageal atrial pacing, both at baseline condition and during Isoproterenol infusion or exercise testing, is a very important tool in the evaluation of young athletes with ventricular pre-excitation to avoid SCD during sport activity.

**OP-06-05****AORTIC DISTENSIBILITY ASSESSMENT BY AN EXTERNAL AUTOMATIC NONINVASIVE DEVICE IN THE PROFESSIONAL FOOTBALL REFEREES: A CAROTID-FEMORAL (AORTIC) PULSE WAVE VELOCITY STUDY**

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**BACKGROUND:** The referees officiate matches that range from local football that is the most popular sport in the world to Premier League matches. Pulse wave velocity (PWV) plays an important clinical role in patients under high cardiovascular risk and it is inversely correlated with arterial distensibility. The aim of this present study was to investigate aortic distensibility and related factors in the professional football referees.

**METHODS:** We recruited 96 football referees who were the members of a Football Federation and they were regularly maintaining sportive activities and training programs with a training history of many years. Twenty-seven healthy sedentary subjects build up control group. Aortic distensibility was assessed by automatic carotid-femoral (aortic) PWV measurement using the Complior Colson device (Createch Industrie, France). PWV is calculated from measurements of pulse transit time and the distance travelled by the pulse between two recording sites, according to the following formula:

$$\text{Pulse wave velocity (m/s)} = \text{distance (m)} / \text{transit time (s)}$$

**RESULTS:** The waist circumference, hip circumference, systolic blood pressure, pulse pressure, heart rate and aortic PWV that is inversely correlated aortic distensibility were decreased in the football referees as compared with healthy sedentary subjects ( $p < 0.05$ ). Although there was a significant correlation between PWV and age (regression analysis:  $R=0.646$ ,  $R^2=0.417$ ,  $F=1.715$ ,  $p=0.033$ ; for age  $p=0.043$ ,  $t=2.057$ ), there were no significant differences in the PWV and other parameters such as left ventricle end-diastolic diameter, mitral E velocity, systolic blood pressure, and platelets ( $p > 0.05$ ).

**CONCLUSIONS:** Aortic distensibility was decreased in the professional football referees as compared with healthy sedentary subjects.

**KEYWORDS:** Aortic distensibility, echocardiography, anthropometric measurements, football referees

## THE EFFECT OF DETRAINING ON THE CHARACTERISTICS OF THE ATHLETE'S HEART

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Relatively short-term detraining often occurs during an athlete's career due to injuries, holidays, army service etc. It is a very important question how the well defined characteristics of the athlete's heart move back to the non-trained values. Different authors (1-3) describe that different characteristics do not change equally after cessation of regular training.

In the present study data of non-athletes (113 males, 117 females), of actually trained athletes (948 males, 486 females) and of athletes after detraining (99 males 101 females) were analysed in the function of the days of detraining (1-20, 21-40, 41-60, 61-180, more than 180).

The earliest (20-40 days) finding during detraining was a slightly higher cardiac output and stroke volume, the next modification was a decrease of the relative left ventricular (LV) muscle mass and an impairment of the diastolic function characterized by the E/A quotient, the resting heart rate (HR) seem to elevate after half a year cessation of regular training only.

We suppose that stop of regular training first induce an increase of the reduced sympathetic tone inducing an enhanced activity of the LV myocardium, which doesn't have parasympathetic innervation. LV musculature seems to lose athletic characteristics (hypertrophy, improved diastolic function) after two months of detraining, the late modification of the HR suggest a stability of parasympathetic regulation.

Modifications are more marked in the males than in the females and athletic characteristics are more stable in the top-athletes than in the lower class or leisure-time athletes.

### REFERENCES

1. Mujika I., Padilla S.: *Med. Sci. Sports Exerc.* 33 413-421 2001
2. Pelliccia A.: *Int. J. Sports Med.* 17, 157-163 1996
3. Pavlik G., Bachl N., Wollein W, Lángfy Gy., Prokop L.: *Int. J.Sports Med.* 7 226-231 1986

Friday, September 27, 2013

## ORAL PAPERS OP7 – KNEE TRAUMATOLOGY

OP-07-01

### EPIDEMIOLOGIE DES RUPTURES DU LIGAMENT CROISE POSTERIEUR A PROPOS DE 113 CAS

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**INTRODUCTION:** Les lésions du LCP sont plus rares que celle du LCA. L'épidémiologie des laxités postérieures du genou est moins bien connue. Ces lésions peuvent passer inaperçues au décours immédiat du traumatisme. Elles surviennent souvent dans le cadre d'un polytraumatisme où les lésions fracturaires associées sont souvent au premier plan. Le but de ce travail était de caractériser les lésions associées aux laxités postérieures pour préciser le diagnostic permettant un traitement adapté.

**MATÉRIEL ET MÉTHODES:** Il s'agissait d'une étude épidémiologique rétrospective incluant tous les patients opérés pour laxité postérieure du genou entre 2001 et 2011. Tous les patients inclus présentaient une instabilité du genou motivant la réalisation d'une ligamentoplastie du LCP. Les données préopératoires étaient recueillies : type lésionnel, type d'accident, présence d'une lésion associée du LCA, présence d'une lésion traumatique associée, statut méniscale et cartilagineux, complications neuro-vasculaires initiales.

**RÉSULTATS:** Nous avons inclus 113 genoux (112 patients). Le sex ratio était de 5,7 hommes pour 1 femme. L'âge moyen à l'accident était de 28,6 ans [15-61]. Le type d'accident était un accident de la voie publique (58%) ou un accident sportif (38%). Le plus souvent il s'agissait d'un accident de 2 roues (66%) ou d'un accident de football (41%). Le bilan lésionnel retrouvait majoritairement une atteinte associée du plan latéral (47%) et 28% d'atteinte isolée du LCP. Nous ne retrouvons pas de différence significative entre le type lésionnel et le type d'accident ( $p=0,4957$ ). Nous observons 41 ruptures associées du LCA (36%). Trente-cinq patients présentaient une lésion traumatique autre qu'une atteinte ligamentaire du genou (31%). Il existait une fracture diaphysaire homolatérale chez 16 de ces patients dont 1 « genou flottant » (46%). Nous retrouvons une paralysie dans le territoire du nerf fibulaire commun chez 9 patients (8%) et une dissection de l'artère poplitée chez 3 patients (2,6%). Une lésion méniscale ou cartilagineuse était présente dans 62% des cas. Elle touchait majoritairement la corne postérieure du ménisque médiale (65% des atteintes méniscales) et le compartiment fémoro-tibiale médial isolé (52% des atteintes cartilagineuses) ou associé au compartiment fémoro-patellaire (29%).

**CONCLUSION:** La rupture du LCP avec instabilité est majoritairement associée à une atteinte d'un plan périphérique et notamment du plan latéral. Les atteintes périphériques doivent donc être systématiquement recherchées pour traiter l'ensemble des composantes de la laxité. Devant une fracture diaphysaire du membre inférieur il convient de réaliser un testing du genou pour ne pas méconnaître une lésion ligamentaire associée souvent dans un contexte de radiographies « normales ».

## EPIDEMIOLOGY OF POSTERIOR CRUCIATE LIGAMENT ABOUT 113 CASES

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**INTRODUCTION:** Lesions of the PCL are rarer than the ACL. Epidemiology of posterior laxity of the knee is less well known. These lesions may go unnoticed at the waning of the immediate trauma. They often occur in the context of multiple trauma fracture where lesions of PCL are often at the forefront. The aim of this study was to characterize the lesions associated with posterior laxity for accurate diagnosis for appropriate treatment.

**MATERIALS AND METHODS:** This was a retrospective epidemiological study including all patients undergoing posterior laxity of the knee between 2001 and 2011. All patients had knee instability motivating PCL reconstruction. Preoperative data were collected: lesion types, type of accident, a lesion associated of ACL, the presence of a traumatic injury associated meniscal and cartilage status, initial neurovascular complications.

**RESULTS:** We included 113 knees (112 patients). The sex ratio was 5.7 males to 1 female. The average age of the accident was 28.6 years [15-61]. The type of accident was a road accident (58%) or a sports injury (38%). Most often it was an accident of motorcycle (66%) or a football accident (41%). The assessment of the lesions found predominantly associated with postero-lateral structures (47%) and isolated PCL damage (28%). We didn't find significant differences between lesion type and the type of accident ( $p = 0.4957$ ). We observed 41 ruptures associated of ACL (36%). Thirty-five patients had a traumatic injury other than knee ligament damage (31%). There was an ipsilateral diaphyseal fracture in 16 patients including 1 'floating knee' (46%). We observed a paralysis in the area of the common peroneal nerve in 9 patients (8%) and dissection of the popliteal artery in 3 patients (2.6%). Meniscus or cartilage damage was present in 62% of cases. It mostly affected the posterior horn of the medial meniscus (65% of meniscal damage) and the medial tibiofemoral compartment isolated (52% damage cartilage) or associated with patellofemoral compartment (29%).

**CONCLUSION:** PCL rupture with instability is mainly associated with damage of postero-lateral structures. A damage of a collateral structure must be systematically sought to treat all components of laxity. If there is a diaphyseal fracture of the lower limb, it is necessary to perform a knee ligament testing to avoid missing a ligament injury often associated in the context of X-rays 'normal.'

## OP-07-02

### PRISE EN CHARGE DES LAXITÉS ANTÉRO-POSTÉRO-LATÉRALES : RÉSULTATS FONCTIONNELS À PROPOS DE 23 PATIENTS SPORTIFS

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**INTRODUCTION:** La laxité antéro-postéro-latérale du genou est une pathologie rare, de diagnostic souvent difficile et retardé et dont l'histoire naturelle conduit à un mauvais pronostic fonctionnel. La majorité des auteurs s'accordent sur la nécessité d'un traitement chirurgical le plus précoce possible mais beaucoup de discordances persistent sur les modalités de la reconstruction des structures postéro-latérales. Le but de cette

étude était d'évaluer le résultat fonctionnel d'un traitement chirurgical combinant une reconstruction du ligament croisé antérieur (LCA) et des structures postéro-latérales (PL).

**MATÉRIEL ET MÉTHODES:** Vingt-trois patients jeunes et sportifs, présentant une laxité combinée antérieure et postéro-latérale du genou étaient revus rétrospectivement au recul minimum de 12 mois. Tous les patients bénéficiaient d'une reconstruction anatomique du LCA et des structures postéro-latérales rompues. 2 patients avaient une ostéotomie tibiale de valgisation associée en raison d'un morphotype en varus et 7 patients nécessitaient une réparation méniscale. La rééducation était effectuée en centre spécialisé après une mise en décharge pendant 6 semaines. L'âge moyen était de 31,5 ans et le sex ratio était de 7,5 hommes pour 1 femme. Les patients étaient évalués par un score IKDC subjectif et objectif. Une mesure de la laxité différentielle entre les 2 genoux par KT1000 était réalisée en préopératoire et au recul. Une mesure différentielle radiologique de la laximétrie était réalisée au recul par Télôs à 250N.

**RÉSULTATS:** La durée opératoire moyenne était de 90,4 min. Le recul moyen était de 30.3 mois [12-90]. La moyenne du score IKDC subjectif était de 81.06/100 [50.6-100]. Le score IKDC clinique retrouvait 89% de patients grade A ou B. les grade IKDC C correspondaient essentiellement à un déficit en flexion. La laxité au recul au KT1000 était significativement améliorée ( $p < 0,0001$ ). Il n'existait pas de laxité différentielle significative entre les 2 genoux au recul au KT1000 ( $p = 0,7898$ ) ou au Télôs ( $p = 0,6765$ ). Les patients de moins de 30 ans et pris en charge au stade aigu ( $< 3$  semaines) avaient de meilleurs résultats fonctionnels subjectifs et objectifs ( $p = 0,0025$ ).

**DISCUSSION:** La prise en charge chirurgicale précoce des laxités antéro-postéro-latérales du genou avec une reconstruction de l'ensemble des composantes de la laxité est fondamentale. Elle permet de contrôler l'instabilité et de retarder l'évolution dégénérative. La reconstruction combinée des structures PL préserve la ligamentoplastie du LCA. Les scores moyens IKDC subjectifs et objectifs sont assez satisfaisants chez la plupart des patients. La reconstruction ligamentaire se montre protectrice vis-à-vis des ménisques et du cartilage. L'amélioration significative de la laximétrie et des mesures radiologiques sous Télôs après chirurgie traduit objectivement l'efficacité de l'intervention.

**CONCLUSION:** la reconstruction anatomique du LCA et des structures PL dans les laxités combinées antéro-postéro-latérales permet un contrôle efficace de la laxité et des résultats fonctionnels satisfaisants. Ce type de laxité est rare et de diagnostic difficile, mais il ne doit pas être méconnu pour bénéficier d'une prise en charge optimale.

## OP-07-02 – ENGLISH VERSION

### MANAGEMENT OF ANTERO-POSTERO-LATERAL LAXITY: FUNCTIONAL OUTCOME OF 23 SPORTS PATIENTS

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**INTRODUCTION:** The antero-postero-lateral laxity of the knee is a rare pathology. The diagnostic is often difficult and unrecognized. The natural history of this laxity bring poor functional outcome. Most authors agree on the need for early surgery but many discrepancies persist about the modalities of the reconstruction of postero-lateral structures. The aim of this study was to evaluate functional outcome of surgical treatment combining a reconstruction of the anterior cruciate ligament (ACL) and posterolateral structures (PL).

**MATERIALS AND METHODS:** Twenty-three young patients and athletes, with a combined anterior and postero-lateral laxity of the knee were retrospectively reviewed at a minimum follow-up of 12 months. All patients had an anatomic ACL and posterolateral structures reconstruction. 2 patients had a tibial osteotomy combined due to a varus morphotype and 7 patients required a meniscal repair. Rehabilitation was performed in a specialized center after 6 weeks without weight bearing. The average age was 31.5 years and the sex ratio was 7.5 males to 1 female. Patients were evaluated by subjective and objective IKDC score. A

measurement of the differential laxity between the two knees KT1000 was performed preoperatively and at follow-up. Radiological differential measurement laximetry was achieved by Telos at follow-up.

**RESULTS:** The mean operative time was 90.4 min. The average follow-up was 30.3 months [12-90]. The mean subjective IKDC score was 81.06/100 [50.6-100]. The clinical IKDC score found 89% grade A or B. the IKDC grade C corresponded mainly to a deficit in flexion. The KT1000 laxity at follow-up was significantly improved ( $p < 0.0001$ ). There was no significant difference between the two knee laxity at follow-up with KT1000 ( $p = 0.7898$ ) or Telos ( $p = 0.6765$ ). Patients less than 30 years and supported the acute stage (<3semaines) had better subjective and objective functional results ( $p = 0.0025$ ).

**DISCUSSION:** The early surgical management of antero-postero-lateral laxity of the knee with a reconstruction of all components of laxity is fundamental. It can control the instability and decreased the degenerative evolution. Combined reconstruction of PL structures preserve ACL reconstruction. The means subjective and objective IKDC scores are quite satisfactory in most patients. Ligament reconstruction shows protective towards the meniscus and cartilage. The significant improvement laximetry and radiological measures in Telos after surgery objectively reflects the effectiveness of the intervention.

**CONCLUSION:** The anatomic ACL and PL structures reconstruction in the antero-postero-lateral laxity combined allow an effective control of the laxity and satisfactory functional results. Such laxity is rare and difficult to diagnose, but it should not be ignored to benefit from optimal care.

#### OP-07-03

### EVALUATION PROSPECTIVE COMPARATIVE DE FAISABILITÉ DE LA CHIRURGIE AMBULATOIRE DANS LES RECONSTRUCTIONS DU LIGAMENT CROISÉ ANTÉRIEUR DU GENOU

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**INTRODUCTION:** La chirurgie ambulatoire est une alternative à l'hospitalisation permettant la sortie du patient le jour de son admission. Ses bénéfices pour le patient sont prouvés en termes de satisfaction et de limitation de l'exposition aux infections nosocomiales. Elle permet également une optimisation des plateaux techniques et une réduction des coûts pour les établissements de santé et l'assurance maladie. Le taux de chirurgie ambulatoire en France reste faible et concerne peu de gestes chirurgicaux. L'objectif principal de l'étude était d'évaluer la sécurité de la chirurgie ambulatoire dans les reconstructions du ligament croisé antérieur (LCA).

**PATIENTS ET MÉTHODES:** Une étude prospective menée en 2012 a inclus l'ensemble des patients opérés en première intention pour une reconstruction arthroscopique du LCA par tendons ischio-jambiers. La chirurgie ambulatoire a été proposée systématiquement par l'un des chirurgiens après vérification des critères classiques d'exclusion (âge > 60 ans, score ASA 3-4, éloignement géographique). Les patients des deux autres chirurgiens ont tous été hospitalisés. Le protocole antalgique postopératoire comprenait des antalgiques de palier I ou II et, pour les patients hospitalisés, de la morphine à la demande en sus. Le critère de jugement principal était l'échec du mode d'admission défini par l'hospitalisation d'un patient opéré en ambulatoire ou la ré-hospitalisation dans la première semaine après la sortie. Les critères de jugement secondaires étaient le taux de complications postopératoires, la satisfaction du patient, la douleur postopératoire et la consommation d'antalgiques. 137 patients ont été inclus, 51 dans le groupe «ambulatoire» et 86 dans le groupe «classique», âge moyen 29,4±9,4, 47 femmes/90 hommes. La rupture était survenue au cours de la pratique sportive chez 117 patients (85,4%), le plus souvent suite à une torsion du genou (66,4%). Aucune différence significative n'a été retrouvée entre ces deux groupes à l'inclusion. Dans le groupe «classique» la durée moyenne d'hospitalisation était de 3,3±1,2 jours.

**RÉSULTATS:** Un patient du groupe « ambulatoire » a été hospitalisé suite à un saignement localisé et aucune ré-hospitalisation n'est survenue. Cinq hématomes diffus de la jambe ont été notés dans chaque groupe et 1 phlébite dans le groupe classique ( $p=0,36$ ). La majorité des patients étaient satisfaits, sans différence entre les 2 groupes ( $p=0,58$ ). La douleur postopératoire moyenne était comparable ( $3,3\pm 1,9$  vs  $3,6\pm 2,2$ ,  $p=0,40$ ). Dans le groupe « classique », 46,5% des patients ont eu recours à la morphine alors que la consommation d'AINS et de paracétamol-codéiné était significativement plus élevée dans le groupe « ambulatoire » ( $p<0,05$ ).

**CONCLUSION:** Cette première étude prospective française évaluant la sécurité de la chirurgie ambulatoire dans la reconstruction du LCA, n'a relevé aucun événement grave. Dans une population sélectionnée, les risques sont comparables à ceux d'une hospitalisation classique.

#### OP-07-04

### ANALYSE COMPARATIVE DU DIAMÈTRE DES GREFFES COURTES VERSUS LIGAMENTOPLASTIE STANDARD DANS LA RECONSTRUCTION MONO-FAISCEAU DU LIGAMENT CROISÉ ANTÉRIEUR PAR TENDONS ISCHIO-JAMBIERS

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**INTRODUCTION:** La reconstruction mono-faisceau du ligament croisé antérieur (LCA) par greffe courte est réalisée avec un seul tendon. L'épargne tendineuse réalisée est intéressante mais le calibre de la greffe varie selon le sexe et la taille du patient. Les objectifs de l'étude étaient d'évaluer le diamètre et la longueur du greffon dans la population globale de l'étude puis dans les sous-groupes des femmes et des patients de petite taille.

**MATÉRIEL ET MÉTHODES:** Une étude prospective menée en 2012-2013 a inclus l'ensemble des patients ayant bénéficié en première intention d'une reconstruction mono-faisceau du LCA aux tendons ischio-jambiers, suite à une rupture tendineuse sans lésions associées. En préopératoire, la laximétrie différentielle des genoux était évaluée avec le Télós™ radiologique et le GNRB®. Les patients étaient opérés soit selon la technique du DIDT (droit interne/demi tendineux) standard avec fixation corticale fémorale et vis d'interférence tibiale soit par greffe courte avec le système TLS®. Le critère principal de jugement était le diamètre du greffon. La série comprenait 191 patients, 130 dans le groupe « greffe courte » et 61 dans le groupe « DIDT standard », 60 femmes et 131 hommes, âgés en moyenne de  $29,9\pm 9,2$  ans. La taille moyenne était de  $174,4\pm 9,4$  cm et l'indice de masse corporelle  $23,9\pm 3,3$ . A l'inclusion les deux groupes étaient comparables.

**RÉSULTATS:** Pour l'ensemble de la série, le diamètre moyen du greffon fémoral était comparable entre les 2 groupes ( $7,9\pm 0,7$  p=0,92) et le diamètre moyen du greffon tibial significativement supérieur dans le groupe « greffe courte » ( $8,6\pm 0,7$  vs  $8,1\pm 0,6$  p=0,00001). Le greffon était en moyenne 2,1 fois plus long dans le groupe « DIDT standard » que dans le groupe « greffe courte » ( $53,1\pm 7,5$  vs  $112,9\pm 15,8$  p=0,00001). Chez les 60 femmes de l'étude, (40 « greffe courte » et 20 « DIDT standard »), aucune différence significative n'a été retrouvée pour le diamètre du greffon fémoral ( $7,5\pm 0,5$  vs  $7,4\pm 0,7$  p=0,72) et une différence à la limite de la significativité pour le greffon tibial ( $8,1\pm 0,4$  vs  $7,9\pm 0,5$  p=0,07). Pour les 49 patients de moins de 1m70, (31 « greffe courte » et 18 « DIDT standard »), aucune différence significative n'a été retrouvée pour le diamètre du greffon fémoral ( $7,4\pm 0,6$  vs  $7,5\pm 0,6$  p=0,72) et une tendance en faveur de la greffe courte au niveau tibial ( $8,1\pm 0,4$  vs  $7,8\pm 0,5$  p=0,10).

**CONCLUSION:** La technique de reconstruction mono-faisceau du LCA a permis d'obtenir une greffe de bon calibre, comparable à celle du DIDT standard au fémur et significativement plus importante pour le greffon tibial. L'étude est en cours et les résultats cliniques des deux techniques devront être comparés à un recul suffisant afin de confirmer l'intérêt de la greffe courte.

## OP-07-05

## RÉSULTATS À COURT TERME DE LA RECONSTRUCTION EN PREMIÈRE INTENTION DU LIGAMENT CROISÉ ANTÉRIEUR AU MOYEN DU FASCIA LATA PAR UNE TECHNIQUE ARTHROSCOPIQUE ASSOCIÉE À UN PRÉLÈVEMENT MINI INVASIF

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Il s'agit d'une étude prospective continue sans groupe contrôle.

L'objectif de l'étude était d'évaluer les résultats à court terme de la reconstruction du ligament croisé antérieur en première intention au moyen du fascia lata par une technique arthroscopique associée à un prélèvement mini invasif. Evaluation fonctionnelle, radiologique et isocinétique.

**MATÉRIEL UTILISÉ ET MÉTHODES:** Entre Septembre 2009 et Septembre 2011, 62 patients ont été opérés selon cette technique. Chaque patient a été revu à l'aide du score IKDC objectif et subjectif, un score KOOS, un test de laximétrie et des tests isocinétiques. Il y a eu 1 perdu de vue.

**RÉSULTATS:** 61 patients ont été revus, à un recul moyen de 16.1 mois (10 à 30 mois). Le score IKDC global était classé A ou B chez 83% des patients avec l'examen TELOS (retrouvant une laxité différentielle moyenne de 3.6 mm) et 86% avec l'examen GNRB (retrouvant une laxité différentielle moyenne de 0.75 mm). 8% des patients avaient un test de Lachman classé C et 6% un ressaut rotatoire interne classé C. Il n'y avait aucun patient classé D. 97% des patients ont repris une activité sportive à un délai moyen de 7.3 mois. Le déficit musculaire était faible, inférieur à 16% pour l'appareil extenseur et inférieur à 12% pour les ischio-jambiers au dernier recul.

**CONCLUSION:** Les résultats de cette série sont comparables à ceux de la littérature notamment ceux concernant les techniques classiques. Il s'agit d'une technique fiable en première intention d'une reconstruction du LCA, permettant un excellent contrôle du ressaut rotatoire et une reprise sportive précoce, avec un déficit musculaire faible en postopératoire.

## OP-07-06

## EVALUATION DE L'EFFET DE L'ÉTIREMENT DU QUADRICEPS DANS LE SYNDROME FÉMORO PATELLAIRE

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**OBJECTIF:** évaluer l'effet de l'étirement du Quadriceps chez les patients atteints du Syndrome femoro patellaire sur la force et la douleur.

**MATÉRIEL ET MÉTHODES:** Deux groupes sujets sont étudiés:

- Un groupe SFP (syndrome fémoro-patellaire) composé de 27 patients (16 hommes et 11 femmes), tous sportifs, âgés de 18 à 40 ans, atteints d'un syndrome fémoro-patellaire unilatéral. Le genou controlatéral est exempt de toute pathologie.
- Un groupe sujets témoins ST (sujets témoins) composé de 12 personnes (5 hommes, 7 femmes), tous sportifs, âgés de 28 à 35 ans et exempts de toutes pathologies sur les genoux.

**MATÉRIEL:** Les évaluations de force pré- et post étirement ainsi que l'échauffement sont réalisés au moyen d'un dynamomètre isocinétique de marque Contrex MJ, human kinetics 1.7.4 filter V 1.7. Le paramètre pris en compte lors des évaluations est le pic de couple ou moment de force maximal (exprimé en Newton-

mètre, N.m). Les mesures du pic de couple en Nm/kg du quadriceps sont enregistrées à chaque vitesse (60° et 180°/sec en concentrique, 30°/sec en excentrique (1) ), pour les deux jambes dans le groupe pathologique et dans le groupe témoin avant et après étirement.

Évaluation de la douleur rotulienne. Après chaque série de répétitions aux différentes vitesses, et après étirement il est demandé aux sujets de coter la douleur patellaire ressentie à l'aide de l'échelle visuelle analogique (EVA).

**MÉTHODE:** avant et après étirement; évaluation de la force du Quadriceps genou lésé et genou sain à 60°/sec concentrique 120°/sec concentrique et 30°/sec excentrique avec dynamomètre isocinétique et évaluation de la douleur par test EVA du quadriceps du genou atteint dans le groupe lésé et dans le groupe témoin.

**RÉSULTATS:** Dans le groupe lésé nous obtenons après étirement du quadriceps du genou atteint une baisse de la douleur de 38% et une élévation de la force de 16% significativement corrélé l'un à l'autre  $r = 0,44445$  ( $p < 0,002$ ). Pas de changement significatif dans le groupe témoin.

**DISCUSSION:** Nos résultats mettent en évidence un apport significatif de la diminution de la douleur mais aussi de la récupération de force sur l'articulation évaluée. S'agissant d'un étirement spécifique de type excentrique sous maximal à vitesse lente sur un muscle bi articulaire les effets ressenties par le patient sont une meilleure adaptation à la douleur ce qui facilite alors une récupération de la force.

**MOTS CLÉS:** syndrome femoro patellaire ; douleur ; force ; étirement ; excentrique ; rééducation.

**BIBLIOGRAPHIE:**

1. BENNETT JG and al : Evaluation and treatment of anterior knee pain using eccentric exercise, Med Sci Sports Exerc 1986;:526-30 . 21:384-91.

#### OP-07-06 – ENGLISH VERSION

### ASSESSMENT OF THE EFFECT OF QUADRICEPS STRETCHING \_IN PATELLO FEMORAL PAIN SYNDROME (PFPS)

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**BACKGROUND:** Limited evidence that muscle stretching is effective in the treatment of PFPS

**OBJECTIVES:** To compare pain and Quadriceps strength before and after quadriceps stretching

**DESIGN AND METHOD:** For each patients the two knees were selected to make comparison between healthy and not healthy knee. EVA method was used to assess the pain at each speed of the isokinetic test (60°/sec /180°/sec/30°/sec) and that before and after Quadriceps stretching .In the same time each patients do the isokinetic test always in the same chronology: Training the test with the healthy knee at the three mode : 60°/sec concentric/180°/sec concentric/30°/sec eccentric. Then, assessment of the injured knee at the three same speeds followed by Quadriceps stretching (3x 20 sec) and a last isokinetic evaluation made three minutes after stretching.

**RESULTS:** With 27 patients evaluated we found a pain decrease after stretching: 55%. ( $P < 0,02$ ). We found also an increase of the quadriceps strength after stretching at each speed : + 15,8% ( $p < 0,02$ ). (r significatif correlation  $R = 0,44445$ )

**CONCLUSIONS:** On looking at the results there are important modifications of the knee pain and the quadriceps muscular strength before and after stretching. We should certainly include the quadriceps stretching as efficiency therapeutic and it must be added in the treatment protocol of PFPS.

**REFERENCES:**

1. Clark DI, Downing N. Physiotherapy for anterior knee pain: a randomized controlled trial, Ann Rheum Dis 2000; 59:700-4.
2. Dvir Z, Halperin N. Quadriceps function and patellofemoral pain syndrome, part 2 : The break phenomenon during eccentric activity, Isokinetics and Exercise Science 1991; 1:31-5

Friday, September 27, 2013  
ORAL PAPERS OP8 – TRAUMATOLOGY

OP-08-01

**STABILISATION PAR BANKART ARTHROSCOPIQUE: RETOUR AU SPORT ET RÉSULTATS FONCTIONNELS CHEZ 46 SPORTIFS À UN RECU MOYEN DE 2 ANS**

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**INTRODUCTION:** L'instabilité antérieure de l'épaule est un problème commun en particulier chez les sujets jeunes, actifs et sportifs. Plusieurs techniques chirurgicales ont été décrites pour la stabilisation de l'épaule, à ciel ouvert ou arthroscopique. Le but de l'étude était d'évaluer le retour au sport et les résultats fonctionnels après une stabilisation par Bankart arthroscopique.

**MATÉRIEL ET MÉTHODES:** Une étude rétrospective a inclus l'ensemble des patients opérés par Bankart arthroscopique en 2010-2011 pour instabilité antérieure d'épaule, sportifs et âgés de moins de 50 ans. La série comprenait 46 patients, 36 hommes et 10 femmes, âgés en moyenne de  $28,92 \pm 8,1$  ans. Deux patients avaient déjà été opérés d'instabilité. La répartition des patients selon la classification d'Allain des sports pratiqués était : G1(sans contact)=3/46, G2(fort impact)=23/46, G3(armé)=16/46, G4(armé contré)=4/46. Le niveau sportif était le sport de loisir 30/46 ou de compétition 16/46 (3 internationaux, 8 nationaux, 5 régionaux). Le critère principal de jugement était le retour au sport. Les critères secondaires étaient le niveau de reprise et le délai, le score fonctionnel WOSI (Western Ontario Shoulder Instability Index), la survenue d'une récurrence, une échelle de satisfaction du patient, le niveau d'appréhension et les conduites d'évitement. Le recul moyen était de  $24 \pm 7$  mois.

**RÉSULTATS:** 44 patients ont repris le sport (95,6%) dans un délai moyen de  $9,8 \pm 5,3$  mois, 2 ont arrêté à cause de l'épaule. Au dernier recul, le niveau sportif était supérieur ou identique à celui d'avant l'instabilité chez 38 patients (86,4%), inférieur pour 4 patients (9,1%) et 2 patients ont changé de sport à cause de l'épaule (4,5%). Le score WOSI total était significativement plus mauvais chez ceux qui n'avaient pas repris ( $p=0,0002$ ). Concernant l'item «activités sportives» du WOSI, le score était significativement plus mauvais chez les patients n'ayant pas repris (0,03) et en cas de niveau de reprise inférieur ou de changement de sport ( $p=0,006$ ). Une récurrence de luxation et 1 capsulite rétractile ont été notées. 35 patients étaient très satisfaits (76,1%), 8 satisfaits (13,4%) et 3 peu ou non satisfait (6,5%). La satisfaction était corrélée au score WOSI ( $p=0,0004$ ). La diminution du niveau d'appréhension était fortement significative ( $p<0,00001$ ). 17 patients (36,9%) avaient des conduites d'évitement à cause de l'épaule.

**CONCLUSION:** Après stabilisation par Bankart arthroscopique, la majorité des sportifs ont repris leur activité sportive principale, le plus souvent à un niveau supérieur ou identique à leur meilleur niveau. Le score fonctionnel de WOSI était corrélé au niveau de reprise sportive.

OP-08-02

**INTERVENTION DE LATARJET: ÉTUDE PROSPECTIVE COMPARATIVE À COURT TERME ENTRE LA TECHNIQUE ARTHROSCOPIQUE ET LA CHIRURGIE MINI-INVASIVE**B. MARION<sup>1,2</sup>, J. DERANLOT<sup>1</sup>, S. KLOUCHE<sup>1</sup>, P. HARDY<sup>1</sup>, G. NOURISSAT<sup>2</sup><sup>1</sup>Hôpitaux universitaires Paris Ile-de-France Ouest, APHP, Boulogne-Billancourt, FRANCE<sup>2</sup>Clinique des Maussins, Paris, FRANCE

**INTRODUCTION:** Le développement d'ancillaires dédiés permet de réaliser actuellement l'intervention de Latarjet sous arthroscopie. Comparés à la chirurgie à ciel ouvert, les bénéfices attendus sont nombreux mais restent encore à valider. Les objectifs de l'étude étaient d'évaluer la douleur postopératoire précoce et le positionnement de la butée après stabilisation de l'épaule selon la technique de Latarjet.

**MATÉRIEL ET MÉTHODE:** Une étude prospective comparative réalisée en 2012 sur deux centres a inclus l'ensemble des patients opérés pour une instabilité antérieure chronique post-traumatique de l'épaule nécessitant une butée (Instability Severity Index Score > 3). L'intervention de Latarjet était réalisée dans un centre par voie mini-invasive (ancillaire Arthrex, Naples, FL) et dans l'autre sous arthroscopie (Depuy-Mitek, Raynham, MA). Le traitement antalgique postopératoire était standardisé (Paracétamol, AINS et Tramadol). Le critère principal de jugement était la douleur postopératoire évaluée quotidiennement par le patient sur une EVA (0 à 10) durant la première semaine. Les critères secondaires étaient le positionnement médio-latéral et cranio-caudal de la butée sur les radiographies standards (épaule de face en rotation neutre et profil de Lamy) réalisées 3 semaines après la chirurgie, la consommation d'antalgiques et la durée opératoire. Cinquante-huit patients ont été inclus, 22 dans le groupe «mini-invasive» et 36 dans le groupe «arthroscopique», 13 femmes et 45 hommes, âgés en moyenne de 26,9±7,7 ans. Les patients étaient en majorité sportifs (84,5%) de loisir (67,2%). Le score ISIS moyen était 4,4±1,4. Les 2 groupes étaient comparables à l'inclusion.

**RÉSULTATS:** Les patients opérés sous arthroscopie étaient significativement moins douloureux sur l'ensemble de la semaine (2,5±1,4 vs 1,2±1,2 p=0,002). Cette différence était plus marquée à J1 (2,1±1,3 vs 4,3±1,7 p=0,0001), J2 (1,8±1,4 vs 3,8±1,9 p=0,001), J3 (1,3±1,8 vs 3,2±1,6 p=0,0006) et J4 (1±1,6 vs 2,3±1,8 p=0,001). La consommation d'antalgique était comparable entre les deux groupes (p>0,05). Le positionnement médio-latéral de la butée était en moyenne à 6,6±5,5mm pour le groupe «mini-invasive» et 3,7±3,3mm pour le groupe «arthroscopique» (p=0,036). Le positionnement cranio-caudal de la butée était à 44,4% en dessous de 5h pour le groupe «mini-invasive» contre 94,1% pour le groupe «arthroscopique» (p=0,002). L'intervention était significativement plus longue sous arthroscopie (76,8±14min vs 61,6±13,2min p=0,00001).

**CONCLUSION:** Cette étude a montré que, comparé à la technique mini-invasive, le Latarjet arthroscopique présentait un bénéfice significatif sur la douleur postopératoire immédiate. Le contrôle radiologique a retrouvé pour la technique arthroscopique une plus grande latéralisation des vis de la butée et un meilleur positionnement équatorial.

## INFLUENCE OF GAME PLAYING ON THE MUSCULAR PROFILE OF SHOULDER ROTATORS OF HANDBALL PLAYERS

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Handball is a lateralised sport for which game play (shoots, passes, stops) can depend on the players position (back, front, goalkeeper). Shoulder microtraumatic pathologies are the most frequent overuse pathologies in handball.

**OBJECTIVE:** Describe the isokinetic profile of the handball players according to their position and determine if exists an influence of the manual dominance on the muscular profile of rotators.

**METHODOLOGY:** Isokinetic assessment at the beginning of season, in dorsal decubitus, with 90° shoulder abduction: measurement of the maximal movements of strength in concentric at 60°/s and 240°/s, in Eccentric at 60°/s.

**RESULTS:** 25 subjects (23 men and 2 women) included, average age 24,28 years±3,11, average height=187,25 cms ± 7,72, average weight 87,16 kg ± 10,22, without any shoulder pathology. 9 were back, 10 fronts and 6 goalkeepers. 22 subjects played in D1 or Pro D2, 2 women in National 2, 1 subject in National 3. We find:

- a significant influence of the laterality on the performances of the internal rotators (IR) no matters the mode of muscular contraction and the angular speed:  $p=0.009$ ,  $0.01$  and  $0.013$  respectively for the analysis in concentric at 60°/s, 240°/s and in eccentric;
- any influences of the dominating side on external rotators (ER);
- a ER / IR ratio significantly lower on the dominating side in concentric at 60°/s ( $p=0,001$ ), concentric at 240°/s ( $p0,001$ ), on the MIXED ratio ( $p=0,002$ ), and on FUNCTIONAL Ratio ( $p=0,025$ ).

Analysis by position players shows significant influence of manual dominance on the performances of IR in concentric and eccentric, on the conventional ratios in 60 and 240 °/s for the back players, in concentric at fast speed and in eccentric, on the conventional ratio with fast speed for the front players. Manuel dominance does not influence muscular profile for goalkeepers.

**CONCLUSION:** Manuel dominance does influence muscular profile of shoulder rotators, and moreover according to the player position (a significant higher influence for the back players). As a result, the isokinetic profile identified for back players leans towards muscular imbalance between internal rotators and external rotators. This kind of isokinetic profile could be a risk factor for shoulder wounds particularly for back players.

**KEYWORDS:** shoulder, isokinetic, manual dominance, handball

OP-08-04

**INTRA-ORAL DEVICE TO PREVENT SPORTS CONCUSSION:  
ELECTROMYOGRAPHIC STUDY**P. POISSON<sup>1,2,3,4</sup>, J. PETIT<sup>4</sup><sup>1</sup>Department of Dentistry and Oral Health, CHU de Bordeaux, Bordeaux, FRANCE<sup>2</sup>Department of Oral Public Health, UFR Odontologie, Bordeaux Segalen University, Bordeaux, FRANCE<sup>3</sup>Medical and Evaluation Service, Centre de Ressources, d'Expertise et de Performance Sportives de Bordeaux, Bordeaux, FRANCE<sup>4</sup>EA 4136 Handicap and Nervous System, Bordeaux Segalen University, Bordeaux, FRANCE

**INTRODUCTION:** MG implication to reduce sport concussion is not well documented 1-3. Several hypotheses have been considered among whom an increasing of neck muscle activity when jaws closed 4. Therefore, this present study aimed compare activation of superficial cervical flexor muscles during cranio-cervical flexions with and without mouthguard.

**MATERIAL AND METHODS:** Sixty subjects, mean age of 26.77 (+/-7.19), were evaluated: 31 boxers, 19 rugby players and 10 field hockey players. Each subject received a custom-made mouthguard and realized three series of six cranio-cervical flexions. During each series, the 6 cranio-cervical flexions were realized alternately open mouth and jaws closed.

**RESULTS:** First, significant increasing of SH, IH and SCM activity when subjects were jaws closed with MG. The mean of increasing was 84% for SH muscle ( $p < 0.0001$ ), 96% for IH muscle ( $p < 0.0001$ ) and 92% for SCM muscle ( $p < 0.0001$ ). Second, significant increasing of SH, IH and SCM activity when subjects were jaws closed with MG and with a load of 2 kg in extension. The mean of increasing was 211% for SH muscle ( $p < 0.0001$ ), 273% for IH muscle ( $p < 0.0001$ ) and 329% for SCM muscle ( $p < 0.0001$ ).

**CONCLUSION:** When subjects are wearing CM-MG, jaws clenching position increases SH, IH and SCM activity which contribute to head and neck stabilisation. However, future researches are necessarily to study, first gender differences, second possible relationship between this finding and prevention of sport concussion.

**REFERENCES:**

1. Benson BW, Hamilton GM, Meeuwisse WH, McCrory P, Dvorak J. Is protective equipment useful in preventing concussion? A systematic review of the literature. *Br J Sports Med* 2009;43 Suppl 1:i56-67.
2. Knapik JJ, Marshall SW, Lee RB, Darakjy SS, Jones SB, Mitchener TA, et al. Mouthguards in sport activities: history, physical properties and injury prevention effectiveness. *Sports Med* 2007;37(2):117-44.
3. Mascarenhas AK. Mouthguards reduce orofacial injury during sport activities, but may not reduce concussion. *J Evid Based Dent Pract* 2012;12(2):90-1.
4. Piccininni PM. Mouthguards and concussion prevention. International Symposium on concussion sport (abstract). *Br J Sports Med* 2001;35:375.

**POWER AND PRECISION OF THE KNOCK IN BOXING: MOUTHGUARD EFFECT**

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**INTRODUCTION:** Mouthguards are known to prevent oral trauma during sports practice 1, however it is not known how they affect the performance of the sportsmen.

**MATERIALS AND METHODS:** We studied the results of 18 boxers of the national teams when they perform jabs with the front arm and with the rear arm against a modified training bag. Jabs were performed in three different conditions: biting on a mouthguard, clenching the teeth without mouthguard, opened mouth without mouthguard. The intensity of the jabs was measured by the square of the maximal velocity reached by the bag after the jab. The velocity of the bag was obtained by the integration of the outputs of a tri-dimensional accelerometer fixed on the bag. The ground reaction forces were also measured with a force platform under each foot.

**RESULTS:** For the front jabs, the intensity was significantly (test T) higher with the mouthguard compared to opened mouth and clenched teeth (increases of 14%  $p=0.006$  and 16%  $p=0.009$  respectively). For the rear jabs, the intensity was significantly higher with the mouthguard only compared to opened mouth (increase 9%  $p=0.03$ ). Inspection of the ground reaction forces revealed that the rear jab is a more complex task than the front jab.

**CONCLUSION:** Using a mouthguard does not impair the performance but can even improve the performance during simple tasks. Several hypotheses could be done for this effect.

**REFERENCE:**

1. ADA. Using mouthguards to reduce the incidence and severity of sports-related oral injuries. J Am Dent Assoc 2006;137(12):1712-20; quiz 31.

OP-08-06

## SPORTS INJURY SURVEILLANCE AND MONITORING OF TRAINING LOAD IN YOUNG ATHLETES

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**INTRODUCTION:** Sports injury surveillance is the basis of prevention. It describes injury characteristics, provides information on risk factors and helps define prevention strategies. The aims of this study were 1) to implement an ongoing injury surveillance system so as to describe the injury problematic in a regional sports school, 2) to observe the evolution of the injury incidence over a 3-year period according to injury and sport categories, 3) to identify injury risk factors amongst sport participation characteristics in this sports context.

**METHODS:** This 3-year prospective cohort study included young (12-19 years) high-level athletes from a regional sports school, practicing at the national level of competition. An internet-based electronic surveillance system (TIPPS, Training and Injury Prevention Platform for Sports) was implemented to allow for easy recording of sporting activities and injuries. Volume and intensity (self-rated perceived exertion) of each sport session were used to compute weekly load, monotony and strain. Sport categories were defined as team, racket, and individual sports. Additionally, injuries (time-loss definition) were registered via a questionnaire on their TIPPS account. Validity of the data relative to sports injuries were verified by systematically cross-checking recorded information with the physical therapists at the sports school.

**RESULTS:** A total of 901 injuries were recorded through the 3 observation periods, representing a yearly rate of 1.61 injuries/athlete. The proportion of athletes who sustained at least one sports injury was stable over the 3 observation periods (68-74%). Team sports had a significantly different distribution of injuries relative to anatomical location ( $p < 0.001$ ), with a higher proportion of lower limb injuries and fewer upper limb and head/neck injuries. A lower overall injury incidence was found in the third period (2.81 injuries/1000h of exposure) when compared to the first (3.91 injuries/1000h,  $p < 0.001$ ) and the second period (4.79 injuries/1000h,  $p < 0.001$ ). Significant decreases of injury incidence in the third year were also observed regardless of injury or sport categorisation.

Sport participation characteristics differed between racket, individual and team sports ( $p < 0.05$ ). Weekly intensity, load and strain were dependent on age ( $p < 0.05$ ). A Cox proportional hazards regression revealed that racket and individual sports were associated with lower injury risk (HR=0.37 and 0.34,  $p = 0.001$  and  $p < 0.001$ , respectively) compared to team sports. Average sport participation characteristics were not related to injury according to the survival analysis. However, intensity during the week prior to injury was significantly higher ( $p < 0.01$ ) compared to the one of the 4 preceding weeks.

**CONCLUSIONS:** The implementation of the sports injury surveillance system allowed describing the magnitude of the problematic within the sport school. A significant reduction of injury incidence in this context was shown during the 3rd observation phase. This project may have influenced stakeholders' awareness and attitude towards the sports injury problematic.

The method applied here to analyse sport participation pattern was sensitive to display the weekly load variations over the whole sport season, to discriminate between different sport categories, and to highlight age-related differences. Apart from short-term modifications in intensity, no characteristics related to sporting activities were associated with injury risk in the present study.

**Saturday, September 28, 2013**  
**ORAL PAPERS OP9 – EXERCISE PHYSIOLOGY**

**OP-09-01**

**AEROBIC PERFORMANCE AND ISOKINETIC ASSESSMENT OF SUBMARINERS BEFORE AND AFTER PATROL**

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**INTRODUCTION:** The operational capacity of a nuclear submarine is closely linked to the performance of his crew, especially physical capacities. The constraint environment in submarine (reduced living space and sports equipments, special rhythm of work, lack of natural light, stressful environment) and limited participation could lead to a state of deconditioning in effort after deployment by reduction of physical activity.

**PURPOSE:** The main aim of this study was to evaluate whether a submarine deployment could lead to central and/or peripheral deconditioning.

**METHODS:** Thirty four submariners (aged  $26,6 \pm 4.3$  yr, watch schedule, practising aerobic sports 80%) underwent a triangular type cardio respiratory test with an electromagnetic cycle ergometer, an assessment of muscles strength (quadriceps and hamstring) with an isokinetic dynamometer at  $60^\circ/s$  and  $180^\circ/s$  and anthropometric measurements, before and after a patrol period of two months ( $65 \pm 2.68$  days).

**RESULTS:** The aerobic capacity at maximal exercise, after deployment, significantly decreased of 3 % ( $p=0.03$ ), with  $VO_{2max}$  before patrol at  $46.4 \pm 6.5$  ml.kg<sup>-1</sup>.min<sup>-1</sup> and after at  $44.9 \pm 5.7$  ml.kg<sup>-1</sup>.min<sup>-1</sup>. There was no significant difference in heart rate at maximal effort, maximal aerobic power or sub-maximal  $VO_2$  at 200W. Regarding muscular parameters, isokinetic fatigue index at  $180^\circ/s$  was significantly increased of 11 % ( $1.8 \pm 0.6$  vs  $2 \pm 0.6$  J.s<sup>-1</sup>,  $p=0.05$ ) for quadriceps as well as for hamstrings of 8 % ( $1.2 \pm 0.8$  vs  $1.3 \pm 0.3$  J.s<sup>-1</sup>,  $p=0.05$ ). No significant difference for explosive strength was found for quadriceps/hamstrings peaks torques at  $60^\circ/s$ . Anthropometric values (weight, fat mass and waist measurement) increased significantly ( $p < 0.05$ ).

**CONCLUSION:** This study shows that submariners have impaired cardio-respiratory performances, accompanied by increased peripheral muscular fatigability after two-months submarine deployment.

**KEYWORDS:** cardiovascular deconditioning; Muscle Strength, isokinetic evaluation; muscular fatigue; submariners

**REFERENCES:**

1. Fothergill DM and Sims JR. Aerobic performance of Special Operations Forces personnel after a prolonged submarine deployment. *Ergonomics*, 2000 Oct; 43(10):1489-1500
2. Bennett BL, Schlichting CL, Bondi KR. Cardiorespiratory fitness and cognitive performance before and after confinement in a nuclear submarine. *Aviat Space Environ Med.* 1985 Nov; 56(11):1085-91.

**OP-09-02****PERCEIVED EXERTION: WOULD YOU TELL WHAT YOU FEEL?**

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**INTRODUCTION:** Perceived exertion is measured by the Borg scale. Minimization of perceived exertion arises when subjects are selected under physical constraint. Military subjects are routinely selected upon physical performance tests, which lead them to overtake perceived exertion and expose them to heat injuries. Beside the Borg scale, can exertion be measured by surrogate markers?

**PATIENTS AND METHODS:** 61 fit military subjects were studied before and after they performed their first 8 km running with complete battle dress, including an 11 kg rucksack. Salivary cortisol, interleukin 1 beta and amylase were measured before, after and the day after the run. Sinusal variability was measured the night before and the night after the run. Anxiety was measured by the state anxiety inventory before and after the run.

**RESULTS:** Discrepancy between perceived and “observed” exertion was noticed, and the Borg scale did not match to any of the studied variables. Better performance was related to low salivary cortisol before and after exercise, and decrease in relative low frequencies before exercise. In a principal component analysis, low frequencies are clustered with salivary cortisol and amylase after exercise.

**CONCLUSION:** Salivary cortisol and heart rate variability variables are surrogate markers for performance but their combination for determining exertion should be assessed by future studies.

**OP-09-03****ROWING ERGOMETER WITH THE SLIDE IS MORE SPECIFIC TO ROWERS' PHYSIOLOGICAL EVALUATION**

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The determination of metabolic thresholds and maximal aerobic power are the most useful tests to rowers' training monitoring and prescription (Mäestu et al., 2005). During progressive rowing ergometer test to exhaustion, the determination of onset blood lactate accumulation (OBLA) intensity, peak oxygen uptake (VO<sub>2</sub>peak) and intensity associated to VO<sub>2</sub>peak are the most common parameters used to prescribe training sessions. The most used rowing ergometer is the Concept 2 (Elliott et al., 2002), but the movement dynamics on the rowing ergometer is different from the dynamics in the water. To better simulate the on water rowing dynamics the manufacturer of the Concept 2 created an accessory called the slide. It consists of a rail that is mounted underneath the ergometer, allowing it to move in opposite direction of the rower, just as it happens in the water, where the rower displaces the boat (Campos Mello et al., 2009). However, no studies were found that evaluated the physiological responses or the performance during graded exercise test in this new device compared to the traditional rowing ergometer. Thus, the present study investigated the performance and physiological responses (VO<sub>2</sub>, heart rate and blood lactate concentration) of eight male

rowers (age:  $23.8 \pm 5.5$  years, body mass:  $81.4 \pm 6.7$  kg, height:  $184.0 \pm 5.8$  cm) during incremental tests to exhaustion performed either in a rowing ergometer without or with the slide. The athletes also performed a 2000m race simulation on water with time, lactate, heart rate and  $VO_2$  measurements. All rowers had been rowing competitively for at least four years and had large experience in rowing individual boats. The experimental protocol was approved by the local Ethics Committee. Normality of the data was checked and confirmed by using the Shapiro-Wilk test. The physiological responses measured during the progressive tests and the slopes of the  $VO_2$ -load relationship were compared through Student's t-test for matched samples. The relationship between variables were determined via Pearson correlation coefficient.  $VO_{2peak}$  during on water race and  $VO_{2peak}$  during ergometer tests were compared through one-way analysis of variance for repeated measurements. Effect sizes were calculated and statistical significance was set at  $P < 0.05$ .  $VO_{2peak}$  was statistically higher (3.4%;  $P = 0.005$ ) in the test without the slide ( $5.18 \pm 0.44$  L.min<sup>-1</sup>) compared to the slide condition ( $5.01 \pm 0.37$  L.min<sup>-1</sup>). For all other variables no difference was found. Time on water race simulation was significantly correlated to the slope of the  $VO_2$ -load relationship in the slide condition ( $r = -0.73$ ,  $P = 0.043$ ) and  $VO_{2peak}$  during the test in the slide condition was correlated to mean  $VO_2$  at the on water race simulation ( $r = 0.78$ ;  $P = 0.024$ ). Thus, the use of accessory slide on Concept2 rowing ergometer does not imply changes in the submaximal physiological responses of the activity, but affects  $VO_{2peak}$ . Additionally,  $VO_2$  is related to the load during the incremental test using the slide, suggesting that the use of this device is more beneficial than the regular test when evaluating rowing skill on water as well as aerobic power for rowing.

#### OP-09-04

### WITHIN-SUBJECT VARIATION IN THE ACCELERATION AND VELOCITY OF TRUNK ROTATION IN PARALYMPIC ATHLETES

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**OBJECTIVE:** Though there are various tests of core strength and endurance, these are not specifically designed for paralympic athletes, in particular for wheelchair users. In these athletes, core musculature is a foundation for efficient movement and maximum power production. To evaluate power and/or velocity during trunk rotation, one should use the dynamometer allowing these athletes to exercise in the seated position, as opposed to the other systems measuring while standing. Contrary to this testing, it is not known variability between individuals in the trunk rotation velocities measured in the seated position and to which extent it correlates with the range of trunk motion. This parameter was assumed to be different between individuals due to their level of paralysis. This study estimates the within-subject variation in the trunk rotation velocity and acceleration, and its relationship with angular distance covered.

**MATERIALS AND METHODS:** Eleven paralympic table tennis players (age  $24.7 \pm 5.2$  years, height  $176.7 \pm 9.5$  cm, weight  $87.2 \pm 16.0$  kg) were tested before London Paralympics. They performed 5 rotations of the trunk to each side in the seated position with barbell of 1 kg placed on the shoulders. The system FiTRO Torso Dynamometer was used to monitor basic biomechanical parameters involved in exercise. The system measures angular velocity and calculates circumferential velocity, as follows:  $v\omega = (\omega/360) \times 2\pi r$ , where  $\omega$  is the angular velocity, and  $r$  is the turning radius. Acceleration is obtained by derivation of velocity. Peak and mean values of velocity and acceleration during rotational movement of the trunk were analysed.

**RESULTS:** Peak velocity of trunk rotation was  $235.3 \pm 55.0$  °/s and ranged between 152.7 and 330.6 °/s. Peak acceleration of trunk rotation was  $19.6 \pm 6.4$  m/s<sup>2</sup> and ranged between 10.6 and 30.5 m/s<sup>2</sup>. Mean velocity in acceleration phase of trunk rotation was  $140.2 \pm 37.2$  °/s and ranged between 83.5 and 202.1 °/s.

Mean acceleration of trunk rotation was  $6.0 \pm 1.9$  m/s<sup>2</sup> and ranged between 3.1 and 9.7 m/s<sup>2</sup>. These values were in high or moderate relation with distance covered. Angular distance correlated strongly with peak and mean velocity of trunk rotation ( $r = 0.91$ ,  $p < 0.01$  and  $r = 0.90$ ,  $p < 0.01$ , respectively), while peak and mean acceleration of trunk rotation showed no significant correlation ( $r = 0.57$ ,  $p = 0.09$  and  $r = 0.52$ ,  $p = 0.17$ , respectively). Coefficients of variation were greater for peak and mean acceleration (34.9 % and 33.1 %, respectively) than for peak and mean velocity (25.2 % and 28.7 %, respectively). Within-subject variation was unaffected by angular distance of trunk movement ( $p > 0.05$ ). It is therefore likely that performance level plays a role in underlying variation within individuals.

**CONCLUSIONS:** These findings indicate that peak and mean velocity and acceleration of trunk rotation are sensitive parameters able to discriminate among performance levels of paralympic table tennis players. The within-subject variation seems to be mainly due to conditioning of these athletes rather than the range of trunk motion.

#### OP-09-05

### NATIVE MILK PROTEIN PROLACTA® REDUCES MUSCLE FATIGUE AFTER A 10-WEEKS RESISTANCE TRAINING: A CONTROLLED, RANDOMIZED, DOUBLE BLIND, CLINICAL TRIAL

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**INTRODUCTION:** It is now well documented that protein supplementation during a resistance training has positive influence on muscle mass and strength gains (e.g., Cermak et al., 2012). An effect during acute prolonged exercises is also observed (Derave et al., 2007) but equivocal results are obtained (Kerksick et al., 2006). Such difference could be attributed to the protein used. Therefore, the aim of the present study was to demonstrate versus placebo the effect of two different milk proteins (miscellar casein and native milk protein Prolacta®) on muscular performance (muscle power and muscle fatigue) during and after a resistance training program.

**METHODS:** 68 physically active men, aged  $22.2 \pm 3.9$  years, were included in the study and conducted 10 weeks resistance training on lower limb muscles. According to randomization, they were included in a placebo (PL,  $n = 24$ ), PROLACTA® (PRO, native milk proteins,  $n = 22$ ) or a miscellar casein (MC,  $n = 22$ ) group. All had to take the placebo or proteins twice a day during the 10-weeks training period. Protein intake was 30 g per day. The main outcome was the leg extensors muscular power. It was evaluated at inclusion (PRE) after 4 weeks and after 10 weeks training (W4 and W10, respectively). Also, during each testing session, it was measured before and immediately after an all-out endurance test (maximum repetition number during leg extensions using 70% of the maximal load) and permitted to quantify muscle fatigue (absolute decrease in muscle power).

**RESULTS:** At inclusion, groups were similar for muscle power and muscle fatigue. After the whole training program, a similar muscle power increase was obtained for the three groups ( $115 \pm 121$  W,  $139 \pm 90$  W,  $102 \pm 162$  W for PL, MC and PRO, respectively). Muscle fatigue was significantly lower in the PRO group at W4 and W10 ( $-327 \pm 114$  and  $-297 \pm 130$ , respectively) as compared with PL ( $-439 \pm 154$  and  $-479 \pm 138$ , respectively) and MC ( $-415 \pm 165$  and  $-414 \pm 139$ , respectively). In comparison with PRE values, muscle fatigue was significantly decreased in the PRO group ( $-36 \pm 133$ W) while it significantly increased in PL ( $65 \pm 155$ W) and MC ( $89 \pm 98$ W) groups ( $p < 0.05$ ).

**DISCUSSION:** Protein type has large influence on muscular performance after prolonged resistance training. Indeed, as compared with placebo or another milk protein (miscellar casein), the present study demonstrate that native milk protein Pro lacta® (PRO) significantly reduce the muscle fatigue induced by an intense exercise. It can therefore be suggested that Pro lacta® supplementation, concurrent with adequate resistance training, may be useful to complete prolonged training sessions or competitions.

OP-09-06

## THE EFFECTS OF NITRATE SUPPLEMENTATION ON CYCLING PERFORMANCE: A LITERATURE REVIEW

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**AIM:** To systematically evaluate the ergogenic value of nitrate supplementation in cycling.

**BACKGROUND:** Cycling is a high intensity endurance sport that combines both anaerobic and aerobic components. A well planned diet with proper nutrition is the foundation upon which a comprehensive training program and performance can be built. Cyclists, both competitive and non-competitive are in constant search for new supplements that will enable them to improve their performance. A recent study showed that highest prevalence of nutritional supplements in Canadian athletes at the Atlanta and Sydney Olympics was in cycling. While a number of excellent reviews have evaluated the performance enhancing effects of most dietary supplements less attention has been made to the performance enhancing claims of nitrates in cycling.

**METHODOLOGY:** A comprehensive, systematic literature review was conducted using databases of PubMed, MEDLINE and the Cochrane library. The following search terms were used in differing combinations: 'nitrate', 'nitrite', 'cycling', 'cyclists', 'supplement', 'supplementation' and 'beetroot juice'. The literature was limited to human studies and adults and articles in English. All titles and abstracts, without time limits, were reviewed.

**RESULTS:** 9 studies involving 69 trained cyclists and 25 recreational active subjects were included after screening. All studies had a crossover design and with nitrate supplements in the form of Beetroot juice or sodium nitrate. Exercise protocols varied from submaximal workloads, incremental tests to exhaustion and time trials. The mean number of subjects was 10.4 (SD 3.8) with a range 8 – 20. In total there were 91 males and 3 females with an average age of 27.6 (SD 4.3). Collectively these studies show that nitrate supplementation may reduce the oxygen cost in sub-maximal workloads and improve time trial performance. VO<sub>2</sub>max and peak power results varied at maximal intensities. Only 1 of the 9 studies reported no improvement in a 1-hr time-trial performance in well-trained cyclists.

**CONCLUSION:** There is an increasingly growing evidence for the role of nitrate in cycling performance. The cellular mechanisms responsible for effects observed remain unknown and larger-scale studies will be required to verify these findings. Moreover, questions remain over the nitrate dose–physiological response relationship and the ergogenic effects in other populations. Although increased consumption of nitrate-rich natural vegetable products is unlikely to be harmful to health, presently little is known about the effects of chronic ingestion of nitrate at high doses. Therefore, athletes are cautioned against indiscriminate use of these supplements, since long term studies on the effect of enhancing nitric oxide bioavailability are lacking. However, the move towards using more natural products such as nitrate-rich beetroot to enhance nitric oxide bioavailability is encouraging.

Saturday, September 28, 2013

## ORAL PAPERS OP10 – MEDICINE AND SPORTS PHYSIOLOGY

OP-10-01

### DIURNAL VARIATION OF IL-6 DURING THE WINGATE TEST: EFFECT OF SLEEP LOSS

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It is clear that short-term maximal performance is best at the afternoon, around the peak of the circadian rhythm of body temperature (Chtourou et al., 2011). Likewise, Vgontzas et al. (2005) suggest an interaction among sleep, circadian rhythms, and pro-inflammatory cytokine such as Interleukin-6 (IL-6). The present study was designed to evaluate the effect of time of day and partial sleep deprivation on short-term maximal performance and IL-6 in trained subjects.

**METHODS:** Twelve football players were asked to perform a 30-s Wingate test during which peak (PP) and mean (PM) power were measured. Tests were performed at 08:00 h (morning) and 18:00 h (afternoon) after two nocturnal regimens: (i) a normal (reference) sleep night (RN) and (ii) 4-h of partial sleep-deprivation (PSD) caused by an early awakening. The regimens were undertaken in a randomized order. Plasma concentrations of IL-6 were measured before (P1), immediately after (P2), and 60 min after (P3) exercise.

**RESULTS:** PP and MP improved significantly from the morning to the afternoon in both NC and PSD conditions ( $p < 0.05$ ). Compared with RN, PP and MP were not affected by PSD the following morning (08:00 h), although there was a significant decrease in PP and MP ( $p < 0.001$ ) at 18:00 h. In all conditions, IL-6 and resting core temperature were significantly higher ( $p < 0.001$  and  $p < 0.05$ , respectively) in the afternoon than the morning. During the four test sessions, IL-6 levels increased significantly from P1 to P2 ( $p < 0.01$ ). Compared to the RN condition, IL-6 concentrations remained elevated in the afternoon during the recovery period (P3) after PSD ( $P < 0.05$ ). However, no significant difference was observed between P1 and P3 during the two test sessions in RN and at 08:00 h after PSD.

**DISCUSSION:** Our results showed that 4-h of partial sleep deprivation at the end of the night modified the magnitude of the diurnal fluctuation of anaerobic performances due to a decrease in performance at 18:00 h (Souissi et al., 2008). In addition, PSD may alter plasma concentration of IL-6 during the recovery period in the afternoon after a short-term maximal exercise.

**CONCLUSION:** Partial sleep deprivation is exceedingly useful in testing the biological- and immunological responses that are linked to homeostatic drive for sleep and in exploring the reciprocal interactions between sleep and cytokines

## INTENSIVE PHYSICAL TRAINING IMPROVES BONE STATUS IN WORLD CLASS RHYTHMIC GYMNASTS

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**CONTEXT:** Regular physical activity during pubertal period improves bone mass acquisition. However, it is less know if extreme intense training as the same favorable effect on the skeleton.

**OBJECTIVE:** The aim of this study was to evaluate the bone mass acquisition in a cohort of world class athletes practicing intense training of rhythmic gymnastic (RG).

**STUDY PARTICIPANTS:** A total of 133 adolescents and young women with a mean age  $18.7 \pm 2.7$  years (ranging from 14.4 to 26.7 years): 81 elite RGs and 51controls (CON) participated to this study.

**MAIN OUTCOME MEASURES:** Broadband ultrasound attenuation (BUA in dB/Mhz) was determined using quantitative ultrasound (QUS) at the heel. Anthropometric and body composition measurements and questionnaires designed to assess the general medical, menstrual and training histories was paralleled performed.

**RESULTS:** RGs presented lower values for weight (-8.5%,  $p < 0.001$ ), BMI (-11.7%,  $p < 0.001$ ), body fat mass (% and kg, -43% and -61.7%, respectively,  $p < 0.001$ ) and higher values for muscle mass (6.3%,  $p < 0.01$ ). The age of menarche was significantly delayed ( $p < 0.001$ ) in

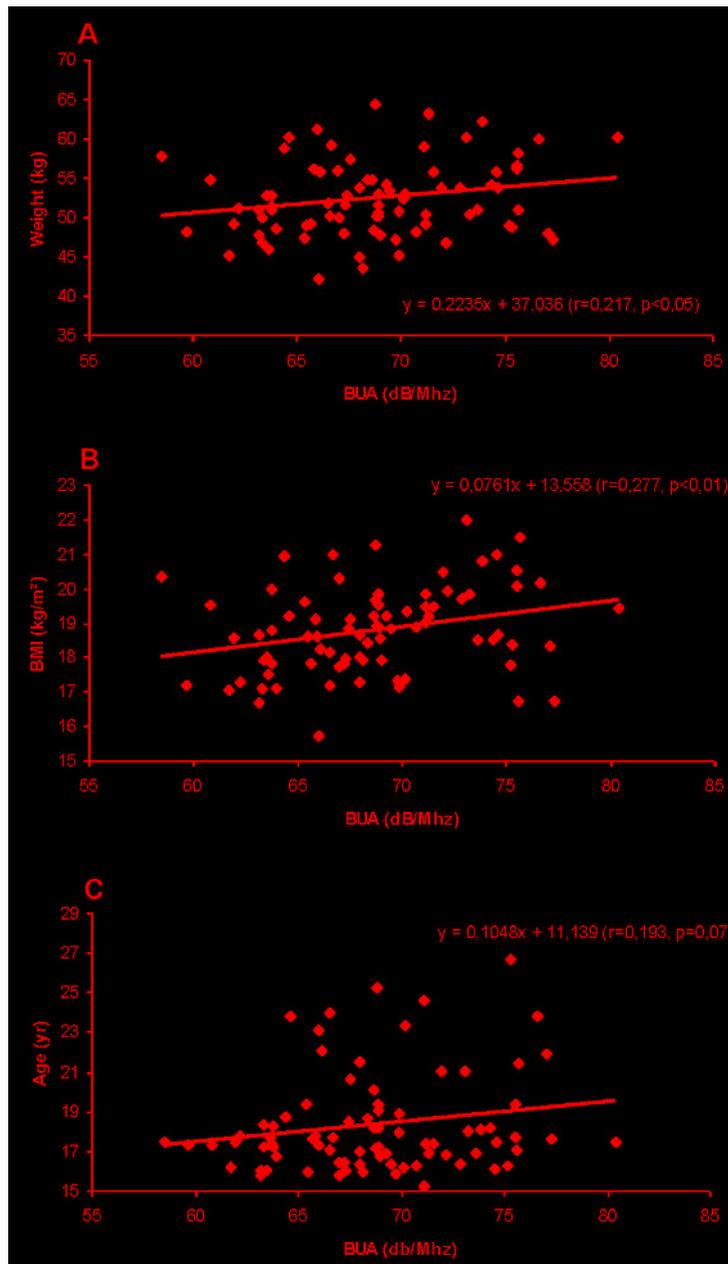


Figure: Correlation analysis between BUA and weight (A), BMI (B) and age (C) in rhythmic gymnasts.

RGs ( $15.6 \pm 1.6$  yr) compared with CON ( $12.7 \pm 1.7$  yr). RGs presented also a high prevalence of menstrual disorders (55%). BUA values were higher (+5%) in RGs vs. CON ( $68.6 \pm 4.6$  dB/Mhz and  $65.4 \pm 3.3$  dB/Mhz, respectively;  $p < 0.001$ ). This difference was exacerbated when BUA was adjusted by age and body weight. In RGs, BUA values were not affected by the menstrual or the training status. Among RGs with menarche, BUA was higher ( $71.5 \pm 4.1$  dB/Mhz and  $67.9 \pm 3.5$  dB/Mhz) in relative retarded ( $14.4 \pm 0.8$  yr) vs. severely retarded ( $17.3 \pm 1.4$  yr) menarchal age. BUA was positively correlated to body weight and BMI and tended to be correlated with age (figure).

**CONCLUSION:** Conversely to be expected in adolescence and young women with a high prevalence of menstrual disorders and delayed menarche, intense training in rhythmic gymnastic appeared benefit for bone health. This favourable effect appeared nevertheless modulated by the age of menarche. The high mechanical loading generated by this high physical activity, may counterbalance the negative effect of menstrual disorders.

### OP-10-03

## HEATED WATER-BASED EXERCISE REDUCES BLOOD PRESSURE IN RESISTANT HYPERTENSION: A RANDOMIZED CONTROLLED TRIAL

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**BACKGROUND:** Regular exercise is an effective intervention to decrease blood pressure (BP) in mild-to-moderate hypertension. However, there is no data concerning the effects of heated water-based exercise (HEx) in hypertensive patients. In addition, BP control is a clinical challenge in patients with resistant hypertension. The present randomized controlled trial examines the BP effects of HEEx on resistant hypertension.

**METHODS:** Thirty-two patients with resistant hypertension were randomized to HEEx ( $n=16$ ) or control ( $n=16$ ). The training program was performed of 60 min sessions in a heated pool ( $32^{\circ}\text{C}$ ), three times per week over 12 week. The protocol in HEEx included walking (30 min, intensity between 11 to 13 Borg's Scale) and callisthenic exercises. All patients were submitted to 24-hour ambulatory BP monitoring before and after program.

**RESULTS:** The training program was well tolerated by all patients. Heated water-based exercise program significantly decreased 24-hour systolic BP (from  $137 \pm 23$  to  $120 \pm 12$  mmHg,  $p=0.001$ ) and diastolic BP (from  $81 \pm 13$  to  $72 \pm 10$  mmHg,  $p=0.009$ ); daytime systolic BP (from  $141 \pm 24$  to  $120 \pm 13$  mmHg,  $<0.0001$ ) and diastolic BP (from  $84 \pm 14$  to  $73 \pm 11$  mmHg,  $p=0.003$ ); and nighttime systolic BP (from  $129 \pm 22$  to  $114 \pm 12$  mmHg,  $p=0.006$ ). Nighttime diastolic BP did not change after HEEx (from  $74 \pm 11$  to  $73 \pm 11$  mmHg,  $p=ns$ ). Besides, BP cardiovascular load was reduced significantly during 24-hour, daytime, and nighttime after heated water-based exercise. The control group after 12 weeks significantly increases diastolic BP daytime (from  $86 \pm 10$  to  $88 \pm 9$  mmHg,  $p=0.005$ ) and nighttime (from  $76 \pm 12$  to  $88 \pm 9$ ,  $p < 0.0001$ ).

**CONCLUSION:** Heated water-based exercise reduced 24-hour, daytime and nighttime ABPM levels. These effects suggest that heated water-based exercise may have a potential as a new therapeutic approach to resistant hypertensive patients.

## ULTRASOUND IMAGING FOR OSTEITIS PUBIS

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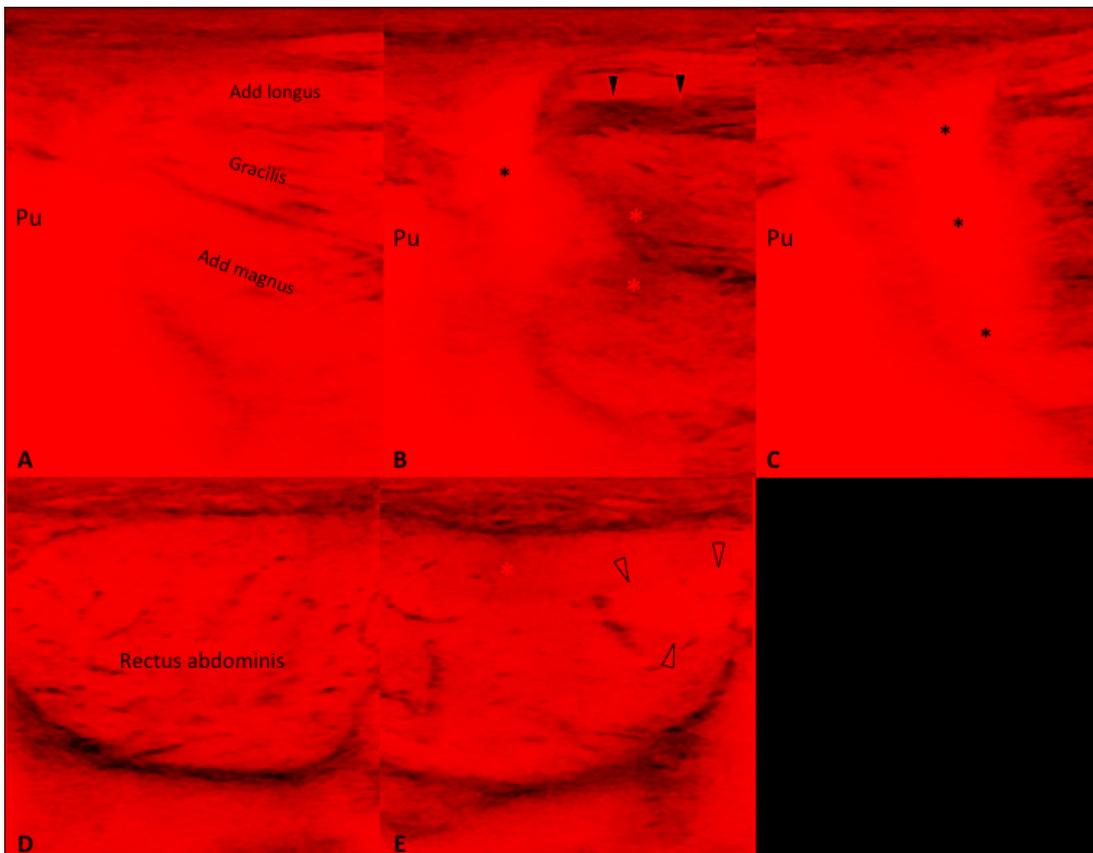
<sup>1</sup>Department of Physical and Rehabilitation Medicine, Hacettepe University Medical School, Ankara, TURKEY

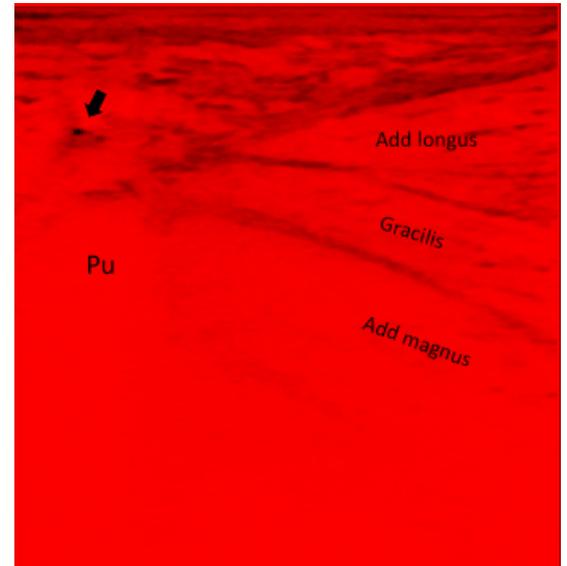
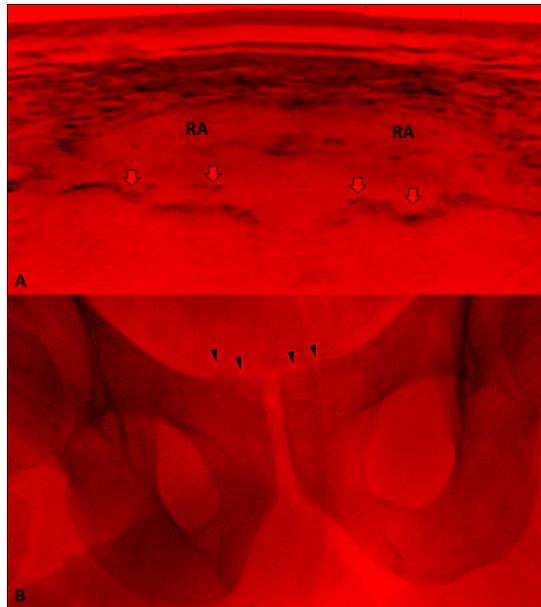
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The painful overuse injury of symphysis pubis and nearby tissues is defined as Osteitis Pubis(OP). It is the third most common etiological factor of groin pain and due to the complex anatomy of the region, shearing stress of the muscles attaching onto the pubic bone is the main pathology for OP. The diagnosis may be confusing if the patient describes inguinal, lower abdominal, scrotal or perineal pain. Imaging is helpful for the prompt and early diagnosis of OP. Imaging modalities consist of x-ray, bone scanning, computed tomography, magnetic resonance imaging and ultrasound.<sup>1,2</sup>

Ultrasound examination can be performed easily either in a clinical setting or, with a portable machine, in any sports field. By being a convenient, inexpensive, non-invasive, repeatable point-of-care tool providing real-time dynamic recurrent imaging without exposure to radiation, musculoskeletal ultrasound may be used also for diagnosing ,follow-up and interventional treatment of OP. Above the quoted advantages, being subject independent and noninfluential for detecting inside the bone are the main disadvantages of ultrasound imaging.<sup>3,4</sup>

Ultrasound technique for OP starts with a correct positioning of the patient for easy visualization. As the pubic region is quite sensitive to palpation, it is more comfortable to have the patient lie supine during the examination. Palpating the painful tissue and observing it on the screen –sonopalpation- is another benefit of dynamic imaging. If an inflammatory condition is suspected or for the follow up of tendon healing, power





Doppler imaging can also be used. Initially, starting imaging with the asymptomatic side can provide better orientation especially in particular cases whereby the normal anatomy may be significantly deteriorated on the site of injury.<sup>3,4</sup>

The aim of this essay is to illustrate the imaging findings of OP by using MSUS -which has already become the stethoscope of the musculoskeletal physicians.

#### REFERENCES

1. Beatty T. Osteitis pubis in athletes. *Curr Sports Med Rep* 2012;11:96-8.
2. Koulouris G. Imaging review of groin pain in elite athletes : an anatomic approach to imaging findings. *AJR Am J Roentgenol* 2008;191:962-72.
3. Özçakar L, Tok F, De Muynck M, et al. Musculoskeletal ultrasonography in physical and rehabilitation medicine. *J Rehabil Med* 2012;44:310-8.
4. Tok F, Özçakar L, De Muynck M, et al. Musculoskeletal ultrasound for sports injuries. *Eur J Phys Rehabil Med* 2012;48:651-63.

## MUSCULAR AND CARDIO RESPIRATORY CHARACTERIZATION OF THE PHYSICAL EFFORT CONCERNING THE YOUNG INSULIN DEPENDANT DIABETIC

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The increase of the number of diabetic rests essentially on three main elements responsible for the insulin-dependence, the development of obesity, sedentariness and ageing. To prevent and fight the first two causes of this increase, physical activity appears as an essential element in the support and the treatment of the diabetic (1,2). According to recent works, the insulin-dependent diabetic (ID) without complications and with a good glycemic control can practice several types of physical activities (3,1,6). Nevertheless, the motivation to put a lot into a regular physical practice is very often limited by the initial physical inaptitude of the subjects (5,6). So, its prescription in combination with the clinical treatments requires an objective evaluation of the physical capacities in the effort of the diabetics (5,6), thus showing the importance of determining the factors limiting the physical capacity to the effort of the diabetics (4,5,6).

In order to study physical adaptation of children with insulin dependent diabetes mellitus (ID), two kinds of test were administered: an isometric test with a force maintain (50% of voluntary maximal force) in leg extension and a linear incremental test on ergocycle (from 20% to 100% of the maximal aerobic power during 8min). For each test, the electromyographic signal (EMG) of quadriceps muscle was characterized in the spectral domain by calculating total energy (ET) and mean power frequency (MPF). During the incremental test, cardio-respiratory variables (heart rate, O<sub>2</sub> consumption, CO<sub>2</sub> production) and metabolic variables (glycaemia, lactatemia, and kaliemia) were measured. With a healthy children group (ETS), ID in isometric condition showed a more important fatigability. In dynamic condition, changes in cardio-respiratory variables were similar while metabolic variables evolved in a different way. Moreover, changes in ET and MPF were illustrated by specific profiles for young children compared to teenagers (quasi-linear increase for ET, relative stability for MPF). Using a discriminant analysis, ETS and ID children may be differentiated. Thus, the EMG signal reflects metabolic changes during incremental test and may be used to characterize ID physical aptitude.

### REFERENCES:

1. Hayes C and Kriska A. Role of Physical Activity in Diabetes Management and Prevention. *J Am Diet Assoc.* 2008 ; 108:S19-S23.
2. Hey-Mogensen M, K. Højlund, B. F. Vind, L. Wang, F. Dela, H. Beck-Nielsen, M. Fernström, K. Sahlin. Effect of physical training on mitochondrial respiration and reactive oxygen species release in skeletal muscle in patients with obesity and type 2 diabetes. *Diabetologia.* 2010 ;53:1976-1985.
3. Grimm JJ, J Ybarra, C Berné, S Muchnick and A Golay. A new table for prevention of hypoglycemia during physical activity in type 1 diabetic patients. *Diabetes Metab* 2004 ;30 :465-70.
4. Merzouk, A., Portero, P., Boudailliez, B., Lalau, JD., Gamet, D. L'enfant diabétique à l'exercice: Etude multiparamétrique. *Science & Sport.* 2001;2:104-106.
5. Zinman B, Ruderman N, Campagne BN, Devlin JT and Schneider SH. Physical Activity/Exercise and Diabetes Mellitus. *Diabetes Care.* 2003 ; 26 (1): S73-77.
6. Varni JW, Limbers CA, Bryant WP, Wilson DP. The PedsQL multidimensional fatigue scale in type 1 diabetes: feasibility, reliability, and validity. *Pediatr Diabetes* 2009.10(5):321-8

OP-10-06

**ROTATOR CUFF STRENGTH WEAKNESS IN RECURRENT ANTERIOR SHOULDER INSTABILITY PHYSIOPATHOLOGY**P. EDOUARD<sup>1</sup>, L. BEGUIN<sup>2</sup>, F. FARIZON<sup>3</sup>, P. CALMELS<sup>1</sup><sup>1</sup>*Department of Physical Medicine And Rehabilitation, Exercise Physiology Laboratory Ea 4338, University of St Etienne, Saint Etienne, FRANCE*<sup>2</sup>*Orthéo, Saint Etienne, FRANCE*<sup>3</sup>*Department of Orthopedic Surgery, Exercise Physiology Laboratory Ea 4338, University of St Etienne, Saint Etienne, FRANCE*

**BACKGROUND:** Although rotator cuff contractions play an important role in stabilizing the glenohumeral joint, little is known about the role of these muscles in physiopathological recurrent anterior instability.

**OBJECTIVE:** To analyze the association between isokinetic internal rotator (IR) and external rotator (ER) muscle strength and glenohumeral joint instability in patients with nonoperated recurrent anterior instability.

**DESIGN:** Case-control study.

**SETTING:** Department of Physical Medicine and Rehabilitation, Laboratory setting.

**PARTICIPANTS:** Forty-eight subjects participated: 37 patients (25±8 yr, 179±6 cm, 74±9 kg) and 11 healthy nonathletic subjects (24±1 yr, 178±5 cm, 70±9 kg).

**INTERVENTIONS:** ER and IR strength of 37 patients with unilateral recurrent anterior post-traumatic shoulder dislocation were compared with those of 11 healthy nonathletic subjects. Isokinetic shoulder IR and ER strength was evaluated with a Con-Trex® dynamometer, in the seated position with 45° of shoulder abduction in the scapular plane. Tests were performed at 180°.s<sup>-1</sup>, 120°.s<sup>-1</sup> and 60°.s<sup>-1</sup> in concentric mode for both sides.

**MAIN OUTCOME MEASUREMENTS:** Peak torque normalized to body weight for IR and ER and ER/IR ratio were calculated for each angular velocity. The association between IR and ER strength and shoulder instability was analyzed by side-to-side comparisons and comparisons to the control group.

**RESULTS:** The association between shoulder instability and IR and ER strength was associated with side-to-side differences (P<0.05). By comparisons to a control group, strength values were lower on the pathological shoulder side than on the healthy homolateral shoulder side of controls at 180°.s<sup>-1</sup> and 120°.s<sup>-1</sup> (P<0.05). The side-to-side differences were increased when the nondominant side was involved and were decreased when dominant side was involved. We found no association between glenohumeral joint instability and ER/IR ratio.

**CONCLUSIONS:** IR and ER strength weakness was associated with recurrent anterior instability and side-to-side differences depended on the dominance of the side involved.

# Free Poster Communications

## POSTER SESSION PP1 – EXERCISE FOR HEALTH-1

### PP-01-01

#### EFFECT OF REGULAR AEROBIC EXERCISE ON HOT FLUSHING IN POSTMENOPAUSAL WOMEN

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**BACKGROUND AND OBJECTIVE:** Most women that reached menopause, experience hot flushing .this study was done with this purpose to investigate the effects of regular aerobic exercise on hot flushing in postmenopausal women.

**METHODS:** In this experimental study, twenty six postmenopausal women with hot flushing symptom with age of 45-55 years, who sampled randomly in 2 groups (control and experimental), were participated in this investigation. The experimental group followed exercise training program including walking three times a week, for 3 months. But control group did not participate in any exercise program. The number of hot flushing was measured before and after exercise.

**FINDINGS:** Mean of hot flushing in experimental group before exercise training relative to after exercise training were significantly decreased .

**CONCLUSION:** The results of present study demonstrated that regular aerobic exercise training decrease hot flushing symptom. So, the authorities should apply strategies to decrease hot flushing by changing life style from inactivity to exercise training in order to support postmenopausal women health.

### PP-01-02

#### TELEPHONE SUPPORT ORIENTED BY ACCELEROMETER MEASUREMENTS ENHANCES ADHERENCE TO PHYSICAL ACTIVITY RECOMMENDATIONS IN NON-COMPLIANT PATIENTS AFTER A CARDIAC REHABILITATION PROGRAM

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**BACKGROUND:** One of the main challenges of cardiac rehabilitation programs (CRP) is to obtain sustained modifications in lifestyle habits. We recently demonstrated that, among patients who had completed a comprehensive CRP, about half resumed a sedentary lifestyle (i.e. weekly moderate-intensity physical activity (PA) < 150 min) in the short and long term (2 months and one year after CRP). Thus, it appears important to experiment new strategies for the follow-up of patients post-discharge in order to allow them

to reach target levels recommended by physicians. Our aim was to assess the efficacy of a strategy based on telephone support oriented by accelerometer measurements, on the adherence to PA recommendations in cardiac patients not achieving PA recommendations.

**METHODS:** Twenty-nine non-compliant cardiac patients (weekly moderate-intensity PA <150 min) who benefited from a CRP were randomized in intervention group (IG, n=19) or in control group (CG, n=10). The IG wore an accelerometer during 8 weeks to assess the active energy expenditure (EE, in Kcal) and the time spent in light, moderate or intense levels (min/week). Every 15 days, feedback and support were provided by telephone. The CG wore the accelerometer only during 8th week of the intervention.

**RESULTS:** Weekly time spent at moderate-intensity PA increased from  $95.6 \pm 80.7$  to  $137.2 \pm 87.5$  min between the 1st and 8th week ( $p=0.002$ ) in the IG only, with 53.6 % of the sample achieving the targeted amount of moderate-intensity PA. During the 8th week, the EE averaged  $543.7 \pm 144.1$  kcal and  $266.7 \pm 107.4$  kcal in the IG and CG, respectively ( $p=0.004$ ).

**CONCLUSIONS:** Telephone support based on accelerometric recordings appeared to be an effective strategy to improve the adherence to PA in non-compliant patients. This intervention could be implemented after CRP because it represents an inexpensive, modern and easy-to-use strategy.

### PP-01-03

#### EFFORMIP, A FRENCH REGIONAL SUPPORT FOR PHYSICAL ACTIVITY AND HEALTH

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**OBJECTIVE:** To support physical activity promotion for patients suffering from chronic diseases by medical doctors and physical-activity (PA) coaches.

**METHOD:** effORMip is a French association giving courses to medical doctors (MD) and physical-activity coaches who are interested in physical activity prescription for patients suffering from chronic diseases. Most of the coaches are licensed in a club. Physical activity is prescribed by a medical doctor, then application of the program is supervised by a PA coach. effORMip's MD and PA coaches differ from usual PA coaches considering their training in PA for health. They support education and counseling of patients. PA coaches facilitate the integration of the patients in a club and they drive the observance of the physical exercise program prescribed. The monitoring of the procedure is supported by a coordination team. Efficacy of the procedure has been assessed after six years of experience. Efficacy criteria were defined as socio-economic criteria.

**RESULT AND PERSPECTIVE:** About 80% of the patients were still engaged in PA after one year of support in effORMip. Transferability of the regional process at the national level has been assessed and will be discussed.

### PP-01-04

#### WHAT ARE THE BARRIERS FOR A REGULAR PHYSICAL ACTIVITY (PA) PRACTICE?

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**BACKGROUND:** Sedentarity is the second cause of morbidity and mortality after smoking, especially its

effects on overweight and its cardiovascular consequences. Thus, for many years the fight against physical inactivity is raised to be a national priority in public health promotion.

**OBJECTIVES:** The purpose of this study is to identify the barriers to practice a regular physical activity (PA), to do a state of inactivity and to assess the knowledge of recommendations of PNNS (Plan National Nutrition Santé), among the Midi-Pyrénées population. In early 2012, no French study has explored this subject.

**METHOD:** This cross-sectional survey by declarative self-administered questionnaire was conducted with 20 general practitioners drawn from among training master regional university. The questionnaires were offered to all patients aged from 18 to 75, consulting the 3 predefined study days. 501 questionnaires were completed and analyzed.

**RESULTS:** 162 patients (33.1 %) of our sample have a Ricci and Gagnon score less than 16 and are therefore inactive. Third (31.4 %) of subjects with non-sportive parents have never practice an extra-school AP, against 5 / 164 (3 %) of subjects with at least one sportive parent. The main barrier, among the population, is the lack of time, for professional reasons (39.3 %), for family reasons (37.2 %), the lack of motivation (27.3 %) and health barriers : low back pain (25.4 %) or various diseases (15.6 %). 493 patients (99.4 %) believe that PA is good for health. 167 subjects report that it is recommended to do three sessions per week (44 %), 18 answer 5 sessions (4.7 %) and 40 report a frequency greater or equal to 5 times per week (10.5 %). 261 patients (54.4 %) believe that, to have a positive health effect, a PA session has to last at least 30 minutes. To initiate a strategy to fight against sedentarity, we propose solutions for the 10 main barriers found.

**CONCLUSION:** An analysis of barriers to PA practice should help to develop measures in order to mitigate them with a regular and personalized care. During our work, 2 studies with similar goal have been published : the IPSOS and the IRMES study, with similar results to ours. However, we found an original brake because non mentioned in French and international studies : low back pain. We also highlighted parental influence on the APS practice. Since October 2012, the National Academy of Medicine recommends APS prescription. Strasbourg Urban Community goes further and innovates with « sport santé sur ordonnance » for inactive patients suffering from chronic diseases.

## PP-01-05

### EFFECTS OF AN ADAPTED PHYSICAL TRAINING ON MOTOR AND NON-MOTOR FUNCTIONS AND QUALITY OF LIFE IN PATIENTS WITH PARKINSON'S DISEASE

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**AIM OF THE STUDY:** Several studies have clearly shown that strategies of health promotion, such as fitness and general exercise programs, may improve quality of life (QoL), motor and non-motor functions in Parkinson's Disease (PD) patients. However, little is know about the effects of specific Adapted Physical Activity (APA) programs on PD patients. Therefore, the aim of this study was to determine the effects of a supervised training based on 18 sessions of APA program on motor and non-motor features and QoL in a group of PD patients

**MATERIALS AND METHODS:** Nine PD patients (5 men, 4 women 64.4±6.8years) were studied using i. Berg Balance Scale (BBS) to assess patient's static and dynamic balance abilities (Qutubuddin et al., 2005), ii. Timed Up and Go test (TUG) to evaluate basic functional mobility and safety with mobility (Morris et al., 2001), iii. Unified Parkinson's Disease Rating Scale-pars 3 (UPDRS-III) and Hoehn and Yahr Scale to establish motor disability, iv. PD Fatigue Scale (PFS) to determine the levels of fatigue in daily activities (Brown et al.,

2005), v. Beck Depression Inventory II (BDI-II) to evaluate the degree of depressive symptoms in PD patients and vi. Quality of life (PDQ-8) to appreciate that parameter in the presence of the disease

**RESULTS:** After 18 sessions of training we observed a significant increase in both balance abilities (BBS:51.77/56±4.35 vs. 36.11/56±9.53,  $p<0.00005$ ) and in safety with mobility (TUG:5.85±1.34 sec. vs. 10.82±3.36 sec.,  $p<0.0005$ ). In addition, a significant improvement in both motor and non-motor symptoms of PD was detected:UPDRS-III 21.1±3.5 vs. 14.1±3.5,  $p<0.00005$ ; PFS 4±0,6 vs. 3,3±0,9,  $p<0.0005$ ; BDI-II 20.8±9.8 vs. 14.3±10.1,  $p<0.005$  and PDQ-8 17.3±4,7 vs. 12±6.2,  $p<0.005$

**CONCLUSIONS:** Our results show that 18 sessions of APA program are able to produce benefits for daily activities, motor functions, mental and emotional levels, also enhancing overall quality of health in PD patients. These findings suggest the usefulness of large studies focused on physical training in this special population

**REFERENCES:**

1. Qutubuddin AA, Pegg PO, Cifu DX, Brown R, McNamee S, Carne W. Validating the Berg Balance Scale for patients with Parkinson's disease: a key to rehabilitation evaluation. (2005). Arch Phys Med Rehabil, 86:789-92
2. Morris S, Morris ME, Iansek R. Reliability of Measurements Obtained With the Timed 'Up & Go' Test in People With Parkinson Disease. (2001). Physical Therapy, 81(2):810
3. Brown RG, Dittner A, Findley L, Wessely SC. The Parkinson fatigue scale. (2005). Parkinsonism Relat Disord, 11(1):49-55

**PP-01-06**

**HIKING AND CHRONIC DISEASES: A SURVEY IN THE FRENCH ALPS**

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The development of leisure and physical activities combined with an aging population lead many individuals with preexisting medical conditions to spend time in the mountains. Because of the specificities of a mountainous environment, some of these chronic diseases may present risks to the health of hikers. This work addresses the objective of better understanding the behavior of hikers in the mountains and the prevalence of their diseases by conducting a field study realized in the French Alps in the summer of 2012.

A questionnaire was distributed to hikers in the Ecrins National Park from July to August 2012. 998 questionnaires were distributed, 320 in different houses of the National Park, 118 in local French Alpine Clubs, 560 in 14 different shelters of the National Park. The questionnaire was addressed to any hiker in the mountains, older than 17, tourists and locals.

514 questionnaires were collected, a response rate of 51.5%. 42 questionnaires were excluded because too partially completed or not completed. The study population therefore included 472 walkers of French origin in 98% of the cases, including 243 men and 229 women. The average age was 47 years. Almost 20% were older than 60 years. Nearly 60% of the hikers were from Rhône-Alpes and Provence-Alpes-Côte d'Azur regions. The population was predominantly physically active (87.5%). The average ascent planned was 900 m per day. Before their sojourn, only 15% of hikers had visited their general practitioner, 8% had already been examined in a consultation of altitude medicine. 60% of those over 40 years had benefited from a consultation with a cardiologist, which was significantly lower in women ( $p < 0.001$ ). 44.1% of subjects had a medical history; the most frequently cited being the history of migraine, asthma, urinary tract infection, acute mountain sickness, sinusitis, hypertension, anxiety disorders and hypothyroidism. 25% of subjects were on medication on a daily basis, most frequently cited were antihypertensives, lipid-lowering agents,

thyroid hormones, antihistamines, antidepressants and antiplatelet agents. Hikers staying at a lower altitude (less than 2500m) had a significantly more frequent history of diabetes ( $p < 0.05$ ), stroke ( $p < 0.01$ ) and glaucoma ( $p = 0.05$ ).

The present study of course presents biases of evaluation and selection. However, it has the advantage of a broad dissemination, a very good return rate (51.5%) and therefore a sizable population ( $n = 472$ ). In total this study shows that, firstly, a significant proportion of hikers have a medical history, with some pathologies that are at risk in altitude, secondly, a significant part of these hikers take a medication during their stay, which often requires adjustments and, thirdly, the medical consultation before the sojourn remains anecdotal. We can assume that an important part of these hikers take a risk in high altitude without being aware of it.

The mountains have wonders to offer to almost everyone and it is likely that in the future more and more ill people will be hiking. Physicians must go along with this phenomenon to help prevent the risks of aggravation of chronic diseases in altitude.

PP-01-07

## EFFECTS OF REGULAR AEROBIC EXERCISE ON LIFE QUALITY OF TYPE 2 DIABETES PATIENTS

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**INTRODUCTION:** Life quality measure as a general concept in diabetic patients has recently gain importance as a treatment target among clinicians (1). Studies made with diabetic populations showed that these patients' life quality is worse than the general society, but regular exercise positively effected their perception of life quality, in general. In our study, we aimed to investigate the effects of aerobic exercise as a treatment plan, which usually is forgotten and given lack of importance, on life quality of Type 2 Diabetes patients regarding its importance.

**MATERIALS and METHODS:** 31 patients, with the Type 2 DM diagnosis, who were being followed by and treated in Istanbul Medicine Faculty Internal Medicine Endocrinology and Metabolism Department with a HbA1C value between 7,5mg/dl and 9,5mg/dl were included in the study. A personal exercise program (3 days/week/12 weeks) was planned for the patients in Istanbul Medicine Faculty Sports Medicine Department. The patients were asked to fill a Short-Form-36 (SF-36) before and after the exercise program to evaluate their life quality (2). A "Paired Samples t-test" was used for inter-group comparisons in a package program SPSS 13.0. Significance value was set to  $P < 0,05$  for the study.

**RESULTS and CONCLUSIONS:** We observed statistically significant increase in score at all sub-scales of SF-36. The biggest change in parameters were observed at "physical functioning", "role-physical", "general health", "vitality", "mental health" sub-scales ( $p < 0,001$ ). When "bodily pain", "social functioning", "role-emotional" sub-scales were evaluated, the score increments were less ( $p < 0,01$ ,  $p < 0,05$ ,  $p < 0,05$  respectively). According to our findings, regular exercise has positive effects on life quality in Type 2 Diabetes patients. It is a well known fact that, life quality is negatively effected in the course of DM, also related to the duration of the disease (3). In this concept, to increase life quality of diabetes patients, as being one of the main purposes in their treatment, our study results support emphasizing the importance of exercise applications.

**KEY WORDS:** exercise, diabetes mellitus, life quality, SF-36

**REFERENCES:**

1. Fitzpatrick R., Fletcher A, Gore S, Jones D, Spiegelhalter D, Cox D. (1992) Quality of life measures in health care. Applications issues in assessment. *BMJ*; Oct 31; 305(6861):1074-7.
2. Koçyigit H, Aydemir O, Fisek G et al. (1999) Short Form SF-36, reliability and validity of the Turkish version 1999, *İlaç ve Tedavi Dergisi*. 12:102-106.
3. Ozdemir I, Hocaoglu C, Koçak M, Ersoz HO. (2011) Quality of life and psychiatric symptoms in the patients with type 2 diabetes mellitus. *Dusunen Adam: the journal of psychiatry and neurological science* 24:128-138.

**PP-01-08****CARDIOPULMONARY RESPONSE TO EXERCISE IN OVERWEIGHT AND OBESITY CHILDREN WITH ASTHMA**

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**INTRODUCTION:** Overweight and obesity could be suggested as risk factors for developing of asthma since they are associated with worsening of physical fitness and lung functions.

**AIM OF THE STUDY:** To assess the influence of Body Mass Index (BMI) on cardiopulmonary response to exercise and lung function tests in a cohort of children.

**MATERIAL AND METHODS:** We studied 415 patients (pts): males/females: 304/111, means age: 12.5±2.5 ; range 6.2-19.4. According to BMI percentiles, children were classified as normal weight (N) between the 5th and the 85th percentile, as overweight (OV) between the 86th and the 94th percentile and as obese (OB) if >94th percentile. Underweight subjects (BMI<5th percentile) were excluded from the study. BMI percentile for age and sex was determined according to the national cross-sectional growth charts.

All subjects performed lung function tests to obtain the following parameters: Forced Vital Capacity (FVC), Forced Expiratory Volume first second (FEV1), Peak Expiratory Flow (PEF), Forced Expiratory Flow (FEF25-75). Each subjects underwent a cardiopulmonary exercise test to measure maximal oxygen uptake (VO2max), exercise time (ET: exercise test duration in minutes) and heart rate recovery (HRR: decrease in the heart rate from peak exercise to one minute after the cessation of exercise). All results were analyzed depending on BMI groups.

**RESULTS:** in 197 pts (47.5%) was reported intermittent or mild persistent asthma: 133N (67.5%), 37OV (18.8%) and 27OB (13.7%). Non-asthmatic pts were 218 (52.5%): 172N (78.9%), 26OV (11.9%) and 20OB (9.2%). We found that the prevalence of overweight and obesity was higher in asthmatic pts (18.8% vs 11.9% in OV group and 13.7% vs 9.2% in OB; p<0.03). In particular, VO2max(ml/min/Kg) exercise time and HRR are significantly lower in OV and OB than N pts, in both asthmatic and non-asthmatic [VO2max (Asthmatic: N=43.1±8.6, OV=40.6±8.7, OB=38.3±5.0; Non-Asthmatic: N=51.6±9.9, OV=48.2±9.9, OB=44.5±7.7; p<0.0001); HRR (Asthmatic: N=39.8±10.7, OV=36.5±11.3, OB=31.0±9.3; Non-Asthmatic: N=39.0±12.6, OV=35.8±11.6, OB=21.7±7.0; p= insignificant); ET (Asthmatic: N=9.2±3.0, OV=8.3±2.4, OB=7.8±2.2; Non-Asthmatic: N=12.3±2.5, OV=11.6±2.7, OB=9.7±2.1; p<0.0001)].

Otherwise, the lung function tests didn't present significative differences among the BMI groups. [FEV1: (Asthmatic: N=96.3±14.0, OV=97.5±12.0, OB=99.2±15.4; Non-Asthmatic: N=101.9±13.7, OV=100.4±11.0, OB=98.3±12.7; p<0.001), PEF: (Asthmatic: N=100.5±15.3, OV=98.5±14.9, OB=100.5±20.0; Non-Asthmatic: N=105.3±17.9, OV=109.3±16.7, OB=96.7±15.9; p<0.014), FEF 25-

75: (Asthmatic:  $N=86.4 \pm 19.5$ ,  $OV=86.2 \pm 20.7$ ,  $OB=87.7 \pm 22.8$ ; Non-Asthmatic:  $N=98.1 \pm 21.9$ ,  $OV=99.0 \pm 18.0$ ,  $OB=87.3 \pm 21.9$ ;  $p=$  insignificant)].

**CONCLUSIONS:** We found a higher prevalence of overweight and obesity in asthmatic subjects compared to the control group. However, the cardiopulmonary response to exercise differs among the three BMI groups but not between asthmatic and non-asthmatic children: overweight and obese children had lower  $VO_{2max}$ , ET and HRR values respect the normal weight group. Moreover, lung function tests were not significantly different among three weight groups.

## PP-01-09

### THE EFFECTS OF EXERCISE ON P WAVE DISPERSION AND DURATION IN PATIENTS WITH TYPE 2 DIABETES MELLITUS WHO HAD REGULARLY AEROBIC EXERCISE PROGRAMME

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**AIM:** The imbalance of autonomic nervous system including a decreased parasympathetic to sympathetic tone ratio in cardiovascular function is associated with mortality and morbidity among patients with type 2 diabetes (1). P wave dispersion (PWD) which could reflect the changes in the tone of autonomic nervous system reflects the activation of atrial muscle and may depend primarily upon the mass of tissue excited. It has been used in the assessment of the risk for atrial fibrillation which is characterized by non-homogeneous and discontinuous atrial conduction (2). The primary end point of this study was to investigate P wave dispersion, P wave durations and related factors in patients with type 2 diabetes mellitus before and after exercise programme.

**METHODS:** A total of 31 (23 women; mean age:  $52.8 \pm 6.5$  years) consecutive patients with type 2 diabetes mellitus (mean diabetes duration:  $11.3 \pm 4.9$  years) who have HbA<sup>1c</sup> value between 7,5mg/dl and 9,5mg/dl and 21 healthy subject (17 women; mean age:  $49.0 \pm 7.5$  years) were included in this study. All 12 lead of

**Table I: Parameters in pre- and post-exercise period in patients with type 2 diabetes mellitus**

	Pre-exercise	Post-exercise	p
Waist (cm)	104.29 ± 8.53	102.49 ± 8.63	< 0.001
Hip (cm)	105.53 ± 7.35	103.54 ± 7.40	< 0.001
Weight (kg)	79.69 ± 12.36	77.57 ± 12.17	< 0.001
Height (cm)	159.58 ± 8.18	159.58 ± 8.18	1.00
Body mass index (kg/m <sup>2</sup> )	31.27 ± 4.20	30.47 ± 4.19	< 0.001
Glucose (g/dl)	190.67 ± 57.10	144.67 ± 49.93	< 0.001
Hemoglobin A1c (HbA1c)	8.55 ± 0.97	7.34 ± 0.70	< 0.001
Tryglicende	182.64 ± 130.73	136.80 ± 78.62	0.002
Total Cholesterol	197.41 ± 41.23	192.90 ± 37.32	0.25
High-density lipoprotein ( HDL)	50.25 ± 13.91	52.51 ± 12.74	0.02
Low-density lipoprotein ( LDL)	112.80 ± 35.22	115.00 ± 33.90	0.53
Very low-density lipoprotein ( VLDL)	34.45 ± 20.53	25.22 ± 13.44	< 0.001
Systolic blood pressure (mmHg)	132.51 ± 17.96	123.87 ± 16.47	0.01
Diastolic blood pressure (mmHg)	78.38 ± 8.38	74.29 ± 9.98	0.01
Mean blood pressure (mmHg)	96.42 ± 10.40	90.81 ± 10.54	0.009
Pulse pressure (mmHg)	54.12 ± 14.41	49.58 ± 14.34	0.11
Resting Heart rate (beat/min)	93.93 ± 9.21	87.58 ± 8.82	0.02
Metabolic equivalent (MET)	9.10 ± 2.14	11.52 ± 1.76	< 0.001
Endurance	435.51 ± 118.12	582.09 ± 94.10	< 0.001
Minimum P wave duration	52.09 ± 8.54	53.06 ± 11.37	0.71
Maximum P wave duration	113.22 ± 8.99	111.93 ± 10.38	0.46
P wave dispersion	61.93 ± 12.69	58.87 ± 11.95	0.26

the resting electrocardiography were evaluated for P wave dispersion. A metabolic test was conducted in I.U.I.M.F Sports Medicine Department and a personal aerobic exercise program (3days/week/12 weeks) was determined upon the heart rate corresponding the anaerobic threshold level measured with gas analyses during the test. Mann-Whitney U test, Wilcoxon signed ranks test, and Pearson correlation were used.

**RESULTS:** Systolic blood pressure ( $132.51 \pm 17.96$ ,  $120.57 \pm 11.57$  mmHg), pulse pressure ( $54.12 \pm 14.41$ ,  $40.95 \pm 10.36$  mmHg), and heart rate ( $93.93 \pm 9.21$ ,  $81.76 \pm 9.39$  mmHg) were significantly higher in patients with diabetes than in healthy subjects ( $p=0.008$ ,  $p=0.001$ ,  $p<0.001$ , respectively). Changing parameters in pre- and post-exercise period was shown in Table I. Only was found a significant correlation between P wave dispersion and endurance ( $p=0.03$ ,  $r=0.38$ ).

**CONCLUSION:** The P wave dispersion and P wave durations were not different in patients with type 2 diabetes mellitus as compared with healthy subjects; additionally, this parameters didn't change before and after exercise programme. Only was found a significant correlation between P wave dispersion and increased exercise time.

**KEYWORDS:** exercise, p wave dispersion, type 2 DM, atrial fibrillation

**REFERENCES:**

1. Zuern CS, Rizas K, Eick C, Sterz K, Gawaz M, Bauer A. Prevalence and predictors of severe autonomic failure in patients with insulin-dependent type 2 diabetes mellitus and coronary artery disease: pilot study. *J Electrocardiol* 2012;45:774-9
2. Dilaveris P, Stefanadis C. P-wave dispersion and atrial fibrillation risk: methodological considerations. *Am J Cardiol* 2011;107:1405.

**PP-01-10**

**MEDICAL PRESCRIPTION OF PHYSICAL ACTIVITY: EFFICIENCY OF THE EXPERIMENTATION CONDUCTED IN STRASBOURG**

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**OBJECTIVE:** Regular and adapted physical activity is recommended for everyone by the World Health Organization and it has shown benefits in various diseases. General practitioners may prescribe physical activity to their patients but the way they can do it is not defined in France yet.

The city of Strasbourg, France experiments since november 2012 a new tool which allows patients to participate in different activities after prescription of general practitioners.

Our objective is to measure the efficiency of this experimentation and particularly its effects on a quality of life score.

**MATERIAL/METHODS:** Patients were included between March 2013 and June 2013. They had received prescription of physical activity from their general practitioner as a medical treatment, after checking exercise ability. Entering the experimentation was limited to patients suffering from diabetes, obesity, hypertension or other cardiac disease. Patients were sent to a sports coach who guided them towards adapted activities.

Patients evaluated answered the SF36 quality of life questionnaire and the Ricci-Gagnon daily physical activity questionnaire. A six-minute walk test was realized.

Participation in the activities was evaluated after 1 month, 3 months and 5 months. After 6 months questionnaires and six-minute walk test have to be realized again.

**RESULTS:** More than 200 patients entered the experimentation, 60 of them are more specifically evaluated. At that time results concern the experimentation functioning, the population characteristics and the compliance of the patients after 3 months.

Further data will be available at the end of the year 2013.

**CONCLUSION:** Physical activity as a treatment needs to be defined precisely. The experimentation led in Strasbourg proposes a system based on a general practitioner prescription. Evaluation is still taking place but shows already results on bringing patients into activities.

PP-01-11

## PHYSICAL ACTIVITY SERVING THE INDIVIDUALS WITH METABOLIC SYNDROME: HOW TO REDUCE ROUTINE MEDICATIONS

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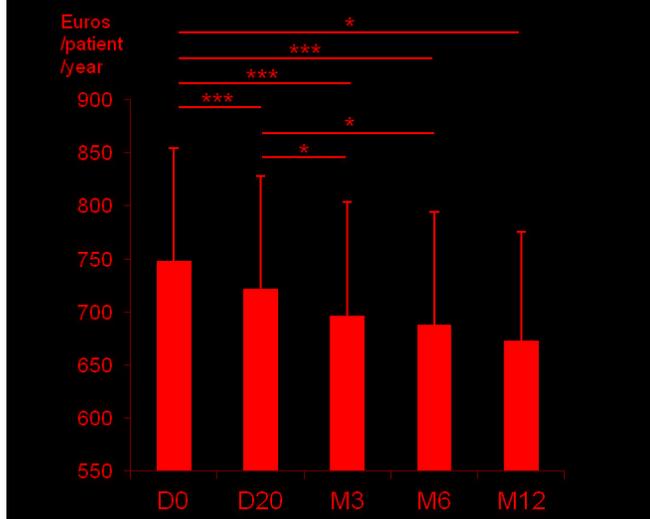
**BACKGROUND:** Metabolic syndrome (MetS), an early stage of type two diabetes (T2D), is a major public health problem. Being overweight causes the constellation of cardiometabolic abnormalities of the MetS. Each is often treated with a specific medication (lipid-lowering, antihypertensive, or antidiabetic). Although the biological benefits of physical activity/nutrition on MetS and T2D are well documented (Dutheil et al., Int J Cardiol, 2013), no study reports the cost of routine medications in MetS or the impact of these interventions.

**AIMS:** 1) To calculate the cost of the routine medications in MetS 2) To demonstrate the benefit of a lifestyle change (physical activity and nutrition) on routine medications consumption. 3) To compare the routine medications cost between MetS and T2D.

**METHODS:** One hundred MetS individuals (43 men, 57 women, age  $59.4 \pm 5.0$  years, BMI  $33.4 \pm 4.1$  kg/m<sup>2</sup>), with no physical activity, participated in a 3-week residential program (Day 0 to D20). 29/100 were T2D. The participants were coached daily individually to perform 3.5 hours/day of physical activity. Throughout the residential program, they received daily standard and personalized balanced meals to reach a negative energy balance of 500 kcal/day. They attended lectures and workshops on the MetS, nutrition, cooking and exercise in order to maintain this lifestyle on returning home. Then the patients were followed for one year (D20 to M12) with instructions to continue the program (training and diet). Clinical parameters,

Figure 1. Changes in annual costs of routine medications in metabolic syndrome treatment by physical activity and restrictive diet, in participants older than 50 years.

\*:  $p < .05$ . \*\*:  $p < .01$ ; \*\*\*:  $p < .001$



biology and routine medications were recorded at D0, D20, M3, M6, M12. Medications continued to be managed by their physicians without any connection with our study.

**RESULTS:** At one year, clinical (weight:  $-6.8 \pm 0.7\%$ ) and biological parameters improved: HbA1c  $-4.6 \pm 0.7\%$ , triglycerides  $-4.4 \pm 3.9\%$ , LDL  $-3.5 \pm 2.5\%$  ( $p < 0.01$ ). At D0, patients consumed  $4.96 \pm 0.2$  tablets per day, or  $1814 \pm 109$  tablets per year, at a routine medication cost/patient/year of  $747 \pm 106$  euros. The cost/patient/year of T2D subgroup was  $1352 \pm 309$  euros, significantly higher than the whole MetS group. The cost reimbursed by the french national healthcare insurance was respectively,  $485 \pm 68$  (MetS) and  $880 \pm 201$  (T2DM) euros/year. For the MetS group, the cost of routine medication significantly decreased at each measurement time after our intervention program:  $747 \pm 106$  (D0),  $722 \pm 106$  (D20),  $696 \pm 106$  (M3),  $687 \pm 106$  (M6),  $673 \pm 102$  (M12) vs. D0. D20, M3, M6:  $p < .001$ ; D0 vs. M12:  $p < .05$ ; D20 vs. M3, M6:  $p < .05$  (Figure 1). For T2D subgroup, the benefit was only significant up to 3 months:  $1352 \pm 309$  (D0),  $1325 \pm 311$  (D20),  $1305 \pm 313$  (M3),  $1307 \pm 309$  (M6),  $1239 \pm 291$  (M12) vs. D0. D20, M3:  $p < .05$ . Weight loss correlated with the decreased routine medication consumption (MetS  $r = 0.369$ ,  $p = .001$ ; T2D  $r = 0.480$ ,  $p = .020$ ).

**CONCLUSION:** We report for the first time the reduction of the public health burden in terms of medical cost of MetS patients and the associated effectiveness of physical activity and nutrition to decrease their long-term routine medication consumption.

#### ACKNOWLEDGMENTS

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#### PP-01-12

### PHYSICAL CAPACITY IMPROVEMENT AND PHYSICAL HEALTH-RELATED QUALITY OF LIFE AFTER 9 WEEKS OF AEROBIC EXERCISE TRAINING IN BREAST CANCER SURVIVORS

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Physical activities and especially endurance training belong to the corner stones of the post treatment period in breast cancer. Performing regular exercises has been shown to prevent weight gain and reduce endogenous estrogen levels, stress and depression along with an improved quality of life. Moreover, it has been reported that exercise reduces cancer recurrence from 30 to 50%.

**METHODS:** 75 breast cancer survivors ( $52 \pm 11$  y) and 14 healthy women ( $50 \pm 9$  y) attended individually supervised endurance training cycling sessions (18 sessions, 30 min each, 2 to 3 times per week), alternating 4 min at the ventilatory threshold power output and 1 min near the maximal power output determined during an initial incremental exercise test. Every two weeks, power output was adjusted to fit the initial level of heart rate.

45 women of the whole group answered the questionnaire EORTC-QLQ-C30 (third version), and 26 of the breast survivors ( $55 \pm 9$  y) continued the training after having completed the initial 6 to 9 week rehabilitation program (PEP'C 1).

**RESULTS:** For the whole group, we observed an important increase in the power output at the ventilatory threshold, from  $60 \pm 15$  watts to  $80 \pm 16$  watts after the 18 sessions ( $+33\%$ ,  $p < 0.01$ ).

In healthy women, the ventilatory threshold power output increased from  $67 \pm 8$  watts to  $99 \pm 12$  watts ( $+48\%$ ,  $p < 0.001$ ).

Before training, ventilatory threshold power output was 11% lower in cancer survivors than in healthy women ( $p < 0.01$ ), and remained lower after the program.

The 26 women who continued the training program for  $55 \pm 19$  sessions, increased their endurance level at about 6.8% between the 18th and the last session of the program ( $78,8 \pm 12$  watts vs  $84,2 \pm 13$  watts) without reaching the endurance level of the healthy women who stopped the training.

The quality of life questionnaire showed a significant increase in physical capacity, global health rating, and work capacity, with less fatigue and better sleep periods.

**DISCUSSION:** A short personalized program of rehabilitation induced significant improvement in aerobic capacity (ventilatory threshold), probably because of muscular modifications already described in cardiac transplant recipients: increase of muscular fibers, mitochondrial quality and neovascularization. Fatigue and cancer treatment side effects seemed to be reduced. These improvements were observed along with an important effect on psychological behavior.

**CONCLUSION:** Aerobic stimulation induced by this short personalized endurance training program is well tolerated and induced an increased aerobic capacity along with a clear positive psychological effect in breast cancer survivors.

In 2006, Rocca et al described a new concept about the telomeres, which are protective DNA-protein complexes at the end of linear chromosomes that promote chromosomal stability. Telomere shortness in human has been suggested to be of prognostic value in cancer like breast cancer. It has recently been shown that in patients with high aerobic capacity, the telomerase activity is preserved. Moreover, the telomerase activity seems to increase significantly when subjects maintain a healthy lifestyle. Training with our personalized program may induce such effect. Studies focused on this aspect could be an interesting part of research in cancer and perhaps in other chronic diseases.

**PP-01-13**

**HEALTH-RELATED QUALITY OF LIFE IN OBESE INDIVIDUALS WITH OR WITHOUT DIABETES COMPARED TO HEALTHY, WITH WITNESSED CARDIORESPIRATORY FITNESS AND OXYGEN SATURATION**

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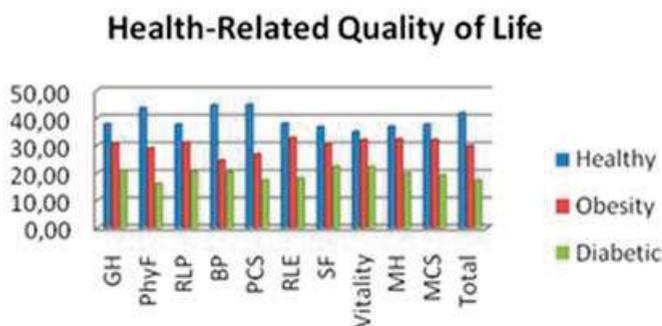
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**INTRODUCTION:** The purpose of this study was to evaluate and comparison health-related quality of life (HRQOL), between individuals with obesity and diabetes than healthy subjects, with witnessed cardiorespiratory fitness (CRF) and oxygen saturation (TSI %).

**MATERIALS AND METHODS:** The 59 volunteer persons (29 women, 30 men) comprised our statistical samples in three groups. The HRQOL estimated by filling out a standard Health-related quality of life questionnaire (SF-36). To measure CRF carried out the 6 minutes walking test (6MWT) with using of K4b2 device, and simultaneously used NIRS device to evaluate their TSI%. The data analyzed by Kruskal-Wallis, U-Mann Whitney and ANOVA tests.



**Fig.** HRQOL subscales between healthy, obese and diabetic groups

**RESULTS:** Kruskal-Wallis results indicated statistical significance(Sig) differences between groups for all of eight HRQOL subscales in two dimensions i.e. physical components summary(PCS) containing: General health (GH), physical functioning (PF), role limitation-physical (RLP), bodily pain (BP), and mental components summary(MCS) containing: role limitation-emotional (RLE), social functioning (SF), vitality (V), mental health (MH). Mann-Whitney U test results showed that mean ranks of eight factors were higher in healthy, obesity and diabetic subjects respectively. The PF and BP subscales had significant differences between healthy and obesity groups ( $p=.003$ ;  $p=.000$ ). All of subscales had significant differences between healthy and diabetic groups at  $P<0.05$  level. But between obese and diabetes groups, these factors had significant differences: PF, RLE, MH, ( $p=.012$ ;  $p=.005$ ;  $p=.025$  respectively).The CRF, TSI% and walked distance parameters were lower in obesity and diabetic groups than healthy at  $p<0.05$ .

**DISCUSSION AND CONCLUSION:** With regarding two summaries state of HRQOL between groups; PCS was Sig between healthy vs. obesity and diabetic ( $p=.001$ ;  $p=.000$ ) but without Sig differences in obesity vs. diabetic ( $p=.083$ ). MCS was Sig between healthy vs. diabetic ( $p=.000$ ) and obesity vs. diabetic ( $p=.026$ ) but without Sig differences in healthy vs. obesity ( $p=.354$ ). Sum of HRQOL dimensions were Sig between groups; healthy vs. obesity ( $p=.027$ ) healthy vs. diabetic ( $p=.000$ ) and obesity vs. diabetic ( $p=.023$ ) The findings of the present study indicate that HRQOL totally is lower in obesity and diabetic groups than healthy; and it is accompanied by lower cardiorespiratory fitness and tissue oxygen saturation. Therefore, it suggests using of physical activity as co-treatment with routinely evaluation of HRQOL to verify effectiveness of treatment and goal-oriented medical and social services for obese and diabetic subjects.

**KEYWORDS:** Health-related quality of life (HRQOL), obesity, diabetes, cardiorespiratory fitness and oxygen saturation

#### PP-01-14

### WHAT ARE THE EFFECTS OF EXERCISE IN ADULTS LIVING WITH HUMAN IMMUNODEFICIENCY VIRUS INFECTION?

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**AIM:** To systematically evaluate the effects of exercise in adults living with Human immunodeficiency virus infection

**BACKGROUND:** Human immunodeficiency virus (HIV) infection was once viewed as an illness progressing in a predictable way toward death. However, with the development of highly active antiretroviral therapy (HAART) the treatment of HIV has been revolutionised, significantly decreasing both morbidity and mortality in the HIV-infected (HIV+) population. This increased chronicity has been mirrored by increased prevalence of disablement among people living with HIV as a result of its sequelae and potential side effects of HAART. Having been shown to improve strength, cardiovascular function, and psychological status in general populations, knowledge about the benefits and risks of exercise for HIV+ adults is still being explored.

**METHODOLOGY:** A comprehensive, systematic literature review.

**RESULTS:** Cardiorespiratory exercise training (CET) positively modulates body composition, decreasing waist circumference, waist-to-hip ratio, and percentage body fat (BFM) in HAART-treated HIV with body fat redistribution and this translates to reduced cardiovascular disease (CVD) risk in HAART-treated HIV+ individuals. Although most studies do not support a beneficial effect of exercise on immune function in HIV+ individuals, exercise performed at low, moderate, or high intensity does not negatively affect immune

function or disease progression in this population. Significant increases in strength along with improvements in depressed mood, anxiety and other indicators of psychological state were found in exercisers compared with non-exercisers in a number of studies in the HIV population.

**CONCLUSION:** Research supports the use of therapeutic exercise as adjunct therapy in HIV infection. In patients without acute infections or severe wasting, exercise therapy should begin as soon as possible after the diagnosis of HIV infection in an attempt to delay the onset of symptoms, decrease the severity of those symptoms already present, and potentially delay disease progression. Exercise therapy may also decrease the ultimate cost of treating HIV+ patients by prolonging the asymptomatic period of the disease, thereby decreasing medication use and health care utilization rates, although further research is needed to clarify the effects of exercise in these areas. It is clear that HIV+ persons respond to training in much the same manner as their healthy counterparts. Although most studies have not linked exercise training to significant positive changes in disease state (CD4 cell count, Viral Load), no reports cite any significant negative effects of exercise on the immune and disease markers in this population. When implementing therapeutic exercise programs for HIV+ patients, it is recommended that programs be individualized on the basis of the functional capacity and individual symptomatology of each client.

PP-01-15

## **AEROBIC PHYSICAL TRAINING INFLUENCES DIFFERENTLY ADIPOKINES IN WOMEN WITH POLYCYSTIC OVARY SYNDROME**

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**INTRODUCTION:** Women with Polycystic Ovary Syndrome (PCOS) have elevated body fat and changes in adipokines that are considered markers of cardiovascular risk. Physical exercise is an important tool in the treatment of the disease. However, the literature is controversial in relation to their effects on adipokines.

**OBJECTIVE:** Thus, we evaluated the influence of aerobic physical training on adipokines in women with different body fat percentages.

**METHODS:** Three groups (N=20) of women with PCOS (22-44 years) were formed according to the body fat percentage, 22-27%, 27-32% and 32-37%. Blood samples were collected before and after 16 weeks of aerobic physical training for analysis of adiponectin, leptin, tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ) and interleukin-6 (IL-6). Two-way ANOVA was used for statistical analysis (Sigma-Stat<sup>®</sup>). Ethics Committee no 963/2008 HCFMRP/USP.

**RESULTS:** There were no differences in body weight after physical training, but there was an increase in VO<sub>2</sub>max. The aerobic physical training reduced leptin in all groups, and the group with the highest body fat percentage (32-37%) had minor reductions than the other groups. Adiponectin increased after aerobic physical training only in the two groups with higher body fat percentages (27-32% and 32-37%). The analysis of IL-6 showed that only the two groups with higher percentages (27-32% and 32-37%) of body fat showed significant reduction. Finally, there were no changes in the values of TNF- $\alpha$  after physical training in any of the groups studied.

**CONCLUSION:** The physical training seems to influence differently adipokines in women with PCOS, since increased values of adiponectin and reduced values of leptin and IL-6, especially for groups with higher percentages of body fat. However, did not affect the concentrations TNF- $\alpha$ .

PP-01-16

**DIFFERENCES IN GAIT CHARACTERISTICS BETWEEN CHILDREN WITH AND WITHOUT CEREBRAL PALSY DURING THE APPROACH OF A TARGET MARKED ON THE GROUND**

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**OBJECTIVE:** The purpose of the present study was to examine the neuromuscular, force and kinematical differences of the lower limb between children with and without Cerebral Palsy concerning the gait characteristics during the approach of a target marked on the ground.

**MATERIAL:** 16 children without (CG; boys: n=8, girls: n=8, aged  $9.5 \pm 2$  years) and 12 children with cerebral palsy (CPG; boys: n=6, girls: n=6, aged  $8.8 \pm 2$  years) were examined. Subjects walked barefooted, at a self-selected pace, through a 5-meter corridor, at the end of which a ground mounted 40 x 60 cm force plate (Bertec Type 4060, Bertec Corporation, Columbus, OH, USA) was placed on the ground perpendicular to the walking direction and served as a target. Data were recorded from the force plate, an EMG device (BTS Telemg, Milano, Italy) and a six-camera 3D motion analysis system (VICON 612, Oxford Metrics Ltd, Oxford, Oxfordshire, UK). All devices were triggered by the motion analysis system, with the sampling frequency set at 1 kHz, 1kHz and 100 Hz, respectively. The parameters evaluated were: the number of steps to foot-fall on the target (n), stance leg's toe horizontal distance from the target (STT), contact (tC) and flight (tF) time of each step, step frequency (SF), step length (SL), step width (SV), vertical ground reaction force (vGRF) at touchdown on the target and the EMG activity of the plantar (PF) and dorsal (DF) flexors. Subjects performed eight trials, but five successful trials were selected. The selected trials were averaged for further analysis. Differences between CPG and CG were investigated utilizing independent samples T-test using SPSS 10.1 software (SPSS, Chicago, Illinois, USA). The level of statistical significance was set at  $p = .05$ .

**RESULTS:** CPG performed the task with significantly ( $p < .05$ ) larger number of steps, longer tC, shorter SL, slower SF and wider SV. Non-significant ( $p > .05$ ) differences between groups were observed concerning relative to body weight vGRF (lower in CPG), PF (higher in CG) and DF (lower in CG).

**CONCLUSION:** The observed differences between the examined groups concerning the gait parameters were in agreement with previous findings (Norlin et al., 1986). Results indicated that CPG and CG followed different motor patterns during the approach of the target. CPG adopted an inconsistent pattern of step length adjustments that resulted in an intermittent sequence of the walking steps that caused larger variations on the magnitude and the consistency of the examined parameters compared to CG, leading to the conclusion that CPG did not prepare effectively their neuromuscular system during the experimental task. In conclusion, the deficit concerning the step regulation pattern which was observed in CPG during the approach of the target could be attributed to their inability to optimally organize complex movements based on a perception-action coupling (Patla et al., 1989).

## POSTER SESSION PP2 – EXERCISE FOR HEALTH-2

PP-02-17

### THE EFFECT OF RESISTANCE EXERCISE WITH DIFFERENT INTENSITIES ON RESISTIN AND FIBRINOGEN LEVELS IN TYPE 2 OVERWEIGHT DIABETICS PATIENTS

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Type 2 diabetes is an inflammatory disease that is often associated with increasing of risk factors for cardiovascular diseases. Among these factors, one can pointed to resistin and fibrinogen. The aim of this study was to investigate the effects of different intensities of resistance activity resistin and fibrinogen levels in patients with type 2 diabetes with overweight. Eleven subjects (Mean±SD; age 53.73±3.55 years; BMI 29.16±0.96) voluntarily participated in the study. After two familiarization sessions and determining of maximal strength, all subjects completed three resistance exercise trials at an intensity corresponding to 30-35%, 50-55%, and 70-75% of 1-RM randomly. The three resistance exercise protocols included the performance of 1) 3 sets of 16 repetitions at 30-35% of 1-RM, 2) 3 sets of 11 repetitions at 50-55% of 1-RM, and 3) 3 sets of 7 repetitions at 70-75% of 1-RM. Two blood samples were obtained before exercise and immediately after exercise to determine the effect of resistance exercise. Data were analyzed using of the repeated measures ANOVA. The findings (Table 1) showed one single bout of exercise induce no significant decrease in resistin and increase in levels of plasma fibrinogen. There was no significant difference in response resistin to intensity of exercise, but fibrinogen has significant increase in response to high intensity of exercise (P=0.046). We can conclude a single session of resistance exercise with different intensities did not led to significant changes in resistin concentrations, Also increased in plasma fibrinogen levels occurred after high-intensity exercise that can result from changes in blood rheology after the resistance exercise.

Table 1 - Average and standard deviation of the dependent variables at pre-test and post-test investigation

	Fibrinogen(mg/dl)	Resistin(ng/ml)	Exercise Intensity (%1RM)
Pre-test	174.91±13.821	5.91±1.6	30-35%
Post-test	175.64±15.56	5.85±1.43	
Pre-test	171.18±14.10	5.68±1.3	50-55%
Post-test	176.91±13.40	5.63±1.00	
Pre-test	170.36±17.58	6.05±1.8	70-75%
Post-test	179.98±19.72*	5.71±1.6	

\* P=0.05

**PP-02-18****ORGANISE AND PROMOTE PHYSICAL EXERCISE FOR HEALTH DURING TRAINING, HEALTHCARE AND RESEARCH**V. ALBERTI<sup>1</sup><sup>1</sup>*Conférence des doyens de Staps, Paris, FRANCE*

The promotion of physical exercise in prevention and in the healthcare system, needs to share same knowledge between professionals.

Until the last year, Medical education presented an important lack of knowledge related to physical exercise and the different way health and sport professionals could work together.

Much work has gone into increasing integration throughout the curriculum at all levels. An agreement was signed last year between the national Dean of medical and sport university.

This reform will not only change the way medical students will learn sport medicine but also will influence the way medicine will be practice with other professionals. Since the beginning of 2013, faculty and staff of 9 universities have been engaged in a multi-phase initiative to revise the four-year MD program with the following goals:

- First year = Develop a sensibilisation of physical exercise that is based on the educational and developmental needs of the public health. Obesity is defined. Physical exercise is considered as an health determinant like environment.
- Second,Third and fourth year = Increase the teaching of physical exercise composed of 60 h with a 2 added hours dedicated specifically on this topic. Propose an option of 20 hours based on a practical issue like physical exercise and chonical diseases, TEP, ...
- Provide opportunities to build those programs and research with both university teachers, medicine and sport.
- Facilitate coordination, exchange of courtesies for sedentary people, overweighted and obese persons.

**PP-02-19****EFFECTS OF ENDURANCE TRAINING ON RESTING METABOLIC RATE IN A GROUP OF MEN WITH SEDENTARY LIFESTYLE**V. BASTYAN<sup>1</sup>, J. NOVOTNÝ<sup>1</sup>, J. MACH<sup>1</sup>, V. POSPÍCHAL<sup>1</sup><sup>1</sup>*Faculty of Sport Studies - Department of kinesiology, Brno, CZECH REPUBLIC*

Changes in resting metabolic rate (RMR) and body composition were investigated in group of men (n = 9), aged 29-36 with sedentary lifestyle.

During the initial measurements, the values of RMR, body composition and exercise test were obtained. In addition, five-day nutritional intake and record of physical activity were completed. After the initial measurements, subjects performed aerobic physical activity – endurance training (running). Physical activity was performed for 12 weeks, 3 times a week. Because of previous physical hypoactivity, training of extensive endurance was chosen and subjects exercised in heart rate zone characteristic for this kind of endurance, ie. between 70-85% of heart rate at the level of anaerobic threshold. Time interval of exercising was 30 minutes for 1st- 4th week, 35 minutes for 5th- 8th week and 40 minutes for 9th – 12th week. The output measurements were obtained after 6 and 12 weeks of regular physical activity. The monitored parameters were mainly differences in value of resting metabolic rate and body composition. Data of RMR were collected using the air analyzer Metalyzer Cortex 3B in the Laboratory of Sports Medicine, Faculty of Sports Studies in Brno.

All subjects had increases in the values of relative RMR from baseline to 3 months of regular physical activity (24,3 kcal/kg/d,  $s = 1,86$  to 26,5 kcal/kg/d,  $s = 1,39$ ). These results suggest that resting metabolic rate is a dynamic parameter, responding to changes in lifestyle.

This study is a part of research for the dissertation of one of the authors and was financially supported from projects of specific research MUNI/A/0987/2011 and MUNI/A/0803/2012.

## PP-02-20

### EFFICIENCY OF AN INDIVIDUALIZED PHYSICAL ACTIVITY PROGRAM (PA) ON THE EVOLUTION OF THE FAT MASS IN OVERWEIGHT OR OBESE WOMEN, FOR THE PREVENTION OF TYPE 2 DIABETES (DT2) IN REUNION ISLAND

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**OBJECTIVE:** In previous experiments in obese subjects, the efficiency of low intensity exercise training was studied only on brief durations (3 months). The objective of this study is to compare the efficiency of three randomized PA programs on 5 months, on the body composition measured by DEXA and the maximal fat oxidation during exercise (MFO).

**PATIENTS AND METHODS:** 136 women aged 20 to 40, non-diabetics, BMI: 27 to 40 kg/m<sup>2</sup>, were randomized in three arms : arm 1) MFO (FATmax training); arm 2) 60 % of VO<sub>2</sub>max. (For 1 and 2, the same energy expenditure) ; arm 3) PA at home according to the recommendations of good medical practice (30 minutes / day minimum, moderate intensity). All groups were supplemented in fruits and vegetables. It lasted 5 months.

**RESULTS:** 103 subjects were screened at M0, M3, M5 (76 %). At M5, the 3 groups have a significant decrease of fat mass measured by DEXA (group 1:  $-4,07 \pm 0,67$  kg; group 2:  $-4,70 \pm 0,62$  kg; group 3:  $-3,54 \pm 0,63$  kg). There were no significant differences between the groups. The group 1 (FATmax =  $45,24 \pm 0,83$  % VO<sub>2</sub>max) had a greater improvement of the MFO than the other groups (group 1:  $1,60 \pm 0,16$ ; group 2:  $1,07 \pm 0,17$ ; group 3:  $0,59 \pm 0,17$  mg/min/kg Fat Free Mass,  $p < 0,001$ ).

**DISCUSSION:** individualized training at the MFO intensity had a similar effect on fat mass loss compare to a higher intensity training (60 % VO<sub>2</sub>max) and increases more than 1,6 times the maximal lipid oxidation capacity.

## PP-02-21

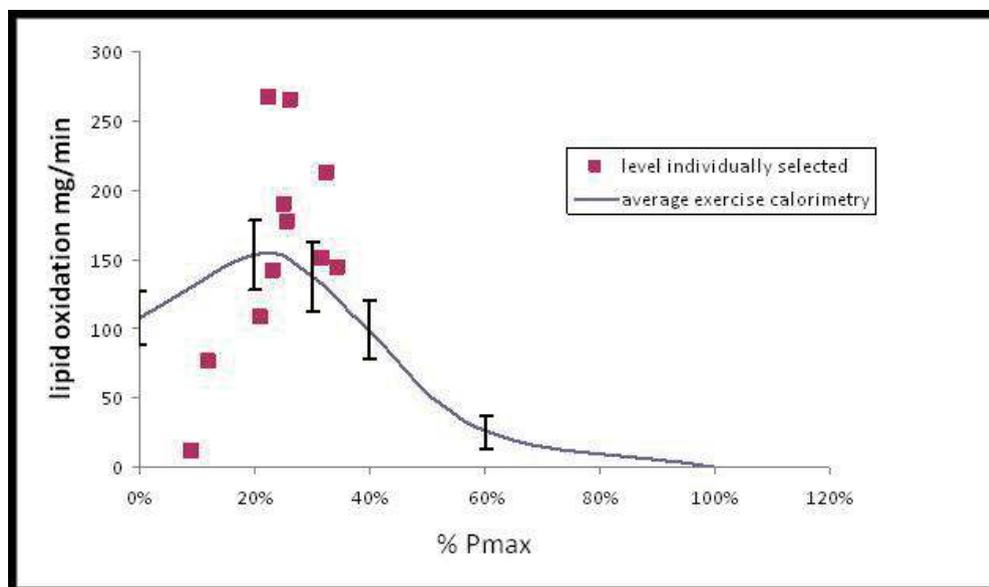
### SPONTANEOUSLY SELECTED INTENSITY FOR PROLONGED EXERCISE FALLS WITHIN THE ZONE OF MAXIMAL LIPID OXIDATION

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We tested the hypothesis that a spontaneously selected pace for long duration endurance activity most often falls in the range of maximal lipid oxidation (LIPOXzone). Eleven subjects (2 men / 9women, aged 20-62 yr, body mass index  $33,9 \pm 1,6$  kg/m<sup>2</sup>, VO<sub>2</sub>max 18-31 ml/min/kg) that had performed an exercise calorimetry with



6 min steady state steps for the assessment of their ability to oxidize lipids at exercise were asked to spontaneously select a power intensity that they feel adapted for 45 min cycling, and this spontaneously selected intensity (SSI) was compared to the results of exercise calorimetry. The level of maximal lipid oxidation (LIPOXmax) ranged between 16 and 57 watts (20-50% VO<sub>2</sub>max) and the maximal lipid oxidation rate (MFO) between 13 and 288 mg/min. The SSI was on the average 7% above the LIPOXmax, and was negatively correlated to the MFO ( $r=0.618$ ;  $p<0.05$ ). Actually in 2 subjects with very low levels of lipid oxidation the SSI occurred above the LIPOXzone in the range of intensities where CHO are the almost exclusive substrate used for oxidation. Therefore: 1) spontaneously selected power for long duration activity is within the LIPOXzone, slightly above the LIPOXmax, but in cases of very low ability for lipid oxidation it may occur elsewhere, in the zone of predominant CHO oxidation; 2) the less the patients are able to oxidize lipids the more they select a lower intensity. These findings are consistent with the theories that assume a physiological relevance of the LIPOXmax as a preferentially selected exercise level for everyday life, aiming at preserving glycogen stores.

## PP-02-22

### RELATION BETWEEN PHYSICAL ACTIVITY AND MORBIDITY AND MORTALITY OF ELDERLY PEOPLE: THE PROOF COHORT STUDY

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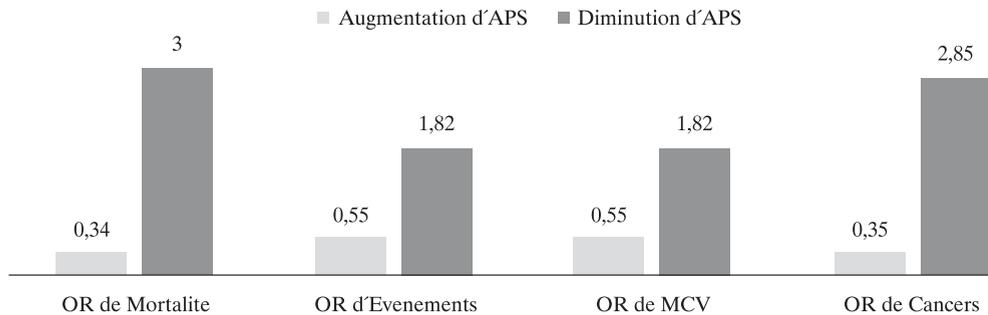
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**BACKGROUND:** The aging of the world population is growing and is inevitable. Aging prevention is a public health issue. Aging well is the major objective. Epidemiological studies are likely to confirm the benefits of regular physical activity on health. A large number of studies have examined the relationship between physical

Figure 9- Odds Ratios (IC 95%) de Mortalite et d'évenements toutes causes confondues, ou par Maladies Cardiovasculaires, ou par Cancers en fonction de l'évolution de la pratique des activités physiques et sportives (APS) durant le suivi



activity and sport (PAS) and the risk of mortality. These studies have shown that the average risk of death was reduced by 30% if the recommendations of PAS (30 minutes at least 5 days per week) were observed. Elderly specific analyses are rare and various recommendations concerning them often come from adults results.

**OBJECTIVES:** To determine via a literature review a negative correlation between physical activity and the risk of mortality among the elderly. Then confirm with a french cohort the results established on an international heterogeneous population.

**METHODS:** The literature review was performed using PubMed of the 1966-2013 data. A French cohort of 1011 subjects aged 65 in 2011 was followed over a period of 12 years. Their PAS was assessed by self-administered questionnaire POPAQ. Mortality and events (cardiovascular and cancer) were recorded.

**RESULTS:** The literature review found a 32% reduction in mortality risk if the recommendations were being followed (HR = 0.68 [95% CI: 0.36-0.86]). About the follow-up of the cohort study, 644 (64%) subjects were analyzed and 66 (10%) deaths were reported. The risk of death was reduced by 64% (OR = 0.36 [95% CI : 0.13-0.98],  $p < 0.05$ ) for subjects practicing physical activity at a level equal or higher than the recommendations of 150 minutes per week ( $> 5.5$  METs-h/sem). Also a very low level of physical activity (2-3 METs-h/sem vs  $< 2$  METs-h/sem) resulted in 51% reduction in mortality risk (OR = 0.49 [95% CI: 0, 25-0.97]  $p < 0.05$ ). Start or restart PAS during retirement, reduced the risk of death by 66% (OR = 0.34 [95% CI: 0.1-0.88]  $p = 0.01$ ) and the risk of events by 45% (OR = 0.55 [95% CI: 0.36- 0.84]  $p = 0.004$ ). In contrast, any reduction of even low physical activity exposed the elderly to the risk of death that is multiplied by 3 (OR = 3 [95% CI: 1-9]  $p = 0.01$ ) and the risk of morbidity by 2 (OR = 1.85 [95% CI: 1.2-2.8],  $p = 0.004$ ).

**CONCLUSION:** A negative correlation was found between the intensity of physical activity and the risk of mortality in the french elderly in a comparable manner to international cohorts. This relationship is dose-dependent, i.e. the risk of mortality will be even more decreased as physical activity is regular and of high intensity. The PROOF study corroborates previous studies on the protective effect of a low dose of APS (below current recommendations) on health. These results may help to adapt future recommendations to the elderly.

**PP-02-23****LEVEL OF PHYSICAL ACTIVITY AND SPORT AND SEDENTARY LIFESTYLE OF THE SENIOR FRENCH POPULATION**J. SCHIPMAN<sup>1</sup>, M. DORSEY<sup>1,2</sup>, A. SEDEAUD<sup>1,2</sup>, P. PRESLES<sup>3</sup>, P. MAUGAN<sup>4</sup>, J-F. TOUSSAINT<sup>1,2,5</sup><sup>1</sup>IRMES/INSEP, PARIS, FRANCE<sup>2</sup>Université Paris-Descartes, Sorbonne Paris Cité, PARIS, FRANCE<sup>3</sup>Institut Moncey, PARIS, FRANCE<sup>4</sup>Assureurs Prévention, PARIS, FRANCE<sup>5</sup>CIMS, Hôtel-Dieu, AP-HP, PARIS, FRANCE

Daily moderate exercise has been shown to have a large preventive effect on many age-related diseases: atherosclerosis, diabetes, osteoporosis, cancer, cognitive disorders... A regular sport or physical activity is essential to maintain or increase his physical and intellectual abilities and to maintain the autonomy of elderly people.

**OBJECTIVE:** Analyze the physical activity of older people and the impact of health status on their daily practice and look for conditions restricting the movement.

**METHOD:** 270 elderly of the French general population aged 65 to 75 years were given a podometer for seven consecutive days during the month of May 2013 ; the number of steps each day was collected on a national database and compared to 1002 subjects < 65 years. A questionnaire on the level and intensity of physical activity and quality of life was completed at the end of the study.

**RESULTS:** The analysis highlights a wide disparity in the number of steps and variations depending on pathologies, Body Mass Index and quality of life.

The number of steps realized each day significantly\* decreases with increasing BMI and the importance of pathologies.

Ageing people with normal weight walk:  $9818 \pm 4058$  steps/day; overweight:  $5330 \pm 2893$ ; moderate obesity:  $4548 \pm 3201$  and high obesity:  $2291 \pm 1101$ .

Older people with pathologies walk more ( $7363 \pm 4494$  steps/day) than those who have not ( $6421 \pm 4288$  steps/day)

The categorization of the level of activity remains underevaluated compared to podometric measurements. The largest reported activities are consistent with the results of the French surveys. Walking remains the most practiced activity among in elderly people.

\*( $p < 0.05$ )**PP-02-24****PROGRAMME D'EXERCICES PHYSIQUES THÉRAPEUTIQUES (EPT) PAR L'ACTIVITÉ PHYSIQUE ADAPTÉE (APA) À DAKAR**D. SECK<sup>1</sup>, M. NDIR<sup>1</sup>, C. BA<sup>2</sup>, N. NDOYE<sup>2</sup>, A. SAMB<sup>3</sup><sup>1</sup>Institut National Supérieur de l'Éducation Populaire et du Sport INSEPS, UCAD, DAKAR, SENEGAL<sup>2</sup>Hopital CHU FANN, UCAD, DAKAR, SENEGAL<sup>3</sup>Faculté de Médecine de Dakar FMPOS, UCAD, DAKAR, SENEGAL

**CONTEXTE ET JUSTIFICATION:** Les maladies chroniques métaboliques, musculo-squelettiques (TMS) et psychophysiologiques, augmentent et viennent s'ajouter au lourd fardeau des maladies infectieuses déjà sur place au Sénégal qui démarre un programme de couverture médicale universelle.

**OBJECTIF:** Le but de cette étude est de présenter l'état de la prise en charge des sujets présentant au moins une maladie chronique et techniquement encadré pour la pratique d'activités physiques sur ordonnance médicale.

**MATÉRIEL ET MÉTHODE:** Une étude rétrospective a été réalisée par un questionnaire et des entretiens auprès de 150 sujets dont 78 femmes et 72 hommes qui fréquentent régulièrement 7 salles de fitness et le parcours sportif à Dakar en Avril 2012. L'âge des sujets varie de 15 à 65 ans. Le groupe présente différents profils et intègre seulement ceux ayant pratiqué de façon régulière depuis un an au moins à raison de 3 heures au minimum par semaine. L'encadrement a été effectué par une équipe multidisciplinaire constituée de médecins, de kinésithérapeutes, de professeurs d'EPS, de maîtres d'arts martiaux internes taichi, qi qong et de moniteurs de fitness.

**RÉSULTATS ET DISCUSSION:** Les sujets ayant entrepris la pratique sur ordonnance médicale d'APA constituent 43% du groupe. Il présente une prévalence de surpoids et d'obésité de 46,8% concernant davantage les femmes. Les pathologies les plus fréquentes sont : le diabète de type 2 (18), l'HTA (17), l'hypercholestérolémie (11), le cancer (10), l'asthme (8), l'arthrose du genou (7). L'étude a révélé aussi que l'ordonnance d'APA et l'EPT ont permis l'augmentation du niveau de la pratique et l'amélioration de la qualité de vie des sujets.

**CONCLUSION:** L'ordonnance d'activité physique adaptée est devenue une réalité à Dakar. La mise en place d'un programme évolutif, bien encadré par une équipe pluridisciplinaire contribue à lever les freins au changement et d'apporter des aides à la pratique d'activités physiques adaptées par l'éducation physique thérapeutique.

**MOTS CLÉS:** Activité Physique Adaptée - Exercices Physiques Thérapeutiques – maladies chroniques

#### BIBLIOGRAPHIE :

1. Barreault D. : Médecine du sport : de l'histoire au renouveau Cinésiologie 2007 n°235, p 105
2. Riquoir M. Programme d'ETP par l'APA: deux ans et demi et quelques chiffres. 5ème congrès commun SFMES et SFTS, 2012, Résumés des communications, p 55.
3. Shioda K., Hayashi Y.: Le Qi Gong du maître Pai Lin et la Chiropractie-Seitai avec énergisation (2009). Editoria Paulo's Graphica. San Paulo Brazil.
4. Virabel-Rebot N., Eberhard Y. : De la constitution d'un corps de connaissances en Activité Physique Adaptée aux métiers en activité Physique Adaptée. Science et Sport (2011) 26, 181-182

PP-02-25

### HEALTH RELATED QUALITY OF LIFE AND LEISURE PHYSICAL ACTIVITY IN PREGNANT WOMEN: A COMPARISON BETWEEN PRIVATE AND PUBLIC HEALTH SERVICES

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**BACKGROUND:** Pregnancy is a period of physiological, physical and psychological, and these changes may alter the perception of quality of life of women. On the other hand, the practice of regular physical activity provides many benefits, including physical and psychological well-being.

**OBJECTIVE:** To verify the association of physical activity in leisure time and quality of life related to health (HQoL) of women during pregnancy and compare the differences between attending in public and private hospitals.

**METHODS:** A retrospective cross-sectional survey was conducted on postpartum women (n=200) in one private hospital (GI) and Public (GII).

Women were interviewed two or three days after delivered, still inside the hospital. Questionnaires for physical activity (PPAQ) and HQoL was used to assessed Information related to the second trimester of pregnancy, when nausea and sickness have lower incidence and abdominal weight gain is not difficult to practice physical activity. SF-12 was filled by the participant. Other informations was assessed by trained interviewers. PPAQ allowed estimates energy expenditure in MET hour by day and also classify level of physical activity. To evaluate the differences it was used a Mann-Whitney's U test, after a Shapiro Wilk's test had showed that quality of life and physical activity variables were not normal. The level of statistical significance was  $p < 0.05$ .

**RESULTS:** Women that gave birth in public hospital had higher total expenditure energy, higher domestic and leisure activity. There isn't difference for physical component related to quality of life, but GII presented higher mental score in SF-12. There isn't association between physical activity level (that consider all dimensions), but there was for physical exercise during pregnancy associated with mental component fo Health QoL. Women who practice exercise had better score ( $p=0.03$ ), but this maintains significance only for GI ( $p=0.03$ ).

**DISCUSSION:** As in the present study, Montoya et al, (2010) analyzed by the SF-12 physical exercise has some effect on the quality of life of pregnant women. Observed that women who practiced reported improved quality of life, and the points were highlighted in the physical domain, the occurrence of pain and general health. Another study using SF-12 indicates direnças the perception of quality of life related to better health among women in urban area compared to rural women, both in relation to the physical and mental component (Naseem et al. 2011). In Brazil, the concern for quality of life during pregnancy is a point addressed by the Ministry of Health (2001) through the Program for Humanization of Prenatal and Childbirth. During this period, due to changes in maternal body, there is a decrease in physical functioning of patients (HAAS et al., 2004). As a strategy to promote quality of life and well-being studies show that physical exercise provides benefits maternal-fetal influencing maternal quality of life (Tendais et al., 2011).

**CONCLUSION:** Self-perceived mental was better in pregnant women who maintain physical exercise during pregnancy.

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**PP-02-27**

## **ARE VENTILATORY TRESHOLD AND 6-MINUTE WALK TEST HEART RATES INTERCHANGEABLE?**

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**OBJECTIVES:** Heart rate (HR) at the ventilatory threshold (VT) remains a benchmark often used in the prescription of exercise intensity in cardiac rehabilitation. Some studies have reported no significant difference between the mean HR at VT and HR measured at the end of the a 6 minutes walk test (6MWT) (1,2). The aim

of this work was to assess the potential equivalence between those parameters with a more appropriate statistical approach.

**METHOD:** 3 groups of subjects performed a stress test and a 6MWT: 22 healthy elderly subjects (GES,  $7 \pm 3.7$  years), 10 patients in cardiac rehabilitation after a myocardial infarction (GMI,  $53.9 \pm 4.2$  years) and 30 patients with chronic heart failure (GHF,  $63,3 \pm 10$  years). We analyzed the correlation, bias, 95% confidence interval (95% CI) of the bias and the magnitude of the bias between the HR at the end of 6MWT and HR at the ventilatory threshold.

**RESULTS:** There was no significant difference in the mean HR of 6MWT and at VT in the 3 groups, but the 95% CI was wide (30% for the GES, 15% for GMI, 40% for the GHF). The correlation was moderate for GMI ( $r = 0.78$ ), and low for GES and GHF ( $r = 0.48$  and  $0.55$ , respectively).

**CONCLUSION:** The HR of 6MWT and HR at VT do not appear interchangeable at the individual level in these groups of subjects. To this date, when training prescription aims to target HR at VT, it remains necessary to perform a stress test, or to develop other walk tests after with an exhaustive study of their cardiometabolic requirements.

## PP-02-28

### ENTRAÎNEMENT EXCENTRIQUE AU COURS DE L'INSUFFISANCE CARDIAQUE CHRONIQUE: FAISABILITÉ ET IMPACTS FONCTIONNELS. RÉSULTATS D'UNE ÉTUDE COMPARATIVE

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**OBJECTIFS:** Les effets positifs du reconditionnement au cours de l'insuffisance cardiaque chronique (ICC) ont été objectivés lors d'exercices concentriques (CON). Cependant l'entraînement excentrique (ECC), par sa moindre sollicitation du système cardiorespiratoire et son impact musculaire plus important, constitue une alternative intéressante (1), encore non évaluée au cours de l'ICC par absence de stratégie de personnalisation, exposant à des effets délétères musculaires. L'objectif était d'évaluer la faisabilité, la tolérance et l'amélioration fonctionnelle liée à l'ECC comparativement au CON.

**MÉTHODE:** 30 patients ont été randomisés dans un entraînement (20 séances) ECC ( $n=15$ ) ou CON ( $n=15$ ). L'ECC était personnalisé sur le niveau de perception de l'effort (RPE ; 9-11 échelle de Borg (2)) tandis que le CON était basé sur la puissance correspondant au premier seuil ventilatoire. La tolérance était évaluée par échelle visuelle analogique (EVA) à la fin de la séance et la fréquence cardiaque (FC) au cours de l'entraînement. Les capacités fonctionnelles étaient évaluées par test de marche de 6 minutes (6MWT) (3) avec mesure de la VO<sub>2</sub> lors des dernières 30 secondes.

**RÉSULTATS:** Deux patients ont été exclus pour effets indésirables dans chaque groupe. Les séances étaient bien tolérées avec une consigne respectée (RPE à 9-11 dans le groupe ECC et 12-14 dans le groupe CON). L'EVA est restée proche du 0 pour les deux groupes avec une FC qui n'augmentait que dans le groupe CON pendant le réentraînement. La distance du 6MWT était améliorée dans les deux groupes (ECC: +53 m ; CON: +33 m) avec une VO<sub>2</sub> qui restait stable dans le groupe ECC mais augmentée dans le groupe CON.

**CONCLUSION:** L'entraînement ECC personnalisé par RPE est une alternative efficace, sans danger au cours du reconditionnement pour l'ICC. L'amélioration fonctionnelle est similaire à celle obtenue lors d'un entraînement CON avec une sollicitation moindre du système cardiovasculaire.

**BIBLIOGRAPHIE:**

1. Asmussen E. Positive and negative muscular work. *Acta Physiol Scand* 1953;28:364-82.
2. Borg G. Perceived exertion as an indicator of somatic stress. *Scand J Rehabil Med* 1970;2:92-8.
3. Kervio G et al. Use of the six-minute walk test in cardiology. *Arch Mal Coeur Vaiss* 2005;98:1219-24.

**PP-02-29****ACCURACY AND CONCORDANCE OF ANTHROPOMETRY FOR MEASURING REGIONAL FAT DISTRIBUTION IN ADULTS AGED 20-55 YEARS**A SCAFOGLIERI<sup>1</sup><sup>1</sup>Vrije Universiteit Brussel, Brussels, BELGIUM

**OBJECTIVES:** This study aimed to assess the accuracy and concordance of anthropometrically derived prediction equations for the estimation of regional fat mass (FM) distribution.

**METHODS:** Sixty-two white males and 50 females with a large range of age (20-55 years) and BMI (16.6-33.4 kg/m<sup>2</sup>) were included. Whole body dual energy X-ray absorptiometry (DXA) scans were acquired and anthropometric prediction equations for regional FM were developed and cross-validated. On the basis of the total sample two anthropometrically derived indices of FM distribution [Formula: %FMtrunk/%FMlegs] ratio and [Formula: FMtrunk/FMlimbs ratio] ratio were compared with their DXA analogues.

**RESULTS:** In both sexes multiple linear regression models predicted the regional DXA fat masses with good accuracy ( $P < 0.001$ ). In men mean bias (limits of agreement) were: -6.8 g (-535,364) for FM(arms), 65 g (-1921,2052) for FM(trunk), -21 g (-1374,1332) for FM(legs), -0.2% (-5.0,4.7) for %FM(trunk) and -0.5% (-6.8,5.8) for %FM(legs). In women mean difference (limits of agreement) were: -86 g (-463,450) for FM(arms), 30 g (-1784,1844) for FM(trunk), -278 g (-1782,1227) for FM(legs), 0.4% (-5.5,6.3) for %FM(trunk), and 0.3% (-8.3,8.9) for %FM(legs). No systematic (constant and proportional) differences between methods for the determination of FM distribution ratios were found, suggesting method interchangeability. The concordance for subject classification based on t-scores according to the National Health and Nutrition Examination Survey (NHANES) was significant ( $P < 0.001$ ), with substantial agreement for [Formula: FMtrunk/FMlimbs] ratio ( $\kappa(w) = 0.80$ ) and [Formula: %FMtrunk/%FMlegs] ratio ( $\kappa(w) = 0.75$ ).

**CONCLUSION:** Anthropometric variables offer promise to the development of simple, noninvasive, and inexpensive screening to identify individuals with abnormal FM distribution. The anthropometrically derived indices of FM distribution demonstrate sufficient accuracy for clinical use.

**PP-02-30****EVALUATION OF MOTOR ACTIVITY, ENERGY EXPENDITURE AND PHYSICAL FITNESS IN CHILDREN AGED 8-11**G. MICHELETTI<sup>1</sup>, F. SCARZELLA<sup>1</sup>, C. MILANESE<sup>1</sup>, GP. GANZIT<sup>1</sup>, P. ASTEGIANO<sup>1</sup>, R. BARTOLOMEI<sup>1</sup><sup>1</sup>Istituto di Medicina dello Sport FMSI, TORINO, ITALY

The study's purpose was to get data about motor activity and energy expenditure (EE) among function of body composition, physical fitness and nutrition in children living in metropolitan area.

**MATERIALS AND METHODS:** We have examined 160 subjects, male (M) and female (F), from age 8 to 11. For functional evaluation we used laboratory and field tests. We have measured EE with Sense Wear Armband system in all subjects for two consecutive days during the weekdays and during the weekends, two times in a year in late autumn and spring.

**RESULTS:** Anthropometric and functional values increase with age in both sex, with statistically significant differences between 10 and 11-yr-old children and younger children. This is true also for DE that resulted greater in M (181 kJoule/kg vs 165 in F). There were no significant differences between DE in ferial days and weekend while spring DE resulted greater than autumn DE (6735 kJ vs 6223 kJ in male and 6349 kJ vs 6052 kJ in F). Caloric intake resulted greater than DE and also higher in M (7547 kJ vs 6797 kJ in F) with lipid excess (44-45%).

**CONCLUSION:** Covariance analysis has not put significant relationship evidence between DE and caloric intake neither between DE and functional parameters, except for muscular strenght. In general it is suggested to carry out educative interventions to decrease consume of fats in nutrition and increase motor activity and sport. In cases of overweight it is necessary to carry out individual interventions, keeping in mind specific anthropometric and functional characteristics.

**KEYWORDS:** energy metabolism – energy intake – physical fitness – child.

## PP-02-31

### BOYS AND GIRLS HAVE DIFFERENT INFLUENCES TO STAY PHYSICALLY ACTIVE

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**BACKGROUND:** The current recommendation for children and adolescents is to perform physical activities of moderate to vigorous intensity every day. During childhood the practice of physical activity is influenced by the support of friends, relatives and teachers among other factors such as the perceived benefits and the feeling of pleasure or not through the practice of physical activity<sup>1</sup>.

**OBJECTIVE:** This study aimed to identify the factors (gender, psycho-social and environmental factors) that influence physical activity according to the theory of planned behavior (TPB).

**METHODS:** This observational study included a sample of 953 children between 6 and 11 years old, selected in 11 public schools in Languedoc Roussillon (France). This data is a baseline study from project “Grand Défi Vivez Bougez” to improve physical activity in children.

All children answered an auto-questionnaire<sup>2</sup> based on TPB including assessment of attitude, subjective norm, perceived behavioral control. It was evaluated socio-demographic factors (age, sexe) and environmental factors (ex: physical activity practice by family, friends). The frequency of physical activity weekly collected as ordinal variable was dichotomized practicing physical activity every day or not. A logistical backward regression was model for all group and for each gender.

**RESULTS:** There is a difference between genders concerning frequency of physical activity. Boys have more chance to do physical activities all days than girls. Intention to do physical activity almost all days was an important predictor for both genders. No positive attitude stay in both models, by the other side for boys and girls, comprehension that physical activity is tiring decreased the chance to do physical activity all days (OR=0.6 and 0.4, respectively). For girls, the behavior of social network (parents, friends, relatives and teacher) didn't show related with his own behavior, but if friends encouraged they had more chance to be active (OR=2.4). Even the support to do physical activity seems important they are not significant in multiple analysis for boys, but if both parents do physical activity boys had more chance to do also

(OR=1.7). Boys that perceived as more actives than others and believes that can do physical activity even if weather is not nice had 2.7 times more chance to be more active. For girls the perceived behavior control is related to their homework (OR=2.2).

**CONCLUSION:** These results provide partial support for understand differences between genders related to physical activity behavior in a sample of French children. Even intention should be the most important predictor to practice physical activity, a negative attitude concerning physical activity is also strong to avoid be more active. Children perceived as selves with autonomy to control their leisure time. These results showed that is necessary specific approaches to engage girls and boys to be physically active.

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### PP-02-32

#### INVESTIGATING THE DIFFERENCES BETWEEN THE BASIC MOTOR CHARACTERISTIC OF 9-10 YEARS OLD STUDENTS LIVING IN CITIES AND RURAL AREAS OF KUTAHYA

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The purpose of this study is to investigate The Basic Motor Characteristic differences between 9-10 years old students living in cities and rural areas of Kütahya. Total 180 children, in age of 9-10, participated in this study from Kütahya City Center (40 girl-50 boy) and Kütahya rural areas (40 girl-50 boy). The test of TGMD-II which widely used to measure basic motor characteristics was applied as measurement method. In order to carry out this study permission was taken from the Director of Study and from the parents who participates the study.

Kolmogorov-Smirnov normality tests were performed to determine whether the data has a normal distribution or not. To determine whether there is a significant difference between the groups, Independent-Samples T-Test was performed in the level of significant  $\alpha=0.05$ .

As a result of this study a significant difference of basic motor characteristics were found between the children who lives in city center and rural areas in Kütahya ( $p<0.05$ ).

**KEYWORDS:** Motor Development, Children, Movement , Motor tests.

### PP-02-33

#### EFFECT OF SPORT CONSUMPTION AND SPORT DEPENDENCE ON STRESS MANAGEMENT IN FRENCH SOLDIERS DEPLOYED SIX MONTHS IN AFGHANISTAN

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**CONTEXT AND OBJECTIVES:** Sport activities can be considered either in terms of sport consumption (hours of sport per week) or sport dependence characterizing a behavioural addiction (BA). During military operations soldiers are used to dealing with stress. We hypothesised that increasing sport quantity could be beneficial, whereas exercise dependence could be deleterious for stress management. The main

	"Cohen's perceived stress" score				POOMS "state of anxiety" score		Ham-A score		Ham-D score		EDMF
	0h (level 1) 0h30-3h30 (level 2) 4h-5h30 (level 3) 7h and more (level 4)	34,6 ± 0,6 (132) 33,2 ± 0,7 (91) 33,4 ± 0,8 (78) 33,4 ± 0,8 (75)	31,3 ± 0,6 (117)§§§p<0,001 34,2 ± 2,2 (102)	10,8 ± 0,2 (226) 11,3 ± 1,2 (103)	10,2 ± 0,3 (121) §p<0,05 12,7 ± 0,4 (137) **p<0,001	11,6 ± 0,4 (131) 11,5 ± 0,4 (92) 11,4 ± 0,4 (82) 12,2 ± 0,6 (77)	5,9 ± 0,3 (137) 5,8 ± 0,3 (96) 5,2 ± 0,3 (81) 5,8 ± 0,4 (78)	4,8 ± 0,2 (121) 5,3 ± 1 (106)	3,2 ± 0,2 (227) 3,8 ± 0,2 (147) *p<0,05	3,9 ± 0,3 (137) 3,2 ± 0,3 (96) 3,5 ± 0,3 (81) 3,0 ± 0,3 (79)	
BEFORE	Sport consumption	NDA	32,6 ± 0,5 (220) sport +	35,3 ± 0,5 (137) *** p<0,001	12,7 ± 0,4 (137) **p<0,001	5,1 ± 0,2 (227)	3,2 ± 0,2 (227)	13,7 ± 0,4 (193)	2,8 ± 0,2 (121)	13,5 ± 0,4 (104)	
		NDS	37,1 ± 2 (15) (p=0,97)	37,1 ± 2 (15) (p=0,97)	15,8 ± 2 (15) **p<0,01	9,3 ± 0,2 (137) **p<0,01	3,8 ± 0,2 (147) *p<0,05	12,8 ± 0,5 (109)	3,9 ± 0,8 (15)	12,3 ± 1,5 (12)	
AFTER	Sport dependence	Same level as before (2 or 3 or 4) Level decreased compared with before (from 2 or 3 or 4)	4 ± 0,6 (26)		4 ± 0,6 (26)	5,4 ± 0,7 (26)	2,7 ± 0,6 (26)	12,3 ± 0,8 (26)	2,7 ± 0,6 (26)	12,3 ± 0,8 (26)	
		Same level as before (1=1) Level increased compared with before (from 1 to 2 or 3 or 4)	3,6 ± 0,7 (43)		3,6 ± 0,7 (43)	4,6 ± 0,4 (43)	4,4 ± 0,5 (43) *p<0,05	10,9 ± 0,7 (35)	4,4 ± 0,5 (43) *p<0,05	10,9 ± 0,7 (35)	
AFTER	Sport consumption	Non observed	Non observed	Non observed	3,9 ± 0,8 (20)	6,5 ± 0,6 (20)	6,0 ± 0,6 (20)	11,5 ± 1,3 (15)	6,0 ± 0,6 (20)	11,5 ± 1,3 (15)	
		NDA before → NDA after NDA before → NDS after	2,6 ± 0,4 (46) 4,1 ± 1,1 (25)	2,6 ± 0,4 (46) 4,1 ± 1,1 (25)	2,6 ± 0,4 (46) 4,1 ± 1,1 (25)	3,4 ± 0,8 (13) **p<0,01	1,7 ± 0,5 (13) **p<0,01	11,5 ± 1,0 (13)	1,7 ± 0,5 (13) **p<0,01	11,5 ± 1,0 (13)	
AFTER	Sport dependence	NDA before → NDA after NDA before → NDS after	3,4 ± 0,8 (25) *p<0,05 5,4 ± 1,1 (25)	3,4 ± 0,8 (25) *p<0,05 5,4 ± 1,1 (25)	3,4 ± 0,8 (25) *p<0,05 5,4 ± 1,1 (25)	4,1 ± 0,4 (46) 3,9 ± 0,8 (25) *p<0,05	3,4 ± 0,6 (45) 5,4 ± 1,1 (25)	10,7 ± 0,6 (40) 12,7 ± 0,6 (24) **p<0,01	3,4 ± 0,6 (45) 5,4 ± 1,1 (25)	10,7 ± 0,6 (40) 12,7 ± 0,6 (24) **p<0,01	

§ not different from anthropologic scale  
 § different from NDA or steady state  
 § different from "no voluntary sport"

objective of this study concerned the effects of voluntary sport on soldiers stress resistance in the context of a six months deployment in Afghanistan.

**EQUIPMENT AND METHODS:** In an anonymous prospective cohort study (397 soldiers) we studied with questionnaires, Extra Regimental Sport consumption (ERS) and exercise dependence before during and six months after deployment (131 soldiers). Subjects were dispatched into 4 levels of ERS consumption (0h, 0h30-3h30, 4h-6h30, 7h and more) and into 3 groups of sport dependence (Non Dependent Asymptomatic (NDA), Non Dependent Symptomatic (NDS), Sport Dependent (SD)). Anxiety and depression diseases (Hamilton scales), psychological state (Cohen's perceived stress and Profil of Mood Scale (POMS)) were also evaluated. Plasmatic Brain Derived Neurotrophic Factor (BDNF), considered as a good marker of central nervous system plasticity, was measured.

**RESULTS:** Before deployment, ERS consumption concerned 65% of soldiers. 42% of soldiers have a BA with SD (4%) and NDS (38%). Interestingly, BA was not statistically related to higher ERS consumption. Level of perceived stress, anxiety and depression diseases were higher when a BA is detected, and were not influenced by ERS consumption. In soldiers without a BA, results showed that perceived stress and state of "mood of tension/anxiety" were higher in subjects without ERS. Neither ERS consumption, nor BA altered BDNF concentration. During deployment, ERS consumption and the percentage of BA observed were not different from before, but the distribution in ERS levels or sport dependence groups were modified. Thus, 64% of soldiers with a BA were not identified as addicted before the deployment. After 3 months, soldiers presenting a BA had a higher state of 'Mood of tension/anxiety' while ERS consumption did not influence mood state through the mission. After deployment, both higher BDNF concentration and anxiety disease score were observed for soldiers developing a BA compared with those who did not develop a BA. Soldiers who reduced their ERS consumption (/before deployment), suffered from depression compared to soldiers without ERS alteration. Conversely, soldiers who increased their ERS consumption exhibited lower anxiety and depression scores.

**DISCUSSION:** BA seems to present : (1) a relation with high "anxiety" (perceived stress, state of tension, or even anxiety disease), (2) a lability in chronic stress environment. However, BA could be considered as an efficient strategy referred to the high level of BDNF after the mission. A follow-up is necessary to confirm this assumption. Increasing voluntary sport could be protective even for a population with a high level of professional physical activity. Furthermore, a decrease in ERS after a military operation should be interpreted as a warning for both medical and executive staff.

PP-03-34

### INFLUENCE DU MOIS DE NAISSANCE SUR L'ACCES AU SPORT D'ELITE CHEZ LES VOLLEYEUSES ALGERIENNES

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En Algérie, le système de détection des jeunes talents en volley ball peut contenir plusieurs lacunes, parmi elles la non prise en considération du mois de naissance comme indicateur du degré de maturité et de développement physique des jeunes filles. Branda et col. 1984 ont établie le lien entre la maturité de l'enfant et sa performance dans les tâches motrices et cognitives, Ross et Marfell 1991, Borms 1986 ont mis l'accent sur l'importance de déterminer le niveau de maturité de l'enfant sportif en évaluant l'évolution de sa structure corporelle dans le temps et fournir ainsi une quantification des influences différentielles de la croissance et de l'entraînement. Chibane et all 2007 a mis en évidence l'influence de la maturité biologique plutôt que l'âge relatif, Jullien et col 2008 ont conclu que pour être sélectionné et formé dans les centres de formations de foot ball français, il vaudrait mieux être né au premier semestre de l'année.

**OBJECTIFS:** A la lueur de ces études on s'est fixé l'objectif de déterminer si le mois de naissance influe sur l'accès des jeunes volleyeuses au sport d'élite en Algérie.

**MÉTHODOLOGIE:** Nous avons en premier lieu recensé les dates de naissances de toutes les volleyeuses seniors qui ont pris part à au moins une compétition internationale depuis 2008. Nous avons par la suite recensé les dates de naissance des jeunes volleyeuses répertorié comme étant de jeunes talents et celles ayant participé aux compétitions international depuis 2008 (n= 120 nées entre 1993 et 1999), nous avons distribué les athlètes selon le trimestre de naissance T1,T2,T3,T4. En second lieu, nous avons fait une étude corrélative entre le nombre de points joués et l'âge en mois (n=96).

**RÉSULTATS:** Chez l'élite algérienne de volley ball féminin senior, 70% sont nées durant le premier semestre de l'année civile. 73.37% des jeunes talents sont nés durant le premier semestre. Une corrélation statistiquement très marquée existe entre le nombre de points jouée et l'âge en mois.

**CONCLUSION:** Il est claire que le mois de naissance influence l'accès au sport d'élite chez les volleyeuses en Algérie, les filles nées en fin d'année semblent être pénalisées par un système de détection qui ne tienne pas en compte des stades de maturité chez l'enfant. Le système de compétition par catégorisation ne les encourage pas à persister dans la pratique sportive.

**MOTS CLÉS:** Détection , volley ball, Filles, mois de naissance.

#### RÉFÉRENCES:

1. Branda C., Hanbenstricker J. et Seefeldt V : «Age changes in motor skill during childhood and adolescence», In R.-L. Terjung (Éd.). Exercise and Sport Sci. Collamore Press, Lexington, 1984
2. Borms, J: 'The child and Exercise: An Overview', Journal of sport sciences, vol 4. 1986
3. Chibane S, Hautier C, Gaudino C, Massarelli R, Mimouni N: 'Influence of age, maturity and body dimensions on selection of under-17 Algerian soccer players.' J Sports Sci Med 2007.
4. Grondin S, Deshaies P, Nault LP: 'Trimestres de naissance et participation au hockey et au volleyball'. Rev Que Act Phys 1984.
5. Jullie,H ,Turpin,B ,Carling,C: ' Influence de la date de naissance sur la carrière professionnelle des joueurs de football français.' ed Elsevier, France 2008
6. Ross,D, Marfell. J: 'Kinanthropometry' dans MacDougall et all physiological testing of high performance athletes, Humain kinetics, Illinois 1991

## PP-03-35

**EFFECT OF THE LENGTHENING OF THE PROTOCOL ON THE RELIABILITY OF KNEE MUSCLE FATIGUE INDICATORS**

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**OBJECTIVES:** to examine absolute and relative reliability of fatigue measures calculated from peak torque (PT) or total work (TW) during 20, 30, 40 and 50 maximal concentric contractions of the knee flexors and extensors performed on an isokinetic dynamometer at 180°.

**METHOD:** eighteen moderately active men performed 50 reciprocal maximal concentric contractions of the knee on a Biodex dynamometer on three occasions with 7-10 days between each. PT and TW were computed for each contraction and summed to compute cumulated performance after 20, 30, 40 and 50 repetitions. Muscle fatigue was determined by the fatigue index (FI), the percent decrease in performance and the slope, determined via linear regression by plotting performance (PT or TW) of each repetition across 20, 30, 40 and 50 contractions. Relative reliability was determined using Intraclass Correlation Coefficient (ICC) and absolute reliability was determined using standard error of measurement (SEM).

**RESULTS:** Reliability of average PT or TW was similar, improved with the lengthening of the protocol, although a learning effect was evident for knee flexors. Reliability of fatigue measures calculated from PT or TW was similar, improved with the lengthening of the protocol and was better for knee extensors. Relative reliability was higher for the slope, while FI had a better absolute reliability.

**CONCLUSION:** Measuring average peak torque or average total work and the slope during a protocol involving 30 maximal reciprocal concentric contractions appeared to represent the better compromise between reliability and physiological interpretability of the data.

## PP-03-36

**IS IT POSSIBLE TO INDIVIDUALIZE INTENSITY OF ECCENTRIC CYCLING EXERCISE FROM PERCEIVED EXERTION ON CONCENTRIC TEST?**

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**BACKGROUND:** Compared with conventional concentric (CON) training, eccentric training (ECC) leads to a greater gain in muscle strength, with a lower energy expenditure and less demand on the cardiorespiratory system. Some studies have demonstrated the greater benefits of ECC muscle training in patients with

coronary artery diseases, when compared with CON training. However, ECC training remains underused in clinical practice in the field of physical exercise and rehabilitation, and there are yet no recommendations for its prescription. Our aim was thus to assess safety and acute effects of a procedure using perceived exertion during a prior submaximal CON test to individualize ECC cycling exercise intensity.

**METHODS:** Eighteen healthy subjects aged 22 to 37 (15 males, 3 females) were included in this study. They performed 3 cycling exercises: (1) incremental CON test to determine the comfortable pedalling power (CPP) corresponding to a Borg scale rating of 12; (2) steady CON exercise at CPP to determine the corresponding plantar pressure; (3) steady ECC exercise with an imposed resistance corresponding to CPP plantar pressure. Data collected were: Rate of perceived exertion on Borg scale, VO<sub>2</sub>, heart rate, cardiac output and stroke volume using inert gas rebreathing techniques were measured during steady CON and ECC exercise. Muscle soreness was rated on a visual analogue scale immediately, 24 and 48h after the tests.

**RESULTS:** No adverse effects were reported. VO<sub>2</sub> was about 5 times the resting values for CON exercise, while it was twice for ECC. Cardiac output was lower for ECC exercise ( $p < 0.05$ ), its moderate increase being exclusively linked to an increase in stroke volume, larger to that of the CON exercise ( $p < 0.05$ ).

**CONCLUSION:** Moderate intensity cycling ECC exercise tailored using Borg scale during a prior CON test is well tolerated. It corresponds to a limited muscular use of oxygen and to an isolated increase of stroke volume. It appears to be a feasible procedure for pre-conditioning before ECC training.

PP-03-37

## PHYSIOLOGICAL INTERPRETATION OF THE SLOPE DURING AN ISOKINETIC FATIGUE TEST OF THE KNEE

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**OBJECTIVE:** to assess the relationship between 1/ the slope of peak torque (PT) or total work (TW) measured during a high intensity isokinetic fatigue test and 2/ relevant measures of anaerobic and aerobic pathways, in order to improve their physiological interpretation. Method : Twenty well-trained cyclists participated to 3 randomly ordered sessions involving a high-intensity isokinetic fatigue test consisting in 30 reciprocal maximal concentric contractions of knee flexors and extensors at 180°.s<sup>-1</sup> (FAT), a maximal continuous graded exercise test (GXT), and a force-velocity test (FVT) immediately followed by a Wingate anaerobic test (WAnT).

**RESULTS:** the slope calculated from the peak torque (PT) or total work (TW) of knee extensors was highly associated to maximal PT ( $r = -0.86$ ,  $p < 0.05$ ) or maximal TW ( $r = -0.87$ ,  $p < 0.05$ ) measured during FAT, and moderately associated to body mass ( $r = -0.55$  to  $-0.59$ ,  $p < 0.05$ ) or peak power output (PPO) during the WAnT ( $r = -0.64$  to  $-0.71$ ,  $p < 0.05$ ). We did not find any association with maximal oxygen uptake measured during the GXT ( $r = -0.29$  to  $-0.31$ ). The slope calculated from PT or TW of knee flexors was highly associated to maximal PT ( $r = -0.83$ ,  $p < 0.05$ ) or maximal TW ( $r = -0.90$ ,  $p < 0.05$ ), as well as to peak power output during the WAnT ( $r = -0.66$ ,  $p < 0.05$ ). We did not find any other correlations.

**CONCLUSION:** the slope of PT or TW measured during FAT appears to be mainly determined by anaerobic energy supply.

**PP-03-38****PHYSIOLOGICAL RESPONSE OF SPECIFIC ENDURANCE TRAINING PROGRAM ASSOCIATED WITH TECHNICAL AND TACTICAL ACTIONS IN MALE HANDBALL PLAYERS**M CHERIF<sup>1</sup>, TH MHENNI<sup>1</sup><sup>1</sup>ISSEP Ksar Saïd Tunis, Tunis, TUNISIA

**ABSTRACT:** The aim of the present study was to investigate the effect of combined specific endurance training with technical and tactical actions on the aerobic capacity of male handball players. Twenty-two male handball players aged (age:  $20.18 \pm 1.32$ ; Height:  $180 \pm 3.07$ ; Weight:  $75.90 \pm 10.22$ kg) were divided into 2 groups: an experimental group (n = 11) and a control group (n = 11). Selection was based on their tactical positions (i.e., "axis" and "lines"). The goalkeepers were not included in the study. Subjects of the experimental group were tested before and after 12 weeks of a combined specific endurance training (intermittent 30-s/30-s runs at high intensity (100% to 130% of the maximal aerobic velocity (MAV)) with technical and tactical actions. The control group was also tested at the same periods (i.e., they performed only their usual handball training). During each test session, the subjects of the two groups performed the Yo-Yo intermittent recovery test. During the test, the maximal oxygen uptake (VO<sub>2</sub>max), the maximal heart rate (HRmax), the MAV, and the percent of recovery (PR) were recorded. All tests were performed during the competitive period (during the season). The results showed that VO<sub>2</sub>max, MAV, and PR were significantly higher after the training period in comparison with before training (+3.65%, +4.45%, and +5.97% for VO<sub>2</sub>max, MAV, and PR respectively;  $p < 0.01$ ) in the experimental group. Likewise, the PR of the control group increased significantly from before to after the training period ( $p < 0.05$ ). However, no significant changes were observed for the HRmax in both groups.

In conclusion, combined specific endurance training with technical and tactical actions is beneficial for further increase in the aerobic capacities of handball players during the competitive period.

**KEY WORDS:** maximal oxygen uptake, maximal aerobic velocity, maximal heart rate, percent of recovery, combined training program, handball.

**PP-03-39****THE IMPACT OF STRENGTH BUILDING EXERCISES BY OLYMPIC STYLE WEIGHTLIFTING ON VERTICAL JUMPING AMONG THE 15-17 AGE GROUP HANDBALL PLAYERS COMPARED TO OTHER STRENGTH BUILDING EXERCISES**M. ERZEYBEK<sup>1</sup>, N. GULAK<sup>2</sup>, I. GULMEZ, B. R. EYNUR, A. EYNUR<sup>1</sup>Dumlupinar University, KUTAHYA, TURKEY<sup>2</sup>Sakarya University, SAKARYA, TURKEY<sup>3</sup>Marmara University, ISTANBUL, TURKEY<sup>4</sup>DUMLUPINAR UNIVERSITY, KUTAHYA, TURKEY<sup>5</sup>DUMLUPINAR UNIVERSITY, KUTAHYA, TURKEY

In this study we have analyzed the influence of strength building exercises by olympic weightlifting on vertical jumping exercises in comparison to other strength building exercises. The participants are a total of 24 players (n=12 as experimental group and n=12 as control group) in the 15-17 age group selected from the infrastructure of handball league teams. Strength building exercises as well as technical and tactical exercises have been applied.

Strength building exercises were applied with olympic-style weightlifting exercises three times a week during a period of 8 weeks. On the other hand other strength technical and tactical exercises three days a week. Statistical analysis of data gained in collection of first and last training test data of experimental and control groups was conducted with t-test method. No meaningful difference has been observed in the ratios of height, weight and fat ( $p < 0.05$ ). Only there has been a meaningful difference in the measurements of vertical jumping. ( $p < 0.05$ ). In other parameters, no meaningful difference has been recorded. However the meaningful difference between the average of the first and second measurements of the vertical jumping of experimental group is considerably greater than the meaningful difference between the averages of the first and second measurements of the vertical jumping of experimental group is considerably greater than the meaningful difference between the averages of the first and second measurements of the vertical jumping of the control group ( $p < 0.05$ ).

**KEYWORDS:** Strength, Vertical Jumping, Olympic style weightlifting

PP-03-40

## PECULIARITIES OF ELEMENTAL BALANCE IN CHILDREN-SWIMMERS

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**OBJECTIVE:** It is known that optimal content of essential trace elements is necessary to ensure good health. It is particularly important in conditions of polluted external environment and increased physical loads. The aim of this study was a determination of the macro- and microelements balance in children swimmers in comparison with relevant age group of non-athletes teenagers.

**METHODS:** 15 swimmers and 15 ordinary schoolboys 12-13 aged were examined. Concentration of 28 chemical elements determined in hair by X-ray spectrophotometry.

**RESULTS:** Elements' balance in children-swimmers was characterized by increased content of many essential elements (here and lower: mean  $\pm$  standart error for elements with normal distribution and median, 25% and 75% percentile for abnormal distribution): Ca (1079,1+217,7 mkg/g) K (272,96+73,97 mkg/g), Se (17,00+10,42 mkg/g), Fe (66,76+13,23 mkg/g), Mo (0,09; 0,00; 1,76 mkg/g) Mn (2,61; 0,95; 5,28 mkg/g), Cr (12,14; 5,90; 15,85 mkg/g), Ni (7,50; 6,89; 14,65 mkg/g) Br (0,49; 0,32; 0,89 mkg/g), As (0,00; 0,00; 1,01 mkg/g) and some toxic (Pb: 21,49+10,035; Sr: 16,72+10,439) elements. At the same time teenagers-swimmers had a deficiency of such important essential element as Zn (63,40+6,00 mkg/g). In spite of not enough correct using of X-ray spectrophotometry to assess of halogen content the high values of Cl (682,09 mkg/g) in 75% tested swimmers pay attention to.

As an element balance in human body in definite degree is determined by biogeochemical characteristic of habitation territory the comparison with one in non-athletes schoolboys was carried out. It has shown the significant differences in elements' content in athletes and non-athletes teenagers. Healthy non-athletes children had a deficiency such elements as Ca and Fe while a content of other elements was in the limits of norm. For instance content of such toxic heavy metal as Pb at background exposure on urbanized territory was 1,1; 0,7; 1,9 mkg/g. Common characteristic of element's balance was content of Zn and Cu. In both groups a deficiency of Zn was revealed, but in group of athletes it was total deficiency of this element, meanwhile the value of Zn is half. In non-athletes teenagers an average content of Zn was  $113,4 \pm 4,31$  mkg/g (at norm 120-200 mkg/g) and deficiency of this element was indicated approximately in a half of individuals. A deficiency of Cu was revealed in a quarter of athletes' teenagers and more than in a half of non-athletes teenagers.

**CONCLUSION:** Comparison of element balance in both groups shows increased content of majority investigated chemical elements in hair of swimmers, both essential and toxic. It may be determined by more intensive metabolism and excretion of elements connected with systematic physical loads and can create an higher risk of essential elements deficiency what are necessary for many physiological and biochemical processes. Zn deficiency can be determined also with biogeochemical peculiarities of geographic region or (and) poor modern diet, because takes place in both groups of teenagers, more expressed in athletes. Competitive relationships between essential and toxic elements can play a definite role in that.

**PP-03-41****EFFECTS OF ECCENTRIC AND/OR CONCENTRIC EXERCISE TRAINING AT THE SAME RELATIVE MAXIMAL SPEED (80%) ON MITOCHONDRIAL FUNCTION**

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It is well-known that regular concentric (CON) exercise training enhances mitochondrial function but the effect of eccentric (ECC) exercise training is unknown. Eccentric exercise can be generated using treadmill running with a negative slope. Then, the purpose of our study was to compare the effects of concentric and/or eccentric exercise training at the same relative maximal running speed on exercise performance and mitochondrial function in rats.

Twenty-four rats performed an incremental test in both CON (uphill, +15°) and ECC (downhill, -15°) mode on a treadmill to plan the exercise training program. Then the rats were divided in 3 groups trained either in CON or ECC or combined CON and ECC exercise modalities during 4 weeks, 5 times/wk. The intensity of exercise training progressively increased to reach 80% of maximal running speed measured during CON (41 cm/s) or ECC (72 cm/s) incremental test for up to 30 minutes the last week of training. Eight rats are also used as a control sedentary group (SED). One week before sacrifice, CON and ECC incremental tests were repeated to assess maximal ECC and CON running speed in all groups. Twenty four hours after the last training session, rats were sacrificed and the vastus intermedius, gastrocnemius and soleus removed to assess mitochondrial function.

All training groups increased maximal running speed in CON and ECC modes compared to the control sedentary group. However, the greater training effect was observed in the CONC group compared to both ECC and CONC-ECC groups. The heart to body weight ratio largely increased in all exercise groups suggesting a heart hypertrophy secondary to exercise training, with no specific effect of training mode. Mitochondrial respiration in vastus intermedius and soleus is enhanced only in the CON group while it did not change in gastrocnemius in all training groups. It seems that the rise in maximal aerobic performance is partly due to heart hypertrophy in ECC and CON-ECC groups and also involved the improved mitochondrial function in CON group. Since CON and ECC groups increased largely ECC and CON maximal running speed respectively, the specificity of exercise training might not represent a key factor to improve eccentric or concentric aerobic exercise performance although whatever CON exercise training tend to be more efficient.

## MAXIMAL HEART RATE IN TUNISIAN MALE SUBJECTS AGED UNDER 20 YEARS: COMPARING MEASURED AND PREDICTED VALUES

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**OBJECTIVE:** Maximal heart rate (HR<sub>max</sub>) is an important physiological variable used as a criterion to assess maximal exertion during graded exercise test and it is often interpreted as the upper limit of the central cardiovascular system. In addition, HR<sub>max</sub> is commonly considered as the widely used measure to assess the response of the heart to exercise, and its recovery from stress, as well as to prescribe and quantify exercise intensities. Actual HR<sub>max</sub> is usually determined in a laboratory by using graded exercise testing that requires skilled personnel and necessitates very expensive equipments which limit its use in large groups. For these reasons, numerous prediction equations based on age are generally used to estimate this variable. However, these equations were assessed essentially for subjects aged above 20 years. Their accuracy and applicability for subjects under 20 years warrant further studies involving a sample of this population. Furthermore, physical educators and fitness trainers are continuously looking for the more appropriate formula that predicts accurately HR<sub>max</sub> in a group of children and adolescents. Accordingly, the aim of our study was to compare HR<sub>max</sub> values measured during 20 m multistage fitness test (MSFT) with those derived from The [220 – age] and [208 – (0.7 × age)] prediction equations in 8-20 years old male Tunisian subjects.

**METHODS:** MSFT was used to obtain reference values for HR<sub>max</sub> in 145 male subjects (age: 13.94 ± 3.17 year, body mass: 49.76 ± 16.92 kg, height: 1.59 ± 0.17 m, BMI: 18.95 ± 2.96 kg·m<sup>-2</sup>, VMA: 12.49 ± 0.83 km·h<sup>-1</sup>). Heart rate (HR) was recorded at 5-s intervals using heart rate monitors (S810TM, Polar, Kempele, Finland) during the MSFT. HR<sub>max</sub> was taken as the highest HR achieved during the MSFT. Measured values were compared with those estimated from the [220 – age] and [208 – (0.7 × age)] formulae using repeated-measures ANOVA. Correlation between measured and estimated values was tested.

**RESULTS:** our results demonstrated no significant difference between measured and [220 – age] predicted maximal heart rate (206.4 ± 6.1 beat·min<sup>-1</sup> vs. 206.1 ± 3.2 beat·min<sup>-1</sup>, p = 0.744). However, significant difference was found between measured and [(208 – (0.7 × age))] predicted maximal heart rate (206.4 ± 6.1 beat·min<sup>-1</sup> vs. 198.3 ± 2.2, p = 0.000). Correlation coefficients for [220 – age] prediction equation and measured maximal heart rate were (r = 0.703, p = 0.000). Measured maximal heart rate was strongly and inversely correlated to age expressed as mean age group or individual age values (-0.916, p = 0.000; r = -0.704, p = 0.000, respectively).

**CONCLUSION:** based on these results, it can be concluded that, the [220 – age] prediction equation seems to be more appropriate than [208 – (0.7 × age)] to estimate maximal heart rate in male Tunisian subjects, aging from 8 to 20 years. This finding may have important implications when prescribing exercise intensity for this population.

PP-03-44

**ALL ROUND, SIMPLE AND INEXPENSIVE FOOTBALL PRE-PARTICIPATION EVALUATION PROGRAM**L. LIMA<sup>1</sup>, I. TÁBOAS<sup>1</sup>, M. CARVALHO<sup>1</sup>, V. ERMIDA<sup>1</sup>, J. CALDAS<sup>1</sup><sup>1</sup>Centro Hospitalar Tondela Viseu - PM&R, Viseu, PORTUGAL

The pre-participation sports medical assessment is a legal demand of various Portuguese sport federations and it combines a cardiovascular screening with a musculoskeletal approach in order to identify high sudden death risk and also musculoskeletal problems. We pretend to describe a low cost pre-participation football screening program that complements the medical obligatory one used in Portugal. The main objectives are to get base values for muscle strength and aerobic/anaerobic performance that can be used to decide when to return to play after a severe lesion, to get base values for better concussion assessment and includes strength and flexibility assessments focused on imbalance detection between agonist/antagonist and contralateral muscular groups. The tests included are simple, easy to read, mimic specific in game exercises and require cheap sport equipment. All the tests included have good inter-observer reproducibility, though we had to substitute some gold-standard tests (like the very valuable isokinetic tests) for being less accessible and time-consuming.

PP-03-45

**THE HEART FUNCTIONAL RESERVE OF YOUNG BASKETBALL PLAYERS AND THEIR SPORTS ACHIEVEMENTS**K. MEKHDIEVA<sup>1</sup>, V. TIMOKHINA<sup>2</sup>, S. DOMANOV<sup>1</sup>, F. A. BLYAKHMAN<sup>1,2</sup><sup>1</sup>URAL Federal University, EKATERINBURG, RUSSIA<sup>2</sup>URAL State Medical Academy, EKATERINBURG, RUSSIA

**INTRODUCTION:** Generally, the heart functional reserve is the ability to maintain pump-function stability in extreme situations, be it an extra load or a pathological process. To determine the heart functional reserve in clinical cardiology, the stress tests with use of the treadmill or bicycle ergometer are usually applying to patients' examination in order to test the patient's tolerance to physical load, reflecting the heart functional reserve. The aim of this study is to determine possible relationship between the young basketball players' tolerance to stress test and their sports effectiveness.

**MATERIALS AND METHODS:** Twenty two students (12 male and 10 female) of two student basketball teams (ASB) of the Ural Federal University underwent the stress test with use of the treadmill exercise testing system (SCHILLER AT-104, Switzerland). All students signed the consent for study participation. The sportsmen's tolerance to physical load was determined by following parameters: heart rate restitution after stress test, the product of heart rate and arterial pressure ("Robinson Index") and the level of maximum attained load (METs). The players' sports achievements were estimated as the mean number of effective actions (EFF) and points per game (PPG) for the playing season of 2012/2013. The statistic software package IBM SPSS was used for statistical analysis.

**RESULTS:** On average, the male players had  $22.0 \pm 2.6$  years,  $197.4 \pm 8.0$  cm height,  $23.7 \pm 2.1$  body mass index; and the female players had  $19.2 \pm 3.1$  years,  $174.8 \pm 8.9$  cm,  $21.5 \pm 2.0$ , respectively. In the male group we found close correlations between heart rate during the 1st minute of recovery period after stress test and EFF ( $r = -0.65$ ,  $p < 0.05$ ) and PPG ( $r = -0.64$ ,  $p < 0.05$ ), respectively. In the female group, the close correlations between the "Robinson Index" and the PPG were determined ( $r = -0.65$ ,  $p < 0.05$ ). No significant

correlations between the METs and the players' effectiveness parameters for both the male and the female players were found.

**CONCLUSIONS:** The obtained data imply that the higher extent of sportsmen's tolerance to physical load associates with the greater level of sports achievements for both male and female young basketball players. In spite of the limited number of observations, we may conclude that independently of the gender of sportsmen the heart functional reserve is an important determinant of the young basketball players' sports achievements.

PP-03-46

## HEART RATE VARIABILITY AND PERSONALITY IN UNIVERSITY STUDENTS WITH DIFFERENT PHYSICAL ACTIVITY LEVEL

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It is widely accepted in sports medicine that both autonomic state and psychological traits show longitudinal stability and heritability.

The aim of the study was to evaluate the relationship between heart rate variability (HRV) and psychological state assessed by "Big Five" factors Inventory (FFI) in healthy subjects with different habitual physical activity level. Russian version of FFI (Chromov A.B., 2000, 75 items) was used in 110 students: 62 - VI year medical students (18 male and 44 female) and 46 - 2-4 year physical education students (29 male and 17 female). HRV was obtained with 5 min. recording in sitting and standing position.

We examined five basic personality traits: Extraversion (E), Neuroticism (N), Conscientiousness (C), Openness to Experience (O) and Agreeableness (A), which are endogenous dispositions, relatively untouched by life experience, and 25 facets.

In male-athletes N was significantly lower ( $40.0 \pm 8.5$  and  $50.9 \pm 9.6$ ) than in females, whereas other parameters did not differ. In untrained male group N ( $45.6 \pm 10.2$  vs  $52.4 \pm 10.2$ ), C ( $52.9 \pm 8.2$  vs  $56.4 \pm 8.4$ ,  $P < 0.05$ ), O ( $51.3 \pm 9.1$  vs  $56.1 \pm 6.3$ ), feelings and intellectual curiosity were significantly lower than in female. Differences in HRV were also found: relative spectral power of LF band in males was higher ( $43.6 \pm 13.8$  and  $36.8 \pm 13.6\%$ ,  $P = 0.04$ ), but HF% - lower ( $22.3 \pm 1.6$  and  $29.9 \pm 16.4\%$ ,  $P = 0.02$ ) than in females.

In male-athletes activity, assertiveness and fantasy were higher, but N, anxiety and depression – significantly lower than in sedentary students. In female-athletes E ( $P < 0.01$ ), activity ( $P < 0.01$ ), excitement seeking, warmth and fantasy were higher, but anxiety and deliberation – lower ( $P = 0.02$ ) than in untrained girls.

Correlation analysis revealed gender differences in relations between autonomic nervous system and personality. The strongest correlations were found in males than in females and in athletes than in sedentary students. Only in male- and female-athletes E was positively related with parameters indicating vagal tone (nHF, SDNN). Excitement seeking positively correlated with TP and HF both in male-athletes and untrained females.

The higher count of correlations in untrained students was found between dominance, emotional lability and sympathetic tone (diminished CV%), while accuracy and assertiveness were positively related with CV%, TP and LF power. Warmth and trust were positively related with functioning of vagus (HF).

High sensitivity in untrained females was related with hyper reactivity to ortotest. Artistry and excitement seeking positively correlated with vagal tone (pNN50%, HF%), while fantasy – positively with sympathetic tone (LF%).

Gender differences were most prominent in athletes: in males accuracy and anxiety were directly related with SDNN, while in females - inversely. In female-athletes facets trust and dutifulness negatively correlated with long term spectral HRV parameters (power of VLF and LF band).

In conclusion, these findings indicate that there is the strong relationship between personality measured by FFI and HRV, i.e. between psychological and physiological characteristics. Obtained gender differences must be taken into account. Results may be helpful for sport physicians and coaches, especially in team sports.

**PP-03-47****MORPHOTYPOLOGIE ET SOMATOTYPICHEZ LES SPORTIFS ALGÉRIENS**

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**RÉSUMÉ:** La définition de la morphotypologie des athlètes est essentielle pour définir le meilleur « type » morphologique pour chaque discipline sportive et pour améliorer la performance. Il est important pour les entraîneurs de connaître et de comprendre les facteurs qui rendent possible un haut niveau de réussite sportive dans leur discipline. L'évaluation de l'athlète de haut niveau est une des dimensions essentielles de l'optimisation de la performance sportive. Les critères qui départagent en premier lieu les individus est la morphologie.

L'intérêt porté à la morphologie du sport de haut niveau par l'ensemble des auteurs tels que Hirata, 1966 ; Maas, 1974, Salmela 1980, Gladden et Colaicino 1978 ; Spence et al 1983 ; Carter, 1984 ; Bale, 1986, etc., montre clairement que ce paramètre apparaît comme l'une des composantes importante de la performance.

C'est dans ce contexte que cette étude a été réalisée afin d'évaluer le somatotype du jeune sportif algérien. Pour le morphotype et le somatotype, 104 jeunes sportifs algériens ont été mesurés. Les résultats indiquent que les sportifs Algériens montrent des paramètres totaux et segmentaires plus petits que leurs homologues belges, canadiens et français. L'ectomesomorphisme caractérise d'ailleurs ces derniers alors que l'endomorphisme est le caractère primaire des algériens.

Enfin les données issues de notre recherche constitueront un support essentiel pour l'entraînement des athlètes algériens

**MOTS CLÉS:** sportifs algériens, morphotypologie, somatotypie

**PP-03-48****EVALUATION OF THE NUTRITIONAL PROFILE AND BODY COMPOSITION OF YOUNG TUNISIANS WEIGHTLIFTERS**

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**INTRODUCTION:** Weightlifting is a sport that requires good muscle preparation because it solicits almost all the muscles of the body. Adequate body composition is necessary for this sport and a good nutritional balance is paramount to achieve this especially in the case of growing teenagers. For these reasons this study is to evaluate the nutrient profile of young Tunisians weightlifters.

**OBJECTIVES:** study the quantitative and qualitative aspects of spontaneous daily diet. As well as anthropometric characteristics and body composition of these young athletes.

**POPULATION AND METHODS:** The subjects were all males ( $n = 31$ ) aged between 14 and 18 years. They train for two hours a day, six days a week in four weightlifting clubs in Tunis. These subjects were invited to attend an evaluation session at the National Center of Sports Medicine Tunis: They attended a food survey (24h recall, with frequencies of consumption over a period of 7 days) and following anthropometric measurements (weight, height and skin folds) were conducted.

**RESULTS AND DISCUSSION:** Our study population was middle-aged ( $15.58 \pm 1.31$ ). The average BMI is ( $21.5 \text{ kg} / \text{m}^2 \pm 3.35$ ), the average body fat is ( $12.28 \pm 5.22\%$ ) and the average lean body mass is ( $87.73 \pm 5.22\%$ ). Regarding dietary intake, the average of the estimated energy intake is ( $3257.19 \text{ kcal} \pm 405.76$ ) while the DRI suggests ( $3274.1 \text{ kcal} \pm 234.04$ ). The distribution of carbohydrates, lipids and proteins are respectively 56.32%, 28.52% and 15.26%. The distribution SFA and MUFA is respectively 13.19% and 11.03%. The average daily intake of calcium and magnesium, respectively ( $822.51 \text{ mg} \pm 188.6$ ) and ( $199.90 \text{ mg} \pm 42.63$ ). The average daily intake of water ( $1587.10 \text{ mL} \pm 410.5$ ). The study population diet provides a daily energy corresponding to the DRI ( $p > 0.05$ ). The contribution is in excess concerning SFA. While MUFA, calcium, magnesium and water intake is deficit. We found correlations between body composition and dietary intake. Finally, the Estimated average fat mass in the study sample was Compared to other populations and it is in the standard  $p = 0.778$ .

**CONCLUSION:** Although the body composition of our population is satisfactory, the intake of certain nutrients in excess or deficit can be adjusted to have the balanced diet recommended. This may have a positive effect on body composition of young weightlifters and performance.

PP-03-49

## ASSESSMENT OF DIETARY INTAKE AND HYDRATION STATUS IN RACE CAR DRIVERS

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**INTRODUCTION:** Long distance race car driving is a sport with a high risk of dehydration both in training and competition, as the athletes have to perform several hours at high temperature in the car. Thus, adequate intake of food and fluid is needed to prevent dehydration and to ensure health and performance of the drivers. However, little is known about the dietary habits and hydration status of race car drivers during training. Hence, the purpose of the study was to assess the hydration status and nutritional intake of long distance race car drivers during annual health evaluation.

**METHODS:** Food and water intake was assessed in 16 male race car drivers ( $28.5 \pm 6.1$  yrs,  $1.81 \pm 0.06$  m,  $68.01 \pm 17.5$  kg,  $21.5 \pm 0.05$  kg/m<sup>2</sup>) using a structured 24-hour diet recall based on the German food data base. To evaluate hydration status, water intake and morning urine specific gravity using a reagent strip was measured. Data were analysed descriptively ( $M \pm SD$ ).

**RESULTS:** Athletes consumed  $2178 \pm 81.34$  kcal/day of energy with  $236.1 \pm 96.7$  g/day of carbohydrates ( $3.3 \pm 1.5$  g/kg/d) and  $95.1 \pm 39.4$  g/day of proteins ( $1.3 \pm 0.7$  g/kg/d). Water intake from food and fluids was  $3310 \pm 1522$  mL/day. The mean urine specific gravity was  $1.022 \pm 0.007$  g/mL. In 73% ( $N=11$ ) of the athletes a urine specific gravity equal to or higher than 1.020 g/mL was measured. Out of this, 27% had a urine specific gravity of 1.030 g/mL.

**CONCLUSION:** Mean energy and carbohydrate intake is low considering the athletes' daily training schedule. This might be attributed to the athletes' strive to have a low body weight to support athletic performance. The study also suggests that a high percentage of race car drivers are dehydrated in the normal training process. It is encouraged to implement education tools and individualized rehydration schedules for the race car drivers during training.

## POSTER SESSION PP4 – EXERCISE PHYSIOLOGY-2

PP-04-50

### RESEARCHING BASIC BIOMOTOR, ENDURANCE AND BODY FAT PERCENTAGE OF ELITE MEN AND WOMEN FENCERS ATTENDING HIGH LEVEL SPORT WHOSE BRANCHES ARE EPEE, FOIL AND SABRE

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**AIM OF THE STUDY:** researching basic biomotor, endurance and body fat percentage of elite men and women fencers attending high level sport whose branches are epee, foil and sabre.

In this research star and young fencers attending epee, foil and sabre branches of Turkey Championships held by National Education Ministry and Fencing Federation, determined as study population. 60 star fencers (24 girls and 36 boys) and 60 young fencers (34 girls and 26 boys) totally 120 sportsman attended to this study. As study group 41 fencer (23 girls, 18 boys) in sabre branch, 43 fencer (18 girls, 25 boys) in epee branch, 36 fencer (17 girls, 19 boys) in foil branch voluntarily participated in this study. Within study a set of measurements performed for determining basic biomotor, endurance, reaction time and body fat percentages of male and female fencers. For Biomotor tests; 20 meter running, sit & reach test, dynamic agility test, right-left hand grip test, vertical jump test and standing long jump test were performed by subjects and measurements taken by researcher. To determine endurance level of subjects shuttle run test were performed. Reaction time rates of subjects determined with Sport Expert marked MPS-501 (multipurpose system) equipment. To determine body fat percentages, anthropometric measurements was taken from subjects' Biceps, Triceps, Sub-Scapula and Supra-Iliak sites. Durnin Womersley Formula applied to calculate body fat percentages.

As a statistical method, to determine differences between two groups, Independent Samples T-Test, to determine differences between fencing branches One Way Anova, to determine differences based on fencing branch-gender-age group, Two Way Anova was performed in the level of significant  $\alpha=0.05$ . Tukey's HSD test was used as the second level test for significant differences found in variance tests.

Test results showed that significant differences between basic biomotor ( $P<0.05$ ), endurance ( $P<0.05$ ), reaction time ( $P<0.05$ ) and body fat percentages ( $P<0.05$ ) of groups based on Star-Young, Girl-Boy and Fencing Branch (Epee, Foil, Sabre) factors.

Findings of this study showed that age, gender and training time has effects on basic biomotor, endurance, reaction time and body fat percentages of fencers.

**KEYWORDS:** Fencing, Epee, Foil, Sabre, Endurance, Body Fat Percentage, Reaction Time.

## PHYSIOLOGICAL ADAPTATION OF METABOLIC AND CARDIOVASCULAR PARAMETERS IN PROFESSIONAL SOCCER PLAYERS

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**INTRODUCTION:** Different specific training programs influence the metabolic and functional characteristics of the athletes and determine physiological adaptation during an agonistic season.

The aim of the study was to evaluate the modifications of the metabolic and cardiovascular parameters in a professional soccer team in three different phases of the agonistic season: predominantly aerobic training, predominantly anaerobic training and alternate aerobic/anaerobic training.

**METHODS:** We studied 24 healthy soccer players (male, 21.7±/− 5.4 years), no smokers. The bioelectrical impedance analysis (BIA) method was performed and cardiovascular parameters were monitored (heart rate, systolic and diastolic blood pressure) before the beginning of the agonistic season (T<sub>0</sub>), after 4 months, during the championship, and after 8 months, shortly before the end of the regular agonistic season. All parameters are reported as mean ± standard deviation and were processed by ANOVA test for repeated measures and considering significant values of P<0.05.

**RESULTS:** We noted a progressive significant reduction of the HR (T<sub>0</sub>=53±7; T<sub>1</sub>=52±4; T<sub>2</sub>=48±3; P<0.001) and of the DBP (T<sub>0</sub>=69±7; T<sub>1</sub>=68±6; T<sub>2</sub>=61±3; P<0.000) and a significant increase of the SBP (T<sub>0</sub>=90±5; T<sub>1</sub>=114±7; T<sub>2</sub>=108±9; P<0.004), determined by the progressive increase of the stroke volume (increased of 23,5% between T<sub>0</sub> to T<sub>2</sub>). No differences were in the BMI value, on the contrary we observed an important reduction of the TWB (P<0.004), the BCM (P<0.000) and the basal metabolism (P<0.001) especially between T<sub>0</sub> to T<sub>1</sub> (Fig. 1).

**DISCUSSION:** Our results show that in a team of professional athletes different types of training can determine different metabolic and functional modifications. The data confirm that an aerobic/anaerobic training determines a significant reduction of the HR and DBP with an increase of the stroke volume connected to the improvement of the peripheral muscular perfusion. Of particular interest was the progressive significant reduction of the basal metabolism in all athletes and during all agonistic season. Until now, this result is unknown in literature, so difficult to explain, because it's no a mean value, but a steady value in all soccer players. It may be the first evidence that need to stimulate further studies.

**Fig. 1** Basal metabolism values

Soccer players	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>
1	1830,00	1720,00	1600,00
2	1700,00	1560,00	1600,00
3	1710,00	1660,00	1620,00
4	1680,00	1760,00	1640,00
5	2030,00	1920,00	1950,00
6	2020,00	1680,00	1980,00
7	1890,00	1600,00	1640,00
8	2040,00	1790,00	1800,00
9	2000,00	1720,00	1680,00
10	1890,00	1620,00	1640,00
11	1969,00	1969,00	1680,00
12	1816,00	1790,00	1850,00
13	1710,00	1620,00	1850,00
14	1710,00	1720,00	1770,00
15	1947,00	1947,00	1770,00
16	1900,00	1580,00	1770,00
17	1886,00	1670,00	1750,00
18	2100,00	1760,00	1750,00
19	1954,00	1720,00	1800,00
20	1645,00	1620,00	1800,00
21	2087,00	1600,00	1810,00
22	1805,00	1730,00	1900,00
23	1760,00	1760,00	1740,00
24	1800,00	1610,00	1720,00

**PP-04-52****MAXIMAL OXYGEN UPTAKE (VO<sub>2</sub> MAX) IN THE TUNISIAN ELITE ATHLETES**

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**INTRODUCTION:** Maximal oxygen uptake (VO<sub>2</sub> max) is considered as a valid indicator of aerobic fitness in elite athletes. It is routinely assessed in athletes to monitor the effectiveness of the physical training program and the preparedness of athletes to compete.

**AIM OF THE WORK:** To examine VO<sub>2</sub>max of Tunisian athletes (n=422) of different disciplines in order to provide normative data for training and talent selection.

**MATERIALS AND METHODS:** We retrospectively reviewed the values of VO<sub>2</sub>max of obtained with laboratory testing during a period of 05 years (2007-2011) in 422 Tunisian elite athletes from 16 different disciplines who visited the National Center of Medicine and Science in Sports for physical tests according to their scientific follow-up schedule.

**RESULTS:** The average age of our athletes in all disciplines, was  $19.77 \pm 3.44$  years, ranging from 13 to 36 years. We counted 422 athletes, including 266 boys and 156 girls, as follows: Athletics (40) Boxing (27) Rowing (45) Gymnastics (11) Judo (42) Cycling (41) Football (34), Handball (43) Volleyball (21) Basketball (43) Fighting (16) Karate (21) Table Tennis (8) Swimming (9), Windsurfing (13) Fencing (8).

For boys, average VO<sub>2</sub> max was 37.01 in Volleyball, 50.85 in Table Tennis, 51 in gymnasts, 52.06 in handball, 53.30 in Judo and Wrestling, for Fencing, Basketball, Boxing and Windsurfing, the average VO<sub>2</sub>max was 54 ml / min / kg. It was equal to 55.29 in football, 57.24 in Karate, 59.84 in rowing, swimming in 61.25, 64.59 to 67.13 and Cyclists in Athletics. For the girls, average VO<sub>2</sub> max was 29.99 in the table tennis and 37.84 in Fencing. It was equal to 38.90 in Athletics (Sprint) to 39.86 in 41.96 in Handball and Volleyball. For gymnasts, basketball players and boxers, the average was 42 ml / min / kg. In Karate, Cycling and Wrestling average VO<sub>2</sub>max was equal to 43 ml / min / kg. It was 45.52 in Judo, 48 ml / min / kg in Rowing and Swimming and 59.22 in Athletics (Endurance).

**CONCLUSION:** In light of this study findings it could be concluded that in elite players discipline may affect aerobic fitness. Due to the high variability of VO<sub>2</sub>max values and the limited number of athletes per discipline, it is difficult to establish a cut-off value of VO<sub>2</sub>max that may be considered as a prerequisite value for competing successfully in each discipline. Nevertheless, we can consider this work as a first step in determining national standards of maximum oxygen consumption in different sports.

**PP-04-53****PROFIL DE PERFORMANCE**

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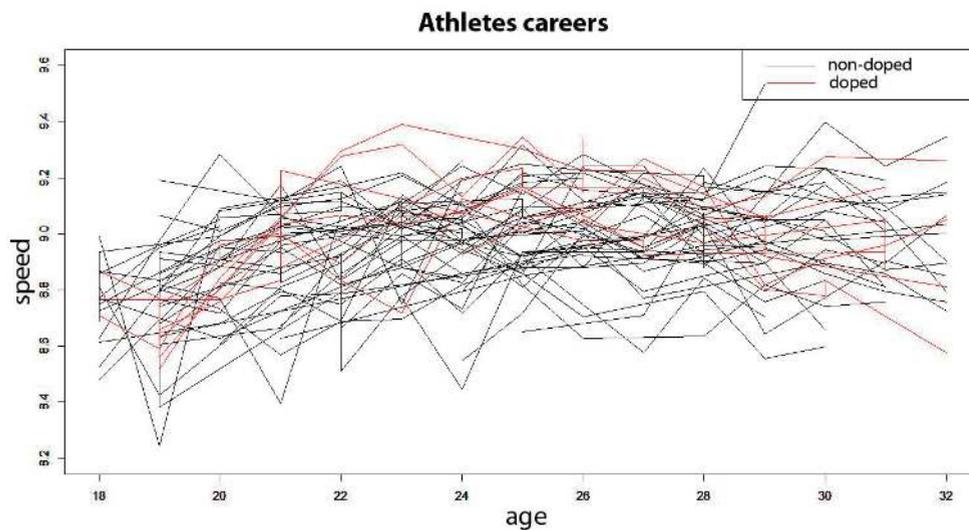
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The development of the best sports performance world has been updated since the last publication of the article in 2010. We note that the stagnation in the 90s in Track and field continues, except for a few rare events where exceptional athletes still shine. We will also make a detailed analysis of the London Olympics this year to see if the trends, especially world records, will be identical to those obtained in Beijing in 2008.



We then found only five new world records in Track and field, with a significant decline in the average performance, and a huge increase of the records in swimming, thanks to the introduction of new swimsuits. In the absence of technological innovation, this development of records can only be reduced to a much narrower portion.

Another point of interest that arose at the Olympic games, was the publication of a press article in Nature, where the performance of Ye Shiwen was described as “anonymous” [1]. We here focus on the trajectory of young athletes and try to model the “standard” path or trajectory an athlete would naturally follow. The main issue is pictured in the figure, where we can see that the trajectories of non-doped and doped athletes in the 100m. straight women are strongly intricated.

The analysis of the distribution of ‘corridors switching’ provides a convenient way to nab any alteration in the behavior of a trajectory during a career. However, finest approaches such as the brownian bridge movement model (BBMM) [2] would be of interest to better understand the statistical underlying properties of atypical trajectories.

We do underline that this approach has to be considered as complementary to traditional biological approaches not a substitute.

#### REFERENCES:

1. E. Callaway 2012 Why great Olympic feats raise suspicions, Nature
2. J.S. Horne et al. 2007 Analyzing animal movements using Brownian bridges, Ecology

PP-04-54

### BIOCHEMICAL PARAMETERS IN PROFESSIONAL MALE SOCCER PLAYERS BEFORE AND AFTER TRAINING

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The aim of this study was to investigate biochemical changes related to acute coronary syndrome, muscle breakdown, hypoglycemia and a number of other variables in the serum of participants in the soccer player.

Fifteen professional level male soccer players (mean (SD) age, 24 (4.4) years) were recruited from a 3rd

league team. Blood samples were collected from professional soccer players before and after exercise. Blood samples were analysed by standard methods and results corrected in biochemistry laboratory.

The average pre- and post exercise biochemical values of 15 soccer players were found to be  $62.33 \pm 3.88$  and  $69.46 \pm 7.76$  ( $P < 0.05$ ) for glucose levels,  $36.00 \pm 9.52$  and  $34.40 \pm 9.21$  ( $P > 0.05$ ) for urae levels,  $0.88 \pm 0.09$  and  $0.83 \pm 0.08$  ( $p > 0.05$ ) for creatine levels,  $309,86 \pm 200,87$  and  $253 \pm 149.74$  ( $P > 0.05$ ) for creatine kinase levels (CK),  $17.86 \pm 6.30$  and  $14.46 \pm 5.43$  ( $P > 0.05$ ) for creatine kinase MB (CKMB) levels,  $0.80 \pm 0.44$  and  $0.75 \pm 0.46$  ( $P > 0.05$ ) for total bilirubin levels,  $4.12 \pm 0.26$  and  $4.11 \pm 0.19$  ( $P > 0.05$ ) for albumin levels,  $16.66 \pm 4.40$  and  $16.33 \pm 4.48$  ( $P > 0.05$ ) for blood urea nitrogen levels (BUN), respectively.

A wide variety of biochemical perturbations occur during soccer playing but a number of variables remain within normal limits despite severe physical stress. The biochemical levels should be examined not only in pathologies but in individuals practicing vigorous sport activities.

**KEYWORDS:** soccer players, biochemical parameters, Physical activity

## PP-04-55

### KEOPE: ERGONOMIC PROPRIOCEPTIVE RESONANCE STRUCTURE

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**AIM OF THE STUDY:** To demonstrate the influence of the ergonomic proprioceptive resonance structure, Keope, on the system proprioceptor-nerve-muscle, muscular repolarization, recovery time of professional athletes.

**MATERIALS AND METHODS:** We have chosen to study blend athletes since their other senses are very accentuated and therefore their perceptions are more consistent.

- Twenty-one blend national climbing athletes, eleven males and ten females, between sixteen and twenty-six years, examined with surface electromyography (EMGs), before and after climbing and during the stimulation with Keope.
  - Zephyr BioHarness, to study through the cardiopulmonary and postural parameters the intensity of the work during the climbing training and Keope stimulation.
- They climbed on the same climbing lead wall, sixteen meters high, three consecutive days, the first without using Keope. The second two days the method was: climbing, Keope thirteen minutes, climbing.
- The fourth day we studied the flexibility of the spinal column with Spinal Mouse, before and after Keope stimulation.
  - Climbing times before and after Keope stimulation.
  - The athletes received a questionnaire about the perceived fatigue (Borg): 0 no fatigue; 10 unbearable fatigue.

"Student's t" used for the statistical analysis.

**RESULTS:** The EMGs demonstrated the muscular repolarization during Keope stimulation and till the next climbing. The values of the basic muscular tone had a statistically significant variation ( $p < 0,05$ ; 0,028).

Zephyr BioHarness: the percent of the cardiopulmonary work during the first climbing (without Keope stimulation) was between 100/110%. The value after Keope stimulation was between 85/95%. During Keope stimulation the value was 40%.

Postural parameters (Zephyr BioHarness): the posture during climbing was more uniform after Keope stimulation.

The ratio between physiological load (cardiopulmonary work) and mechanical load (posture during the movement) was more low after Keope stimulation, therefore the movements are more ergonomic.

Spinal Mouse: after Keope stimulation the spinal column was more elastic and flexible.

Times: decreasing of climbing times after Keope stimulation, statistically significant ( $p < 0,05$ ).

**Questionnaire:** the first day the value of the perceived fatigue was between 4 (quite strong) and 7 (very strong). The last day 3 (tolerable).

**CONCLUSIONS:** The examined parameters, muscular repolarization, cardiopulmonary work, mechanical load, posture, column flexibility are positively affected by Keope stimulation.

The ergonomic proprioceptive resonance stimulation repolarizes the muscles, that become more relaxed, more elastic and consequently ready for the next exercise.

This induces the decrease of times climbing , objective and subjective fatigue, recovery time.

#### REFERENCES:

1. F. Coscia, P.V. Gigliotti, Aerobic training in sports based on anaerobic metabolism, First Congress European Association of Sports Medicine, 1995 Brussels p.12
2. N. Seichert, E. Senn, Sagittal Shape and Mobility of the Spine-Validity and Reliability of the new SpinalMouse® , Rehaklinik Bellikon, CH European Spine Journal, Vol. 9, No.4, 2000, American College of Sports Medicine (2004) Guidelines of Exercise Testing and Prescription. Baltimore, Williams and Wilkins, 2 pp.1-373
3. P.V.Gigliotti, F.Coscia, Health Sport Environment, 13th World Sport for All Congress, University of Jyvaskyla Finland 2010 pp.29-30

#### PP-04-56

### EFFECT OF RAMADAN INTERMITTENT FASTING ON SELECTED HAEMORHEOLOGICAL MEASURES IN ATHLETES AND NON-ATHLETES

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**INTRODUCTION:** During Ramadan healthy adult Muslims refrain from eating and drinking from sunrise to sunset. This is a major physical challenge not only but in particular for Islamic athletes (Chaouachi et al. 2009). Strenuous exercise especially under thermally challenging conditions induced substantial haemolysis combined with erythropoiesis (Beneke et al. 2005, Yusuf et al. 2007). However, haemorheological findings in athletes practising Ramadan were equivocal and possibly confined by (de)hydration effects (Maughan et al. 2008).

**METHODS:** 14 football players (F) practising football for more than 7 years continuing their training routine and 14 sedentary subjects (S) all aged 20 to 24 years provided venous blood in the afternoon without (weeks 1, 6 and 7) and after about 11 hours of fasting during Ramadan (weeks 2 to 5). The overall daily average duration of fasting during the Ramadan period was 15 hours.

Haemoglobin (HB), haematocrit (HCT), mean red blood cell count (RBC), mean RBC volume (MCV) and mean corpuscular HB concentration (MCHC) were analysed.

**RESULTS:** Ramadan fasting had no effect on body mass and body mass index which were both higher ( $p < 0.05$ ) in F ( $68.8 \pm 4.1$ kg,  $23.3 \pm 1.1$ kg/m<sup>2</sup>) than in S ( $65.2 \pm 5.2$ kg,  $21.6 \pm 1.0$ kg/m<sup>2</sup>).

HB and HCT were higher ( $p < 0.05$ ) in F ( $15.4 \pm 0.4$ g/dl and  $43.5 \pm 1.3\%$ ) than in S ( $13.4 \pm 0.6$ g/dl and  $41.3 \pm 0.8\%$ ) with no effect of Ramadan progression on HB. HCT decreased ( $p < 0.05$ ) in F in weeks 2 and 3. The corresponding HCT-decrease ( $p < 0.05$ ) lasted until week 5 in S.

In F, RBC increased ( $p < 0.05$ ) in weeks 2 to 5, whilst remaining unchanged in S.

MCV was lower ( $p < 0.05$ ) in F ( $85.9 \pm 10.0$ fl) than in S ( $95.4 \pm 7.2$ fl). In S, MCV decreases ( $p < 0.05$ ) in week 3 whilst in F a corresponding decrease ( $p < 0.05$ ) continued until week 7. MCHC was higher ( $p < 0.05$ ) in F ( $35.4 \pm 1.2$  g/dl) than in S ( $32.3 \pm 1.5$ g/dl). MCHC was increased ( $p < 0.05$ ) in weeks 2, 3 and 5, 6 in F whilst in S a corresponding increase ( $p < 0.05$ ) was only seen in week 2.

**DISCUSSION:** The combination of unchanged HB, decreasing HCT, MCV and increasing MCHC combined with increased RBC indicates significant haemoconcentration during the day combined with haemolysis and erythropoiesis inducing a younger RBC population until one to two weeks post Ramadan in F practising Ramadan whilst continuing their usual training routine. S show haemolysis and erythropoiesis during the initial two weeks of Ramadan. However, they demonstrate no prolonged effect on RBC age and no consistent signs of haemoconcentration.

**REFERENCES:**

1. Beneke R, et al. (2005). *EJAP*, 95, 307-312.
2. Chaouachi A, et al. (2009). *IJSPP*, 4, 419-434.
3. Ezzat Foris M, et al. (2012). *JNM*
4. Kauser S, et al. (2013). *JIMR* 3(issue1), 48-52.
5. Maughan R, et al. (2008). *J Sports Sci*, 26(S3), 39-46.
6. Necati Develioglu O, et al. (2013). *JIMR*, 1-10.
7. Yusuf A et al. (2007). *JAP*, 102, 582-586.

**PP-04-57**

**CHANGES OF MAXIMAL POWER OUTPUT OF LOWER EXTREMITY DURING A DECATHLON**

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**OBJECTIVES:** To determine the change in lower extremity power output over the course of a decathlon in order to better define/understand 1) the functional demands represented by decathlon, 2) the muscular mechanical capabilities determining decathlon performance, and 3) their potential relationships with injury risk factors.

**METHODS:** Six national-level athletes and 11 representative control participants were included in this cross-sectional controlled study implemented in field conditions during the 2010 French National Decathlon Championships. The change in lower extremity power output, and its force and velocity components, was tested on the basis of maximal squat jump and cycling sprint measurements, at the beginning and end of the two days of competition.

**RESULTS:** No differences in squat jump and cycling sprint values were found between each testing time ( $P > 0.05$ ), while significant lower squat jump values for control participants were reported at the second day beginning ( $P < 0.05$ ).

**CONCLUSIONS:** These preliminary results suggest that decathlon competition did not induce measurable alterations in lower extremity force, velocity or power output. In order to improve decathlon performance and injury prevention, practical information for athletes, coaches and medical teams could be: adapted wake-up and warm-up is necessary before morning events and other injury risk factors should be explored.

## RELIABILITY OF ISOKINETIC TRUNK MEASUREMENTS WITH AND WITHOUT PERTURBATION IN YOUNG ATHLETES

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**OBJECTIVE:** High reliability of isokinetic peak torque measurements has been reported in various studies. However, reliability of these measurements in less fixed, but more functional positions during trunk rotation, as well as measurements with additional perturbation, remains unclear. The purpose of this investigation was to determine the test-retest reliability of peak torque measurements during isokinetic trunk rotation, flexion and extension with and without perturbation.

**METHODS:** Thirteen healthy young athletes (2 male, 11 female;  $16 \pm 2$  years;  $69 \pm 17$  kg;  $1.7 \pm 0.1$  m;  $16 \pm 8$  h exercise/week) underwent two identical maximal strength tests ( $30^\circ/s$ , concentric, eccentric, eccentric with perturbation mode) separated by two weeks. Measurements of trunk rotation (Con-Trex, WS module; ROM  $60^\circ$ ) were performed in upright-seated posture with fully extended arms stretched forward ( $90^\circ$  angle to trunk). Trunk flexion/extension (Con-Trex, TP1000 module; ROM  $55^\circ$ ) was performed in a standing position. Perturbation stimuli applied at maximal strength tests were released at midpoint of ROM during extension (5-fold baseline velocity, 120 ms duration for rotation, 250 ms duration for flexion/extension). Intra class correlation coefficient (ICC 2.1), Bland-Altman analysis with Limits of Agreement (Bias  $\pm 1.96 \times SD$ ) and test-retest reliability (TRV %) were calculated based on peak torques (mean of 3 highest measures out of 5 repetitions).

**RESULTS:** Measures of reliability for strength tests without perturbation showed for flexion/extension an ICC ranging from 0.81 to 0.93, TRV from 8.0 to 14.3 % and Bland-Altman analysis from  $4.0 \pm 36.7$  to  $24.7 \pm 77.6$  Nm. Trunk rotation without perturbation showed an ICC ranging from 0.65 to 0.87, TRV from 15.6 to 19.6 % and Bland-Altman from  $-0.1 \pm 58.2$  to  $10.8 \pm 25.4$  Nm. Strength measurements with applied perturbations during trunk extension showed an ICC of 0.94, TRV of  $8.5 \pm 6.3$  % and Bland-Altman of  $8.2 \pm 64.8$  Nm. Respective measurements during trunk rotation showed an ICC of 0.91/0.70 (right/left), TRV of  $8.3 \pm 7.1/18.1 \pm 16.0$  % (right/left) and Bland-Altman of  $-3.1 \pm 30.2/-10.1 \pm 55.9$  Nm (right/left).

**CONCLUSION:** Measurements in a less fixed position in trunk rotation revealed increased test-retest variability compared to the more standardized measures of trunk flexion and extension. Perturbation tests during isokinetic strength measurements can be considered as reliable as peak torque measurements during trunk rotation, flexion and extension without perturbations. Due to practical relevance of high intensity trunk perturbation in prevention and rehabilitation, these measurements could be implemented in quality control of interventions.

PP-04-59

## THE EFFECT OF NUMBER OF REPETITIONS ON THE VARIATION OF BLOOD LACTATE CONCENTRATION DURING REPEATED-SPRINT SESSIONS

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**INTRODUCTION:** The aim of the present study was to examine the effect of number of repetitions on the variation of blood lactate concentration during different repeated-sprint sessions in order to find the appropriate number of sprint repetitions that simulate properly the physiological demands of team sport competitions.

**METHODS:** Twenty male physical education students (age,  $22.2 \pm 2.9$  years; body mass,  $70.2 \pm 11.6$  kg; height,  $180 \pm 1$  cm; % fat mass,  $12 \pm 4$  %;  $VO_2\text{Peak}$ ,  $54.6 \pm 5.2$  mL·kg<sup>-1</sup>·min<sup>-1</sup>) licensed in various team sports have participated in this study. They performed Repeated-sprint session (RSS) consisting of 1, 2, 3, 4, 5, 9, or 10 repetitions of 15-m shuttle sprints (15 + 15m) interspersed with 30 seconds of passive recovery. Determination of blood lactate concentration [La] was obtained from the fingertip after 3 min of recovery at the end of each RSS. They were measured with a portable analyzer (Lactate Pro, Arkray, Japan)

**RESULTS:** The averaged blood [La] measured after completion of one repetition of 15 + 15 m sprint increased from resting values of  $1.8 \pm$  mmol·l<sup>-1</sup> to  $4.7 \pm$  mmol·l<sup>-1</sup> and were not different from the blood [La] of RSS with 2 repetitions (RSS2) ( $5.7 \pm$  mmol·l<sup>-1</sup>,  $p = 0.80$ ).

For RSS3 there was much more increase ( $p < 0.000$ ) in blood [La] approximately fivefold from resting values reaching  $9.4 \pm$  mmol·l<sup>-1</sup> and then remained unchanged significantly compared to the RSS of 4 and 5 sprints ( $p = 1$ ). The blood [La] were highly and significantly elevated ( $p < 0.000$ ) for RSS9 and RSS10, with similar levels of 12.6 and 12.7 mmol·l<sup>-1</sup>, respectively.

**CONCLUSION:** The results of the present study show that, performing RSS with 3, 4, or 5 shuttle sprints (15+15m with 30-sec recovery in-between) produce a similar blood lactate concentrations around 9 mmol·l<sup>-1</sup> compared to what is observed in team sport competition. For that reasons it could be more pertinent for Coaches and fitness trainers to select the number of about 5 sprints repetition for testing or training session, and may better prepare athletes for, the physiological demands of team sport competition

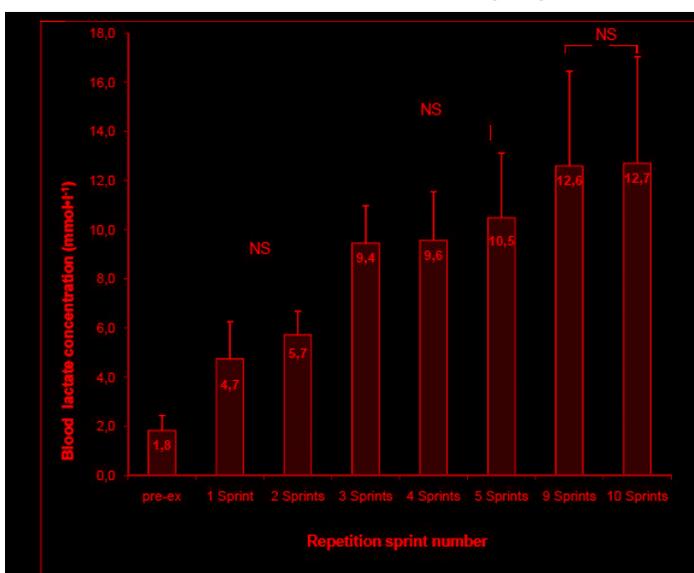


Figure 1. Mean and  $\pm$  SD values for blood lactate concentration ([La]) achieved after repeated-sprint sessions (RSS) with 1, 2, 3, 4, 5, 9 and 10 sprints. NS: no significant difference in blood [La].

PP-04-60

## A COMPARISON OF 10-11 YEARS OLD BADMINTON AND BASKETBALL ATHLETES CHILDREN'S MOTOR SKILLS IN INTERSCHOLASTIC COMPETITIONS WITH BOTMP-2 SF

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The aim of research was to investigate the affect of the regular sportive exercise to the development of 10-11 years old children's motor skills. Participants were recruited from the children competing in interscholastic basketball (n=30) and badminton (n=30) competitions and sedentary children (n=30). In research was administered the measurements for the assessment of children's motor proficiency by using the BOTMP-2 Short Form (Bruiniks-Oseretsky Test of Motor Proficiency, Second Edition. The BOTMP2-SF involves only 14 of the 46 items of the full test battery. Collected data were subjected to one way analysis of variance (ANOVA, SPSS for Windows 20.0) and post hoc analysis was performed using Tukey's multiple range test. According to test results, significant differences between Copying a Star, Folding Paper, Transferring Pennies, Tapping Feet and Fingers (Same Side Synchronized), Walking Forward on a Line, One-Legged Stationary Hop, Dropping and Catching a Ball-Both Hands, Dribbling a Ball-One Hand, Sit-up, Knee Push-ups subtests were found. Consequently, doing regular exercises were positively affect the development of motor skills.

**KEYWORD:** Motor skill, Bruininks-Oseretsky Test of Motor Proficiency, Badminton, Basketball, Interscholastic competition

PP-04-61

## NATIONAL FENCERS AND NEW STARTERS INVESTIGATION OF SOME PHYSICAL, BIOMOTOR AND THE PERCENTAGE OF BODY FATS

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With this study the differences or the similarities for the scores which have been involved the peculiar to physical fitness; length, width and circumference measurements tests, physical fitness levelling tests, 20m sprint, jump up, jump while standing and flexibility tests that achieved by sportsmen who are high level fencers and new beginner fencers was researched.

Total of 48 subject, 12 women, 12 man high level fencers and 12 women, 12 man new beginner fencers were participated in this study

Ms Excel Spreadsheet Programme was used in the arrangement of data, SPSS 19 statistic package programme was used in the arrangement of tables and statistic analysis. The independent sample t-test were applied in order to research if there are significant differences between sportsmen view of physical, psychological and physico-motor properties of them.

General specialities between high level fencers and new beginner women fencers ( $p < 0.05$ ), Biomotoric specialities ( $p < 0.05$ ), Length measures ( $p < 0.05$ ), Width measures ( $p < 0.05$ ), Circumference measures ( $p < 0.05$ ), Body fat percentages ( $p < 0.05$ ) were founded.

General specialities between high level fencers and new beginner men fencers ( $p < 0.05$ ), Biomotoric

specialities ( $p < 0.05$ ), Length measures ( $p < 0.05$ ), Width measures ( $p < 0.05$ ), Circum measures ( $p < 0.05$ ), Body fat percentages ( $p < 0.05$ ) were founded.

**KEYWORDS:** Fencing, Antropometric measurement, Body fat percentages.

#### PP-04-62

### THE INFLUENCE OF SOMATHOTYPE ON THE CHANGES OF AEROBIC ENDURANCE FIELD TEST OF SOCCER PLAYERS AGED 15-17 YEARS

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The aims of this study are to determine the somathotype and its influence on the changes of Yo-Yo intermittent endurance test level 2 of soccer players aged 15-17 years.

**MATERIAL AND METHODS:** 46 soccer players, aged 15-17 years, were included in this study. During a training and competition process of 4 months, three times (at the beginning, in the middle and after the finishing of this process), we measured speed of running (km/h) and total distance covered (m) with Yo-Yo intermittent endurance test level 2 on field (Yo-Yo IE2). With Heath-Carter anthropometric somathotype model, we determined 13 categories of somathotype. We used descriptive statistics, ANOVA and multiple regression analysis.

**RESULTS:** The most frequent somathotype was mesomorph-ectomorph (45%), balanced mesomorph (17%), balanced ectomorph (15%) and others. There were insignificant changes of speed of running and total distance covered with Yo-YoIE2 of soccer players aged 15-17 years during a half-competition season. There were no significant influence of somathotype on speed of running and total distance covered with Yo-YoIE2 in each period of training and competition process.

**DISCUSSION:** These results suggested that the type of somathotype maybe do not influence on aerobic endurance of soccer players aged 15-17 years. On the other side, other studies are necessary in this direction.

**KEY WORDS:** somathotype, aerobic endurance, soccer players, aged 15-17 years, Yo-YoIE2

#### PP-04-63

### THE INFLUENCE OF ACTN3 GENOTYPE ON THE CHANGES OF ANAEROBIC TRESHOLD AND YO-YO INTERMITENT ENDURANCE TEST LEVEL 2 OF SOCCER PLAYERS AGED 15-17 YEARS

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The aims of this study are to determine the ACTN3 genotype and its influence on the changes of anaerobic threshold and Yo-Yo intermittent endurance test level 2 of soccer players aged 15-17 years.

**MATERIAL AND METHODS:** 46 soccer players, aged 15-17 years, were included in this study. During a training and competition process of 4 months (half-competition season), three times (at the beginning-P1, in the middle-P2 and after the finishing of this process-P3), we measured: ACTN3 genotype from abstracted genomic DNA (RR, XX and RX variant); anaerobic threshold (AnT, km/h) with Conconi protocol on treadmill and maximal treadmill speed (km/h) and speed of running (km/h) and total distance covered (m) with Yo-Yo intermittent endurance test level 2 on field (Yo-Yo IE2). We used descriptive statistics, ANOVA and multiple regression analysis ( $p < 0.05$ ).

**RESULTS:** The most frequent variant of ACTN3 genotype was RR variant (44%), than RX (41%) and XX (15%). AnT ( $12,3 \pm 1.09$ ;  $12,43 \pm 1,35$ ;  $12.15 \pm 1.09$ ) and maximal treadmill speed changed insignificantly during this training and competition process. There were insignificant changes of speed of running and total distance covered with Yo-Yo IE2 of soccer players aged 15-17 years during a competition half-season. The variants of ACTN3 genotype had significant influences on AnT and Yo-Yo IE2.

**DISCUSSION:** During this soccer competition half-season, the model of soccer training process did not increase significantly the AnT and aerobic endurance that was probably connected with stagnation of sport performance. ACTN3 genotype profile could help in process of selection and specialization of young soccer players.

**KEY WORDS:** ACTN3 genotype, AnT, Yo-Yo IE2, soccer players, aged 15-17 years

PP-04-64

## ANTHROPOMETRIC AND PHYSICAL CHARACTERISTICS OF MALE HANDBALL PLAYERS ACCORDING TO AXES AND LINES PLAYING POSITIONS

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**ABSTRACT:** But: The purpose of the study was to compare anthropometric data and physical performance characteristics between different axis and lines playing positions in professional team handball. Furthermore, a comparison between performance profiles of professional and international Tunisian team handball players was made.

**METHODS:** Forty four male professional handball players were recruited with a mean age of  $22, 09 \pm 2,56$  years, and 12 years of playing experience at national level. Measurement of anthropometric data, repeated sprint ability, jumping performance, and endurance performance were determined and analyzed with respect to axis and lines playing position.

**RESULTS:** Players of national team had highest average heart rates, maximal oxygen uptake, anthropometric and physical performance characteristics, best times in repeated sprint Ability tests, best jumping performance. Similarly, players of central axis (play makers and pivots) reached highest size, weight and thin mass. Players of lateral axis (lateral backs and wings) had higher, maximal oxygen uptake, maximal speed and jumping performance. While players of rear lines (backs, and play makers) reached highest age.

**CONCLUSIONS:** The present results demonstrate that international teams were characterized by highest average of age, seize, jumping performance and maximal oxygen uptake than those of professional team. Best performances were found in endurance and jumping performance to the players of lateral axis, Play makers and pivots reached highest size, weight and thin mass.

**KEYWORDS:** Handball, axes, lines, anthropometric, physical, physiological

## POSTER SESSION PP5 – EXERCISE PHYSIOLOGY-3

PP-05-65

**ECCENTRIC EXERCISE TRAINING: MODALITIES, APPLICATIONS AND PERSPECTIVES**

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**INTRODUCTION:** Eccentric (ECC) exercise has long been used as a model to investigate muscle degeneration and regeneration processes. Indeed, when it is performed at high intensity and/or for long duration, ECC exercise can induce muscle damage and delayed pain, commonly defined as delayed onset muscular soreness (DOMS). However, when the duration, frequency and intensity of the ECC training sessions are progressively increased, muscle damage can be minimised and even avoided, thus making of ECC muscle work a promising training strategy, not only to improve the athletes' performance, but also to help maintaining or restoring the exercise capacity and the quality of life of patients with chronic disabilities. Objective: Describe first the mechanical, metabolic and cardio-vascular specificities of acute ECC muscle work, and then to discuss its applications and the known training responses in sport performance, ageing and pathology.

**METHOD:** Review of the literature

**RESULTS:** At similar mechanical power, eccentric muscle work induces lower metabolic and cardiovascular responses than concentric muscle work. However, when both exercise modes are performed at similar level of oxygen uptake, a greater cardiovascular stress is observed during eccentric muscle work. If the ECC exercise intensity is increased gradually, both young and older healthy subjects can adapt to high-force ECC exercises without muscle damage and with significant improvement of skeletal muscle size and strength.

Using ECC exercise to specifically increase the mechanical stimuli (i.e., strength or mechanical power) generated by the training sessions while minimising the metabolic stimuli (i.e., energy expenditure) is a strategy that has been widely employed in the last 30 years with ongoing developments. As muscle damage is not necessarily an issue if care is taken to familiarise the subjects, ECC muscle work, ECC exercise training can be safely proposed to healthy sedentary and athletic populations. In patients with chronic pathologies (cardiorespiratory diseases, metabolic disorders, neurological pathologies and cancers) and/or in the field of ageing, ECC training might be used to increase their muscle strength with minimal cardiovascular stress and obtain functional gains, the ultimate goal being the improvement of their quality of life.

**CONCLUSION:** Eccentric exercise is a promising training modality with many different domains of application. However, more research work is needed to better understand how the neuromuscular system adapts to eccentric exercise training in order to optimise and better individualise future eccentric training strategies.

PP-05-67

## ACE AND ACTN3 GENES POLYMORPHISMS AND MAXIMAL OXYGEN UPTAKE IN YOUNG CROSS-COUNTRY SKIERS

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**BACKGROUND:** There are a large number of studies done about ACE and ACTN3 genes. It has been discussed that ACE gene II genotype and ACTN3 gene XX genotype might be associated with improved endurance performance. However, there are only few studies that analyse these genes in relation to maximal oxygen uptake.

The aim of this study was to examine the associations between ACE and ACTN3 genes and changes in maximal oxygen uptake in Estonian young cross-country skiers.

The subjects were 60 young cross-country skiers (42 boys and 18 girls). Health screening tests between the ages 14-21 were analysed. The tests were performed in Sports Medicine and Rehabilitation Clinic of Tartu University Hospital during 1996-2013. Control group included 322 sedentary healthy individuals. Subjects' VO<sub>2</sub>peak was measured using a gas analyzer system according to a standardized test on treadmill for cross-country skiers. The ACE I/D polymorphism were genotyped using the 5' TaqMan Allelic Discrimination Assay (Applied Biosystems, Foster City, CA, USA).

**RESULTS:** Among male athletes the frequency of the ACE ID and ACTN3 RR genotype was statistically higher than among controls (64% vs 47% and 40% vs 18%, respectively). The ACE and ACTN3 gene genotype distribution showed no statistically significant differences between the female skiers and controls. There were no statistically significant differences in allelic distribution between the male and female study groups. Study results revealed no significant differences between ACE and ACTN3 genes genotypes. The results showed no significant differences between ACE and ACTN3 genes genotypes and VO<sub>2</sub>peak nor endurance capacity. According to the regression analysis, the change in VO<sub>2</sub>peak/kg between the ages 14-21 was significantly related to the initial level of VO<sub>2</sub>peak/kg, the maximal result of VO<sub>2</sub>peak/kg between the age period 14-21 and with the change in training load during the same age period ( $R^2=75\%$ ;  $p=0.000$ ).

**CONCLUSION:** Our study results revealed higher prevalence of the ACE ID and ACTN3 RR in male skiers as compared to controls. VO<sub>2</sub>peak/kg did not differ between the ACE and ACTN3 genotypes. The improvement in VO<sub>2</sub>peak/kg between the ages 14-21 was significantly related to the initial level of VO<sub>2</sub>peak/kg, the maximal result of VO<sub>2</sub>peak/kg between the ages 14-21 and with the elevation in training loads during the same age period.

PP-05-68

## EFFECTS OF GEOGRAPHICAL ORIGIN ON PERFORMANCE IN MEN AND WOMEN SPRINTERS

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**INTRODUCTION:** Geography may be a determinant factor of high level performance by contributing to

the genetic, physiological, morphological, environmental and cultural heritage of international athletes.

**OBJECTIVE:** Study the impact of geographical origin and its evolution on the 100 meters sprint performances, from 2000 up to 2012.

**METHODS:** Data for the 10 best sprinters on 100 meters were collected from 2000 up to 2012 for men and women and studied by geographical groups: speed performances from American (G1), Jamaican (G2), Caribbean (G3), European (G4), African (G5) and Asian athletes (G6) were studied each year. Best annual performance and corresponding ranking, age, body mass, stature and BMI (Body Mass Index) have been gathered for each athlete. The complete data set represents 1820 annual performances (910 for both sexes) for a total of 238 men and 229 women sprinters.

**RESULTS:** For men, average speed of G1, G2 and G3 increased from  $10,01 \pm 0.02$ ,  $9.93 \pm 0.04$  and  $9.91 \pm 0.05$  m.s<sup>-1</sup> respectively in 2000 to  $10.15 \pm 0.09$ ,  $10.16 \pm 0.07$  and  $10.11 \pm 0.15$  m.s<sup>-1</sup> in 2012 ( $p < 0,001$ ). In contrast, the 10 best G4, G5 and G6 performances did not progress respectively  $9.84 \pm 0.04$ ,  $9.91 \pm 0.06$  and  $9.78 \pm 0.05$  m.s<sup>-1</sup> in 2000 to  $9.84 \pm 0.06$  m.s<sup>-1</sup>,  $9.80 \pm 0.04$  and  $9.79 \pm 0.06$  m.s<sup>-1</sup> in 2012.

For women, similar trends were measured with a constant progression in the G1, G2 and G3 groups from  $9.10 \pm 0.05$ ,  $9.08 \pm 0,04$  and  $9.09 \pm 0.06$  m.s<sup>-1</sup> in 2000 to  $9.14 \pm 0.08$ ,  $9.15$  and  $9.12$  m.s<sup>-1</sup> in 2012 ( $p < 0,05$ ). Yet, the average speed of G4, G5 and G6 declined, from  $9.01 \pm 0.09$ ,  $8.89 \pm 0.10$  and  $8.78 \pm 0.09$  m.s<sup>-1</sup> in 2000 to  $8.96 \pm 0.06$ ,  $8.84 \pm 0.10$  and  $8.72 \pm 0.06$  m.s<sup>-1</sup> in 2012, respectively ( $p < 001$ ).

Morphological analysis of G1, G2 and G3 athletes shows that became significantly heavier than G4, G5 and G6 sprinters for both genders.

**CONCLUSION:** This study shows differential performance progressions, depending on geographical origin. Such a difference increased in the last 12 years, with the progression of Jamaican and Caribbean sprinters being the most important. This progression has been supported by parallel biometrical trends in both genders.

#### PP-05-69

### MAXIMAL SPEED AND PHENOTYPIC EXPANSION: THE BASE OF A COMMON PATTERN?

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**BACKGROUND:** Speed is one of the best biomarkers for aging. Recent work lead by F. Desgorces and al. (2012) showed that maximal speed of greyhounds tend to reach a limit. The greyhounds are dogs (a mammal species), which run under strong human constraints. Despite very different selection conditions, they offer great similarities with humans in term of training and competition. Here 1. The same evolutive model previously used to study human performance was tested for the greyhounds. and 2. The phenotypic expansion phenomenon in this species was investigated by a secular discretization of the data.

**METHODS:** Data was collected on the website <http://www.greyhound-data.com/>. Then, a database was established containing name, dates of birth and death of the animals, gender, place and date of race performed, distance of the race, time, and speed of each greyhounds (winners and others). After, the Moore model was adjusted for the gathered data (best performance by age) and the classical goodness-of-fit tests were used ( $R^2$ , MSE, ...). To assess the phenotypic expansion, different discretization of the data (by year, by decades, ...) were tested. The dynamics of the expansion were investigated by the AUC (Area Under the Curve) method.

**RESULTS:** A total of 48,025 greyhound's performances during 480m race in the period 2002 to 2012 were collected. The Moore Model was applied which shows an excellent fit. A pattern of phenotypic expansion was described decade by decade through an increase of speed at all ages and thus of the Moore coefficients.

**CONCLUSION:** This work shows the first indication of a similarity in the process of performance development for another mammal species. We will now extend our investigation through others species.

PP-05-70

## VALIDITY OF TWO SUBMAXIMAL CYCLE-ERGOMETER VO<sub>2</sub>MAX PREDICTION TESTS IN YOUNG ADULTS

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**OBJECTIVE:** Many submaximal tests differ in their accuracy to predict VO<sub>2</sub>max. Good accuracy has been reported in the Astrand test, where VO<sub>2</sub>max is predicted in relation to final heart rate achieved during constant load exercise (1, 2). However, a higher precision was documented for the Ekblom-Bak (EB) test, where VO<sub>2</sub>max is predicted according to a change in heart rate between a lower standard work rate and an individually chosen higher work rate using a mechanically braked cycle-ergometer (3). Despite the common use of electronically braked cycle-ergometers in clinical practice, test precision for both tests using this device has not been documented. Therefore, the objective of this study was to compare the validity of the Astrand and EB submaximal cycle-ergometer tests in relation to VO<sub>2</sub>max measured directly by gas exchange using an electronically braked cycle ergometer.

**METHODS:** Six young and healthy participants (3 men and 3 women, 27 ± 3 yrs., 172 ± 10 cm, 69.9 ± 12.7 kg) were tested in two sessions. In session one, participants performed a continuous ramped cycle ergometer VO<sub>2</sub>max test while their gas exchange parameters were measured till exhaustion. In session two, subjects performed the two submaximal protocols. First, the Astrand test was performed, followed by the EB test. A 10-minute rest was allowed between protocols. The Pearson correlation coefficient (r) and Bland-Altman analysis (Bias ± Limits of Agreement [1.96\*SD] (LoA)) were calculated to analyse differences between predicted and directly measured VO<sub>2</sub>max values. Results: VO<sub>2</sub>max measured by gas exchange was 41.3 ± 6.8 ml/kg/min while predicted VO<sub>2</sub>max by the Astrand test was 47.4 ± 10.3 and 48.4 ± 7.4 ml/kg/min by EB test. Mean difference between measured and predicted VO<sub>2</sub>max was 13.0 and 14.7% respectively. Pearson correlation coefficient (r) and Bland-Altman analysis for the Astrand test revealed r = 0.96, p < 0.01, 95% CI: 0.71 - 0.99, bias ± LoA of 6.13 ± 8.2 ml/kg/min. For EB, r was 0.91, p = 0.01, 95% CI: 0.41 - 0.99, and bias ± LoA was 7.16 ± 5.87 ml/kg/min.

**CONCLUSION:** Both tests seem to be valid in an electronically braked cycle ergometer. However, because of it's easier use, shorter time of application and higher correlation with measured VO<sub>2</sub>max values.

**RESULTS:** favour the Astrand test when measured with an electronically braked cycle ergometer.

### REFERENCES:

1. Astrand I. Aerobic work capacity in men and women with special reference to age. Acta Physiol Scand Suppl. 1960;49(169):1-92.
2. Cink RE, Thomas TR. Validity of the Astrand-Ryhming nomogram for predicting maximal oxygen intake. Br J Sports Med. 1981;15(3):182-5.
3. Ekblom-Bak E, Bjorkman F, Hellenius ML, Ekblom B. A new submaximal cycle ergometer test for prediction of VO<sub>2</sub>max. Scand J Med Sci Sports. 2012.

**PP-05-71****SOMATOTYPIC OF ALGERIAN SPORTSMEN, MEMBERS OF NATIONAL TEAMS**N. MIMOUNI<sup>1</sup>, S. ZAKI<sup>1</sup>, M. ABDELMALEK<sup>1</sup>, S. MIMOUNI<sup>1</sup><sup>1</sup>*Ecole Supérieure en Sciences et Technologie du Sport, Alger, ALGERIA*

The rationalization of the management of the training, the evaluation, the orientation, the detection and the selection in almost all of sports leans on the appropriate morphological and functional parameters as well as at their levels of development.

Now, these characteristics are rarely considered in Algeria, and if they are, it is only in a superficial way based on a visual evaluation.

Unfortunately, it still makes us believe that in Algeria, nothing is done since the systems of orientation and selection are almost or not based on scientific criteria.

For this, we address the study of the somatotyping of Algerian sportsmen, members of national teams, in order to characterize correctly their somatotypic profiles which will serve as criteria of orientation and preparation for high level competition.

Our study has been carried out on several national teams (volleyball, football, karate, athletics, cycling, weightlifting and judo). The measurements were carried out during the African games organized in Algeria. The method of somatotyping applied is that of Heath-Carter (1990), using anthropometric measurements. All the measurements were carried out according to the requirements of Weiner and Lourie (1981) and ISAK (2000).

In conclusion, the concretization of the objective of our study, namely the modeling of the morphological profiles of the Algerian elite, would allow coaches to better understand the processes of preparation of high level sportsmen.

**MOTS-CLÉS:** somatotypie, équipes nationales, algériennes, profil.**BIBLIOGRAPHIE:**

1. CARTER.J.E.L (2009): « anthropometry of team sports » Department of exercise and nutritional sciences. San Diego University.CA.92182-7251 USA.
2. CARTER.J.E.L, ACKLAND.T.R, KEN.D.A, ET STAPFF.A.B (juillet 2004): «Somatotype and size of elite female basketball players ». Department of exercise and nutritional sciences. San Diego State.
3. WEINER J.S and LOURIE J.A (1981) : Practical Human Biology by Hardcover

**PP-05-71 – ENGLISH VERSION****SOMATOTYPIC OF ALGERIAN SPORTSMEN, MEMBERS OF NATIONAL TEAMS**N. MIMOUNI<sup>1</sup>, S. ZAKI<sup>1</sup>, M. ABDELMALEK<sup>1</sup>, S. MIMOUNI<sup>1</sup><sup>1</sup>*Ecole Supérieure en Sciences et Technologie du Sport, Alger, ALGERIA*

The rationalization of the management of the training, the evaluation, the orientation, the detection and the selection in almost all of sports leans on the appropriate morphological and functional parameters as well as at their levels of development.

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In this way, we studied the somatotype of Algerian sportsmen, members of national teams, to characterize correctly their profiles which will serve as criteria of orientation and as preparation for the high level competition

Our study concerns several national teams : volleyball, soccer, karate, cycling, athletics, weightlifting and judo).

The measurements were realized during April 2013, in the High School of Sport Sciences and Technology, in Algiers.

We used the somatotype method oh Heath-carter (1990), using the anthropometric measures.

All the measures were realized according to the requirements of Weiner and Lourie (1981) and ISAK (2000).

In conclusion, the realization of the aim of our study, namely the modeling of the morphological profiles would allow the trainers to arrest better the processes of preparation of the high-level sportsmen.

**KEYWORDS:** somatotype, national teams, Algerian, profile

**BIBLIOGRAPHIE:**

1. CARTER.J.E.L (2009): « anthropometry of team sports » Departement of exercise and nutritionnel sciences. San Diego University.CA.92182-7251 USA.
2. CARTER.J.E.L, ACKLAND.T.R, KEN.D.A, ET STAPFF.A.B (juillet 2004): «Somatotype and size of elite female basketball players ». Department of exercise and nutritional sciences. San Diego State.
3. WEINER J.S and LOURIE J.A (1981) : Practical Human Biology by Hardcover

PP-05-72

## COMPARISON OF THREE METHODS FOR PREDICTING MAXIMAL OXYGEN UPTAKE IN A POPULATION OF SUB-MARINIERS

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**INTRODUCTION:** Maximal oxygen uptake (VO<sub>2</sub>max) is considered one of the best indicators of aerobic fitness. It is an important parameter for assessing military populations, particularly in operational units as submariners to better evaluate their operational capabilities.

**PURPOSE:** The objective of this study is to compare the results of an indirect measurement of VO<sub>2</sub>max with a field test and those of a questionnaire for estimating VO<sub>2</sub>max with the direct measurement of VO<sub>2</sub>max in laboratory.

**METHODS:** Forty-seven submariners (aged 29 ± 4.93, 76.7 ± 9 kg weight, regular sports) underwent a cardiorespiratory test of triangular type with an electromagnetic cycle ergometer and completed the Huet questionnaire the same day. We got back the latest data from the field-test VAMEVAL conducted annually to determine the athletic ability of the military.

**RESULTS:** The mean maximal oxygen uptake found for each test were 46.1 ± 6.3 ml.kg<sup>-1</sup>.min<sup>-1</sup> for laboratory test on a cycle ergometer, 46.8 ± 7.14 ml.kg<sup>-1</sup>.min<sup>-1</sup> for the field test VAMEVAL, and 52.2 ± 5.4 ml.kg<sup>-1</sup>.min<sup>-1</sup> for the Huet questionnaire. A positive correlation existed between the field test and the laboratory test (r = 0.40, p = 0.0001), and an agreement of results. The Huet questionnaire and laboratory test also showed a positive correlation (r = 0.47, p = 0.005) but without a good agreement rate.

**CONCLUSION:** This study shows that, for submariners population, the field test VAMEVAL is correlated and concordant with the results of maximal oxygen uptake measured in laboratory. However, this correlation is mild. The Huet questionnaire allows an assessment if the test is not feasible but with less reliability.

**KEYWORDS:** maximal oxygen fitness; field test; prediction of maximal oxygen uptake; aerobic capacity

**REFERENCES:**

1. Grant S, Corbett K, Amjad AM, Wilson J, Aitchison T. A comparison of methods of predicting maximum oxygen uptake. *Br J Sports Med.* 1995 Sep;29(3):147-52.
2. Trivel D, Calmels P, Léger L, Busso T, Devillard X, Castells J, Denis C. Validity and reliability of the Huet questionnaire to assess maximal oxygen uptake. *Can J Appl Physiol.* 2004 Oct;29(5):623-38.

**PP-05-73**

**PHENOTYPIC CHARACTERIZATION OF IRON OVERLOAD HFE KO MICE**

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Iron is used by the body to transport oxygen and produce some energy. It is thus essential in performance. However, athletes are usually diagnosed as being deficient in iron. Expression of hepcidine, the inhibitor of iron intestinal absorption, is partially controlled by HFE protein. Homozygous mutations of HFE gene lead to hemochromatosis, characterized by a body iron overload. Few studies were realized on mutation heterozygosity. However in elite athletes, its frequency is almost doubled with regard to the population. These mutations would favor the performance by allowing a compensation of the iron losses due to physical activity. In this study, our objective is to estimate the phenotypic differences between knock-out mice (KO) and wild type (WT) for HFE gene.

Four HFE<sup>-/-</sup> KO and six wild type (WT) SV129 male 6 months-old mice were analyzed during 72h for the following parameters (every 15 min); whole energy expenditure, O<sub>2</sub> consumption/CO<sub>2</sub> production (VO<sub>2</sub>, VCO<sub>2</sub>), respiratory exchange rate (RER = VCO<sub>2</sub>/VO<sub>2</sub>), food and water intake as well as locomotor activity (beam breaks) using calorimetric cages. Datas are expressed as mean ± SEM. Their body mass composition and weight were also measured. Their maximal VO<sub>2</sub> were measured on a running treadmill during an incremental test (1cm.s<sup>-1</sup> speed increase each 30 s).

Body mass of KO mice HFE are significantly higher than the WT (p<0.05). A significantly higher lean mass and a fat mass which tend to be higher are observed in KO mice (respectively p<0.05 and p=0.07 on the first day in calorimetric cages). Measure of rostro-anal size indicates nevertheless that KO mice are significantly bigger than WT (p<0.05). There is no difference in food intake. At night, KO have a total activity significantly more important than WT (1438±178 and 942±87 beambreak.hr<sup>-1</sup> for KO and WT respectively, p<0.05). RER level (RER.hr<sup>-1</sup>) of KO mice was significantly higher (P<0.05) in the second half of the night (mean of 6 hr, 1.11±0.02 and 1.07±0.01 for KO and WT mice respectively). Expressed as Kcal.kg<sup>-1</sup> lean body mass.hr<sup>-1</sup>, KO mice had a significant less energy expenditure during daylight than WT mice (19.75±0.18 and 23.44±0.98 respectively, p<0.05). Expressed as ml.hr<sup>-1</sup>.lean body mass<sup>-1</sup>, VO<sub>2</sub> and VCO<sub>2</sub> is significantly higher in WT mice during daylight and at the entrance of the night (p<0.05). There is no difference in exercise performance between the 2 groups but KO maximal VO<sub>2</sub> (ml.h<sup>-1</sup>) is significantly higher (169±9 vs 138±11; p<0.01).

The differences of body weight can be explained by the differences between energy intake and expenditure in both groups especially during daylight. However during the night the loss of significant differences can be attributed to the large increase in locomotors activities of the KO mice. Their tissues will be soon analyzed to explore mechanisms involved in the regulation of energy expenditure underlying these differences in respect of iron overload.

## PP-05-74

### PHYSIOLOGICAL RESPONSES IN CYCLING AND RUNNING AFTER CYCLING BETWEEN YOUNG AND ELITE MALE TRIATHLETES

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The purpose of this investigation was to compare the physiological responses in cycling and running after cycling between young male triathletes and elite triathletes.

Eleven male triathletes: 9 young [Y] (age: 15.5 +/- 1.5 y; height: 174.8 +/- 6.6 cm; body mass: 61.02 +/- 6.7 kg) and 2 elite senior [S] (age: 26.3 +/- 1.7 years; height: 178.7 +/- 3.6 cm; body mass: 64.9 +/- 2.9 kg) competing at national championship level performed a laboratory trial that consisted of maximal cycle ergometry (to determine the peak power output [PPO], V.O<sub>2</sub>max, the ventilation threshold [VT] and cycling economy [CE]) followed by an additional maximal treadmill running.

S possessed a significantly higher PPO (403 +/- 27 vs. 314 +/- 56 Watts) and a significantly higher V.O<sub>2</sub>max (77.1 +/- 1.8 vs. 62.7 +/- 8.16 ml x kg<sup>-1</sup> x min<sup>-1</sup>) than Y but also had a better CE (1.13 +/- 0.07 vs. 1.28 +/- 0.05 l O<sub>2</sub> / 100 Watts) whereas VT was similar in S and Y. There were no significant differences in running economy but S performed a significantly ( $p < 0.05$ ) higher maximal aerobic running speed than Y (21.5 +/- 0.7 vs. 18.1 +/- 1.9 km.h<sup>-1</sup>).

In conclusion, this preliminary study suggests that elite senior triathletes can be distinguished from their younger counterparts, mainly by a higher PPO and CE and a better maximal running speed after cycling. This can suggest that CE could contribute to increase running speed after cycling. More subjects completing that laboratory cycle-run trial are needed to conclude, especially about significantly difference in running economy after cycling or not.

## PP-05-75

### DAY-TO-DAY VARIABILITY OF THE CORTEX METAMAX 3B SYSTEM FOR DETERMINATION OF VO<sub>2</sub>MAX

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**OBJECTIVE:** The assessment of physical performance by exercise testing has a wide spread application in research and clinical diagnostics. Determination of maximum volume of oxygen uptake (VO<sub>2</sub>max) gives a representative value for cardiopulmonary capacity and the ability of the muscular system to transport and utilize inhaled oxygen. It is used e.g. in detection of chronic obstructive pulmonary diseases (COPD). High reliable measurements of VO<sub>2</sub>max are the basis for the clinical application. The aim of the present study was to investigate whether results of high reliability of previous investigations [1] could be confirmed by

verifying measurement results of MetaMax 3B® referred to results of biological variation of VO<sub>2</sub>max originated in a previous study [2]

**METHODS:** Eight male participants (31±7 years, 1.78±0.06 m, 78.7±6.0 kg) performed two ramp wise exercise tests with seven days in between on a cycle ergometer (Excalibur by Lode) until full exhaustion. Experimental setting in the lab and nutrition of participants were standardized. The portable breath-by-breath system MetaMax 3B® was used for the assessment of respiratory value VO<sub>2</sub>max. Body weight, maximum heart rate (HR<sub>max</sub>) and final workload were also assessed. Descriptive statistics (mean ± SD), paired t-test (α=0.05) and calculation of coefficient of variation (CV) were used for reliability analysis.

**RESULTS:** Results showed a non-significant decrease in VO<sub>2</sub>max (3.91±0.55 L/min to 3.84±0.57 L/min; p=0.383) and relative VO<sub>2</sub>max (50.0±8.0 mL/kg\*min to 48.8±7.6 mL/kg\*min; p=0.199) between first and second trial whereas a non-significant increase was observed for HR<sub>max</sub> (185±12 bpm to 186±12 bpm; p=0.382) and final relative workload (4.63±0.78 W/kg to 4.67±0.81 W/kg; p=0.225). Calculation of coefficient of variation resulted in CVVO<sub>2</sub>max=3.83%, CVrel.VO<sub>2</sub>max=3.57%, CVHR<sub>max</sub>=0.90% and CVfinal rel. workload=1.34%.

**CONCLUSION:** Performance tests of the study resulted in slightly higher values for CV of VO<sub>2</sub>max referred to comparative study (CVVO<sub>2</sub>max=3.3%) [2]. The high reliable results of the study for VO<sub>2</sub>max are substantiated by results for HR<sub>max</sub> and the final relative workload indicating a full exhaustion of the participants in every trial. Therefore, the MetaMax3B® seems to be a potential device for diagnostics purpose in clinical practice and research. Considering the limitations of the study due to small sample size, further investigations seem to be necessary.

#### REFERENCES:

1. Macfarlane DJ, Wong P. Validity, reliability and stability of the portable Cortex Metamax 3B gas analysis system. *Eur J Appl Physiol.* 2011 Nov 11;112(7):2539–47.
2. Bagger M, Petersen PH, Pedersen PK. Biological variation in variables associated with exercise training. *International Journal of Sports Medicine.* Stuttgart, 2003;24(6):433–40.

### PP-05-76

#### A COMPARISON OF SPINE ROM AND PHYSICAL FITNESS PARAMETERS IN ACTIVE FEMALES AND SEDENTARY FEMALES

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**PURPOSE:** The purpose of this study was to investigate the effect of physical activity on spine range of motion (ROM) and on some physical fitness parameters in young females.

**SUBJECTS:** Ninety-nine female university students (45 physically active and 54 sedentary) between the ages of 18 and 24 years with no history of back pain (Age: 19,69±1,85 years; Height: 158,61±7,11cm; Body weight: 55,34±6,13 kg) voluntarily participated to this study.

**METHODS:** The anthropometric, strength, endurance and flexibility measurements of the all participants were made. After, spine ROM measurements from two different anatomic points were recorded. For data analysis, each parameters were calculated as mean±standart deviation (SD). Differences among the two groups were investigated by independent sample t testing. Pearson correlation coefficient was used to test relationships among the parameters.

**RESULTS:** The tests which resulted in significant differences (P < 0.00) between the two groups included the back muscle strength (Active: 77,52±11,77 kgf; Sedentary: 60,83±11,98 kgf) and all the spine ROM variables except left lateral flexion (L5-S1 flexion: 71,08±11,52°, 58,81±10,16°; L5-S1 extension: 35,13±8,12°, 23,59±7,10°; T12-L1 flexion: 104,04±12,57°, 94,81±12,24°; T12-L1 extension: 53,20±9,01°,

42,61±10,22°; Right Lateral Flexion: 22,12±3,80 cm, 19,75±3,56 cm). Moreover, there were low and moderate significant relationship between spine ROM parameters with anthropometric and physical fitness parameters. These are: L5-S1 extension ROM with triceps SF ( $r=-,266$ ), suprailiac SF ( $r=-,264$ ), total fat ( $r=-,284$ ), FM(%) ( $r=-,270$ ), wrist circumference ( $r=-,325$ ), with frame size ( $r=,318$ ). L5-S1 flexion ROM with triceps SF ( $r=-,250$ ). T12-L1 extension ROM and wrist circumference ( $r=-,208$ ). According to these results, L5-S1 flexion and extension ROM were correlated positively with back muscle strength, the relative strength, and sit and reach score. T12-L1 flexion and extension ROM only correlated with sit and reach score.

**CONCLUSIONS:** It was demonstrated that there was a positive effect of physically active life-style on the back health. The results from this study will be helpful to know for individuals who have a physically active life-style will be able to improve their physical fitness parameters and spinal flexibility.

PP-05-77

### THE SURFACE EMG CHANGES WITH AEROBIC-ANAEROBIC TRANSITION INTENSITY AT INCREMENTAL EXERCISE IN SOCCER PLAYERS

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In physiological evaluations it has been postulated that Electromyographic Threshold (EMGT) may be used as a method to alternatively determine anaerobic threshold (AT). The correlation has been shown between the exercise intensity(AT2) that corresponds to the transition phase(AT2) expressing the beginning of the compensatory mechanism and EMGT exercise intensity. It is still controversial whether the EMG threshold value can be used as a valid method.

The aim of this study, in control and soccer player groups, is to determine exercise intensities between the AT2 and EMGT, and to argue the utilization possibility of EMGT as an alternative noninvasive method.

In this study 16 male subjects performed the incremental exercise test to exhaustion on an electronically-braked cycle ergometer (workload starts with 5 minute warm up at 50 watts and exercise load was increased by 25 watts every 2 minutes.) to measure and evaluate performance parameters, electromyographic signals. During the test, respiratory gas exchange data and Raw-sEMG signals were collected to determine Ventilation (VE), Heart Rate (HR), Respiratory Exchange Ratio (RER), VO<sub>2</sub>, VE/VO<sub>2</sub>, VE/VCO<sub>2</sub>, Rating of Perceived Exertion (RPE), Anaerobic Threshold2 (AT2), Rms-EMG. Rms-EMGT was determined by Linear Regression Analysis. The results were compared statistically evaluated. SPSS 15.0 was used for statistical analysis.

The aerobic capacities of the soccer players were found significantly improved compared to the sedentary participants ( $p<0.001$ ). No significant relation was found between AT2 and Rms-EMGT of 4 separate muscles. In conclusion, our findings suggest that Rms-EMG, may not be used a valid, noninvasive method for Anaerobic Threshold determination.

#### REFERENCES:

1. Jürimäe J, Duvillard von SP, Mäestu J et al, Aerobic-anaerobic transition intensity measured via EMG signals in athletes with different physical activity patterns. *Eur J Appl Physiol* (2007) 101:341-346 DOI 10.1007/s00421-007-0509-5
2. Hug F, Laplaud D, Lucia A, Grelot L. EMG Threshold Determination in Eight Lower Limb Muscles During Cycling Exercise: A Pilot Study. *Int J Sports Med* 2006; 27: 456-462
3. Lucía A, Sánchez O, Carvajal A, Chicharro JL, Analysis of the aerobic-anaerobic transition in elite cyclists during incremental exercise with the use of electromyography. *Br J Sports Med* 1999;33:178-185

PP-05-79

## TIME-RELATED HEART RATE VARIABILITY INDICES E-I, E/I AND MCR IN LEISURE-TIME LONG-DISTANCE RUNNERS

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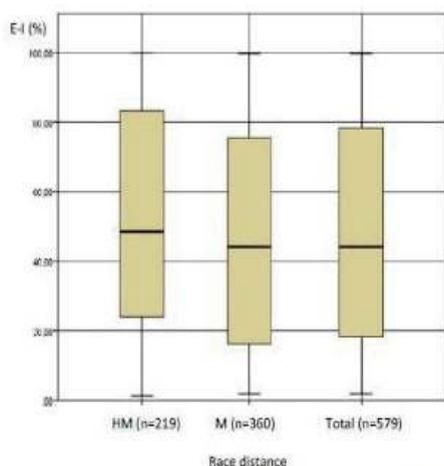
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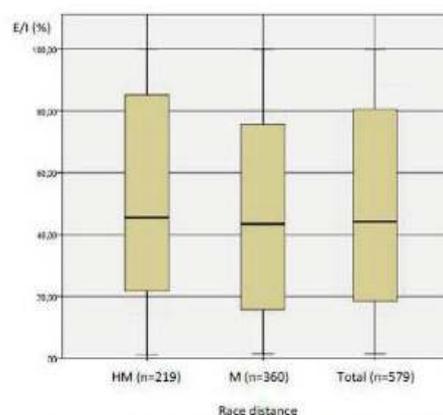
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**BACKGROUND:** Moderate physical endurance training benefits the cardiovascular system and is believed to lead to improved heart rate variability (HRV) that reflects as increases of parasympathetic and reduction of sympathetic tone. Nevertheless, there is only limited research available demonstrating parameters of HRV in a large cohort of leisure-time long-distance runners.

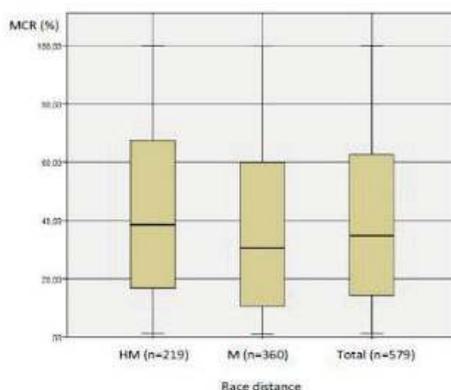
**METHODS:** In a cross-sectional study of 579 apparently healthy leisure time athletes in Germany, a 1-channel ECG was recorded for 1 minute under controlled breathing conditions of 6 breathing cycles per minute prior to 5 running events. E-I, E/I and MCR were calculated as time-related indices of HRV. We applied age-independent order statistics measured in the non-trained general population. We report about median values and 25. – 75. percentile. Additionally, a questionnaire was applied to gain information about the participants' health status and training parameters.



**Figure 1.** Results of E-I (%) presented by race distance and for all participants. (HM = half marathon, M = marathon, Total = all participants).



**Figure 2.** Results of E/I (%) presented by race distance and for all participants. (HM = half marathon, M = marathon, Total = all participants).



**Figure 3.** Results of MCR (%) presented by race distance and for all participants. (HM = half marathon, M = marathon, Total = all participants).

**RESULTS:** 219 half marathon (HM) and 360 marathon (M) runners with a median age of 43 years (34-49) have been included in this study. 113 (20 %) are females and 466 (80 %) males. Median endurance running experience was 8 years (4-15) (HM: 6 years (3-13), M: 10 years (5-16),  $p = 0.000$ ). Average specific preparation time for the competition was 3 months (3-5), with a median weekly running distance of 50 km (40-65). Intended median target time was 1:55:00 h (1:40:00 - 2:03:00) in HM and 3:57:00 h (3:31:53 - 4:27:22) in M. Median break in training prior to the competition was 7 days (0-10) (HM: 6 days (0-7), M: 7 days (3-14),  $p = 0.002$ ). All HRV indices measured in our study showed decreased values in athletes compared to the general population. While E-I (P50 = 46.01 %) and E/I (P50 = 44.33 %) were only slightly reduced, MCR was markedly decreased (P50 = 33.19 %). In HM, the median of all HRV measures was higher than in M (E-I: M = 44.23%, HM = 48.96%,  $p = 0.0034$ ; E/I: M = 43.87%, HM = 45.79%,  $p = 0.079$  and MCR: M = 30.87%, HM = 38.46%,  $p = 0.029$ ) (Figure 1-3). HRV in M with a finishing time of < 3 h and HM with a finishing time of < 1.5 h was not different compared with M and HM with longer finishing times.

**CONCLUSION:** This study is the first to present time-related HRV values in a large cohort of leisure-time long-distance runners. Leisure-time athletes showed lower HRV indices as compared to the general population. Marathon runners had lower HRV compared with half marathon runners. More specific training parameters need to be analyzed to clarify the influence of long-distance running on HRV.

## POSTER SESSION PP6 – PHYSIOLOGY AND ANTIDOPING

PP-06-80

### SPORTS EVOLUTION: A NATURAL SELECTION?

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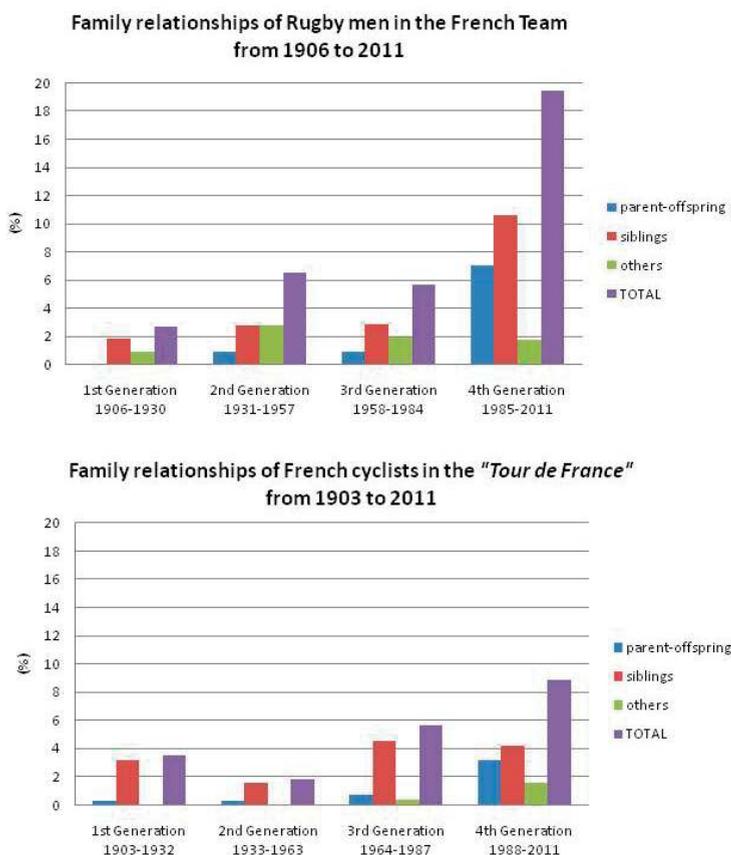
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The identification of multiple genetic polymorphisms favoring sport performance, suggests a strong interdependence of the genes related. It has been demonstrated that sport performance results from the balance between genetics and environmental components.

In order to understand if family relationships play a role in elite sports, the two aims of our study are: i) to analyze the family ties occurrence among the French Rugby team and among French Cyclists of the "Tour de France" and ii) to verify if there is an association between family ties and athletes performance.

Biographic data was collected from all of the Rugby men of the French Team starting from 1906 until 2011. Similarly, data was collected from French cyclists that have completed the "Tour of France" (TDF) between 1903 up to 2011. The occurrence of family ties (parent-offspring, grandparent-offspring, uncle-nephew,



cousins and siblings) among the athletes was analyzed by functions of 4 generations (each generation consisting of around 26 years of follow up) of men athletes. The criterion used to define the best performers among the rugby men and the cyclists was; selection to play on the National team for more than 50 times, or to be ranked in the top 10 of TDF for cyclists. The Chi-squared test was performed to verify if the probability to be among the best performers increases among the group of athletes that had family ties.

The percentage of total family ties was: 2.7%, 6.6%, 5.7% and 19.5% among the rugby men (figure 1) and 3.5%, 1.8%, 5.6% and 9 % among the cyclists (figure 1) for the first to the fourth generation respectively. The probability to play more than 50 times in the National team (non-family ties group = 10.9%; family ties group 33,3%  $p < 0.001$ ) or to be among the top 10 cyclists in the TDF (non-family ties group = 11.8%; family ties group 26,5%  $p < 0.001$ ) is significantly larger among the group of family tie athletes.

It was observed that both sports (rugby, cycling) demonstrate a trend of increased family ties among the most recent generations. This increase may be the response to the increased selectivity the elite athletes undergo nowadays. Thus, having a family ties with elite athletes family members may be associated with higher performance due the genetic contribution as well a favored environment.

PP-06-81

## PREVALENCE AND SAFETY OF THE USE OF DIETARY SUPPLEMENT IN TUNISIAN GYMS

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**BACKGROUND:** The use of dietary supplements in Tunisian gyms reached high records. The products used are varied and had several sources. Although studies on this subject are insufficient, we decided to explore the Tunisian market of bodybuilder supplements whilst evaluating the risks that may threaten these amateur by consuming these products.

**OBJECTIVES:** Exploring the Different dietary supplements used by bodybuilders and available on the Tunisian market. Assess the knowledge of sellers as well as consumers about these products and perceive the dangers that may threaten the health of consumers.

**METHODS:** The study carried at two target populations: sellers of dietary supplements (n = 30) installed in Tunisia: A full sheet visit allowed us to record the different products on sale. As well as an interview of vendors that allowed us to assess their knowledge about its products for sale. The Amateurs of bodybuilding at different gyms in Tunisia (n = 250) participated in a survey involving various sections (demographics, supplements use, knowledge of the supplements...)

**RESULTS AND DISCUSSION:** Our survey shows that (90%) of sellers in various outlets had no training in nutrition sciences or concerning dietary supplements. The results of the proposed evaluation revealed that only 8% were able to successfully respond to more than (80%) of the questions proposed. The Investigation in gyms has shown that (62.4%) of supplement users are younger than 30 years old. 40% of them use several products at the same time. Multiple results argue the following hypothesis 'the attendance at gyms encourages the consumption of supplements.' Regarding the types of supplements most used, gainers (49%) and protein powders 46% are at the top of the list however Anabolic androgenic steroids are also included (20%), the use of doping substances is particularly higher among subjects aged less than 20 years  $p < 0.05$  and only 4% of all its consumer are aware of them dangerousness on health. Indeed, most of the subjects (92.8%) confuse steroids with dietary supplements. Actually 68.4% of sports amateur get their

supplements in the black market or gyms and this is where we note the highest sales of the Anabolic steroids.

**CONCLUSION:** Our results show that the range of dietary supplements sold and consumed by young Tunisians bodybuilders is varied. The insufficient control of sales of these products and the widespread use among young amateurs in gyms without prescription make them vulnerable to doping. The teams of sports medicine must take proactive decisions to control the sales of these products and improve the amateur bodybuilders knowledge about the use of dietary supplement.

**PP-06-82**

### **A PILOT STUDY ABOUT CAUSES OF DROPOUTS IN HIGH-LEVEL DECATHLON COMPETITIONS**

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**BACKGROUND:** Decathlon is a track and field discipline where participants run, jump, and throw; and the competitions are highly demanding from both the physical and psychological standpoints because of the frequency and intensity of the events. Knowing the frequency and causes of dropouts in decathlon competitions seems relevant and helpful to develop strategies of injury prevention for decathletes.

**OBJECTIVE:** To determine the causes of dropouts and the frequency of injury as the cause of dropout in decathlon.

**DESIGN:** Pilot prospective epidemiological study.

**SETTING:** This study focused on 3 senior male national or international level (high-level) decathlon competitions.

**PATICIPANTS:** Fifty senior male national or international decathletes.

**INTERVENTIONS:** Data concerning athlete's participation (number of participating athletes listed on the start list, number of athletes in the final ranking), the event (or time) of dropout, and the causes of dropouts were collected prospectively during the 3 high-level decathlon competitions. In case injury was retained as the cause of dropout, its description was made following the IAAF and IOC recommendations.

Main outcome measurements: Percentage of dropouts and percentage of each dropout cause, description and percentage of injuries (circumstance, location, type).

**RESULTS:** 38% of decathletes did not complete these competitions. The causes of dropout were: injury (36%), loss of motivation (36%), tiredness (9%), and indeterminate (18%). 50% of injuries were acute hamstring injuries during explosive events on the first day (100-m and long jump).

**CONCLUSIONS:** Not completing a decathlon is rather common due to various difficulties (physical, technical and psychological). Although caution is needed when interpreting these results due to methodological limitations, musculoskeletal injury prevention and motivational aspects seem important to complete an entire decathlon and to aim at best performance. More detailed prospective studies are needed to determine the exact medical causes of dropouts in decathlon.

PP-06-83

**DOPING IS AN ATHLETIC ETHICAL PROBLEM OR CAUSED BY AN AFFECTIVE DISORDER? -TWO FOLD MATRIX CLINICAL AND TRANSCULTURAL ASSESSMENT WITH DSM IV TR AND TCM FOR CHINESE ATHLETE WHO ACCEPT DOPING UNDER CON**L. ZHU<sup>1</sup><sup>1</sup>*Beijing Normal University HongKong Baptist University UIC, Zhu Hai, CHINA*

One frequently used argument in the discussion on human enhancement is that enhancement is a form of cheating. This argument is well-known in relation to doping in sports (Schermer, M., 2008) and it is still discussed on 2012 Pre Olympic Congress, UK. An ethnically, and linguistically homogenous sample (n=7) of Chinese athletes suffering from over training syndrome and achievement stagnation identified by key informants was included in the study. The authors primarily apply an empirical qualitative inductive study, evaluation applied content analysis (Mayring, 2000); the secondary step is applying two medical transcultural sport psychiatric assessment systems: DSM IV TR, parallel traditional Chinese medicine (TCM). Result: Case 2, 3, 4 and case 6 had experienced Accept doping, suffered under Major Depressive Disorder (MDD), Major Depressive Episode (MDE), Adjustment Disorders in DSM IV TR system; the symptoms meet the criteria of Heart Kidney Deficiency Depression (HKDD), Heart Spleen Deficiency Depression (HSDD) in TCM system, the symptoms of athletes are severe enough to constitute a clinical diagnosis with two medical systems. Professional athletes are often the role models of adolescent and young adult populations, who often mimic their behaviors, including the abuse of drugs (Baron, D., 2005). Our study provides evidence those groups of athlete suffer under clinical depression therefore leading to doping acceptance. Those results might be in opposition to a critical opinion for athlete from an ethical, legal perspective. More refer to Clinical psychology of accept doping under condition (Zhu, L.J., 2011).

PP-06-84

**SUBSTANCE USE IN ATHLETICS: A SPORTS PSYCHIATRY PERSPECTIVE**D. BARON<sup>1</sup><sup>1</sup>*University of South California, California, USA*

Professional and other elite athletes use some substances at higher rates than nonathletes in the general population [1–7]. This is especially true for substances that have actual or perceived positive impacts on athletic performance. Substances such as anabolic androgenic steroids, amphetamines, human growth hormone, or erythropoietin that combat fatigue, relieve pain, enhance injury recovery, alter intensity and aggression, sharpen focus, increase strength and endurance, or reduce or add weight are the most attractive.

Although these performance-enhancing substances may objectively or subjectively aid performance, they may also produce negative effects at higher dosages [8–15]. Other substances such as alcohol, marijuana, cocaine, or club drugs are used or abused for the same reasons by athletes as nonathletes. The reasons for starting these drugs of abuse (ie, fit in, boost self-confidence, produce pleasure, escape problems, have fun) are not always the same as for continued use (ie, stress relief, psychological dependence, negative emotions reduction, tolerance/withdrawal). Tobacco, especially if it contains high dosages of nicotine, can be viewed as either a drug of abuse or a performance enhancer.

PP-06-85

## WHAT IS THE ATTITUDE OF JAPANESE PHYSICAL EDUCATIONAL UNIVERSITY STUDENTS TO DOPING IN SPORTS?

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**INTRODUCTION:** Drug abuse in athletes is thought to be widespread. Therefore various surveys on drug abuse in sports by youth among developed countries have been made. We have surveyed the state of drug abuse through a blog frequently accessed by drug abusers. In addition, we have consulted with drug abusers from the viewpoint of anti-doping. Our findings have led us we think that it is necessary to know what the attitudes of young people, especially, athletes, are toward drug abuse in sports. Therefore, as a first step in this study, we have made a questionnaire survey on this topic in a Japanese physical education university.

**MATERIALS AND METHODS:** The surveyed sample studied was comprised of students who attended a physical educational university in Chiba, Japan. The setting of the university is rural, and its various athletic teams are strong. This anonymous self-completed questionnaire was given out at the beginning of the semester to two sports medicine classes and one class on health care studies. Here we present the results of the questionnaire that was distributed in 2011. Section I of the questionnaire asked II questions about drug abuse: did the responder use drugs and which drugs were used? In Sections II and III, we examined their attitudes on doping. For example, in Section III, we asked a hypothetical question as to whether the responder would feel positive about drug use if he used performance enhancing drugs to win a gold medal but his life span would be only 5 years after the event. In this study, we did not divide responses by gender because there were few female students.

**RESULTS:** The recovery rate of the questionnaire and the response rate to the first question were both 100%. There were 2 drug abusers (0.4%) and 744 (99.6%) non-abusers. The use of diuretics was mentioned. In Section II, in response to "What do you think about doping?", "good" was indicated by 144 (19.3%) responders and "bad" by 592 (79.1%). In Section III, "yes" to the use of drugs under the hypothetical situation was selected by 85 (11.4%) responders and "no" by 655 (87.5%).

In conclusion, it was ascertained that there are fewer students abusing drugs in Japan than in other developed nations. However, about 20% of the students accepted drug use in sports. Furthermore, it is thought that about 10% of students might use drugs in sports. This state has continued for some years. It is thought that it is necessary for the government to adopt effective measures on this issue.

## FEDERATED NONPROFESSIONAL ATHLETES RESEARCH: MOTIVATIONS AND CHARACTERISTICS OF THEIR PRACTICE AND TREND OF LEGAL OR ILLEGAL SUBSTANCE TO INCREASE THEIR PERFORMANCE

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**INTRODUCTION:** The objective of this research was to know motivations and characteristics of the practices of athletes of a sport institution, the ways chosen to increase the performance and if the legal or illegal substance was a relevant option in that population as well as the risk perception of their use. From this knowledge evaluate the need to generate preventive programs.

**MATERIALS AND METHODS:** 393 federated non-professional over 16 years athletes were surveyed through self-administered voluntary and anonymous survey of a major sport organization in Argentina. Relevant sports of it (basketball, football, hockey, rugby, volleyball, judo and bodybuilding gyms users) were chosen. The number of respondents per sport was proportional to the number of practitioners and broadly representative in each of them.

**RESULTS:** 67.6% were men and 32.4% women. The average age was 25 years. 75% had university level. 91% practice regularly for over 1 year and 3 to 4 times a week. Promote health and improve quality of life stand out as practice objectives. They relate the performance improvement to increase training and improve nutrition. Only 8% consider that drug consumption is important. However 26% ever used drugs for that purpose, 24.2% vitamins, minerals, amino acids and 3.8% sport prohibited substances. Most states have consulted with doctors to use them. .

**CONCLUSIONS:** The studied population is young and well educated. Sport practice is regular and sustained over time. Health and socialization are the most important reasons for their practice. Increasing training hours, improving nutrition and good lifestyle are mostly chosen paths to improve performance. The use of drugs is not relevant for that purpose. Among those who consume only 3.8% do so with sport prohibited substances. 80% of prohibited substances consumers correspond to Rugby where the trend of anabolic consumption is 14.8%. 53.3% has no concept of risk consumption.

**RECOMMENDATIONS:** Is necessary preventive programs, not only with adult athletes in more committed sport, which must include coaching staffs, leaders, families, health equipment etc but primarily at children and junior categories. These programs will tend to minimize the risk that with the increased level of competition may initiate the use of prohibited substances to obtain success, so overrated and as an almost exclusive target in prevailing social models in today sport world.

## POSTER SESSION PP7 – SPORTS CARDIOLOGY

PP-07-87

**CONTRIBUTION OF THE RESTING ECHOCARDIOGRAPHY IN THE PREPARTICIPATION CARDIOVASCULAR SCREENING TO COMPETITIVE ATHLETES**H. ADALA<sup>1</sup>, D. KOUBAA<sup>1</sup>, I. FRADI<sup>1</sup>, A. BEN HALIMA<sup>1</sup>, F. AZZOUZI<sup>1</sup><sup>1</sup>Centre National de la Médecine de Sport, Tunis, TUNISIA

**INTRODUCTION:** Cardiovascular screening in athletes is routinely practiced as part of the preparticipation medical examination to competitive athletes with systematically a heart Doppler ultrasound according to the consensus of National Center of Medicine and Sciences in Sports (CNMSS).

**THE OBJECTIVE:** The aim of this study was firstly to examine the cardiovascular abnormalities observed in a cohort of a large sample of resting transthoracic echocardiography (TTE) of Tunisian athletes. Secondly we discussed the need for recommending a systematic TTE as part of the athlete's pre-participation medical screening.

**MATERIALS AND METHODS:** This retrospective study evaluated the data of 4254 heart Doppler ultrasound of 2253 athletes (86 girls and 1667 boys; age  $20.58 \pm 4.2$  years) sampled from 1998 to 2009. All subjects had competed at national and international level in their respective teams.

**RESULTS:** The unfitness from cardiac causes represents 68.7% of total unfitness. Twenty-three cases (69.7%) of cardiac abnormalities incompatible with sport were detected by systematic TTE. They represent 9.3% of all TTE and 1.02% of the explored sporting population. The average age of detection of heart disease was  $20.2 \pm 5.34$  years. These are 9 student athletes, 7 national team members and 7 professional players. The sports are football, handball, athletics, basketball, wrestling, swimming, taekwondo and judo. 52.1% of the sports played in Class IIC of Bethesda. Heart diseases observed in unable athletes were: mitral and / or aortic advanced degree valve disease (11 cases), hypertrophic cardiomyopathy (6 cases), congenital heart disease (5 cases) and arrhythmogenic right ventricular cardiomyopathy (one case).

The TTE has also detected 628 cardiac abnormalities compatible with the practice of the sport. They were mainly valve anomalies (133 minimal mitral regurgitation, 126 rheumatic aortic regurgitation, 117 mitral valve ballooning, 36 cases of minimal to moderate aortic regurgitation, 17 mitroaortiques leaks, 86 left ventricular hypertrophy and 6 small left-right shunts). All these anomalies were without impact on left ventricular function. All decisions taken in response to various cardiac abnormalities detected by TTE were taken in accordance with the recommendations of Bethesda. The systematic control of the ETT performed in 88 cases after more than 30 months showed no significant differences in echocardiography parameters.

**CONCLUSION:** This study highlights the interest of resting echocardiography exploration within the standard preparticipation medical examination to competitive athletes. This is in not only to detect the risk of sudden death (HCM) but also to early identify and supervise the cardio-vascular abnormalities in athletes.

PP-07-88

## ELECTROCARDIOGRAPHIC ANALYSIS OF 140 ALGERIA'S PROFESSIONAL'S PLAYERS

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**OBJECTIVES:** The aim of our work was to determine the frequency of various cardiovascular abnormalities and atypical aspects observed in Algeria's competitive athletes.

**MATERIAL AND METHODS:** Our population was constituted of 140 professional athletes (average age  $23.1 \pm 3.9$  years) consulted in "complexe régional sportif" of Ouargla with to obtain medical certificate authorizing professional sports practice.

**RESULTS:** Electrocardiogram was strictly normal in 67 players (47%). Twenty-nine players had conduction abnormalities. Repolarisation abnormalities were noted in 20 players.

**CONCLUSION:** Cardiovascular abnormalities found in electrocardiogram in the Algeria's professional players are comparable with those usually observed in elite athletes

**KEYWORDS:** Sports; Physical fitness, Cardiovascular disease, Electrocardiography

PP-07-89

## POSSIBLE CORRELATION BETWEEN CARDIAC ELECTRICAL INSTABILITY AND FAMILY HISTORY OF WILLIAMS SYNDROME: A CASE REPORT

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**AIM OF THE STUDY:** The family history is an important risk factor for cardiovascular disease, but relatively little is known about the nature of specific genetic risk factor. Now we can identify and characterize genes responsible for many inherited disorders in hope that this information will also provide mechanist insight into common form of cardiovascular disease. Williams Syndrome (WS) is a microdeletion syndrome (chromosome 7q11.23) affecting cardiovascular and connective tissue as well as the endocrine and central nervous systems in 1 in 7,500 live births. By contrast, genetic linkage analyses in families with long QT syndrome indicate that at least four distinct genes can cause this disorder. Patients with long QT have been shown to have an increased risk of sudden cardiac death.

**MATERIAL AND METHODS:** Has come to our attention a young athlete (11 yr old) to annual examination for sports eligibility in baseball. Was the third consecutive examination; in the first two was considered eligible; the young athlete did not have significant symptoms but in family history there was a younger brother with WS.

**RESULTS:** The ECG showed a long QTc at rest (485 ms) and after exercise (451 ms).

The ECG of the previous year was normal; the ECG of two years earlier, showed a short PR that was not investigated.

**CONCLUSION:** This case showed a new possible relationship between ECG abnormality and family history of WS, suggesting the possible contribution of other genes could be involved in cardiac electrical instability. Additional investigation of this clinical observation, particularly with molecular genetic analysis, is clearly required for development of new rational treatment and prevention.

**PP-07-90****SPORT RELATED SUDDEN DEATH: ECG FINDINGS AT REST IN NON ELITE ATHLETES**A. BRUNEAU<sup>1,2</sup>, A. TABOUREL<sup>1</sup>, L. CONNAN<sup>3</sup>, C. BOUTON<sup>3</sup>, J. MARCHAND<sup>1</sup>, P. ABRAHAM<sup>1</sup><sup>1</sup>Explorations fonctionnelles de l'exercice - CHU, ANGERS, FRANCE<sup>2</sup>Direction départementale de la Cohésion Sociale de Maine et Loire, ANGERS, FRANCE<sup>3</sup>Département de médecine générale - Faculté de médecine, ANGERS, FRANCE

**AIMS:** A resting electrocardiogram (ECG) is required by cardiologic societies for a pre-participation screening of young competitive athletes to prevent any sudden death. The aim of the present epidemiological study was to assess the prevalence of electrocardiographic abnormalities on trained athletes aged 12 to 35 as well as the number of additional test consequently needed.

**MATERIALS AND METHODS:** As part of a screening campaign lead in Maine et Loire, 459 non-professional volunteer athletes (training at least 6 hours per week) have benefited of a resting ECG (may 2011-december 2012). ECG analysis was done with a standard grid and then categorised from normal to requiring an expert cardiologic advice. The expert advice and results of cardiac additional examinations were obtained from medical records or phone call.

**RESULTS:** On 432 reported ECG, 54 have shown an abnormality. The most common were: electric left ventricular hypertrophy, shortened space PR and repolarisation disorders. This last abnormality was more often in women than men ( $p < 0.05$ ). After all, 24 ECG were considered as normal by the cardiologist. 21 echocardiography and 9 maximal exercise tests have been indicated. Finally, one real left ventricular hypertrophy has been detected.

**PP-07-92****CARDIOVASCULAR EXPLORATION IN HIGH-PERFORMANCE ATHLETE. CASE STUDY**J. SUBIELA<sup>1</sup><sup>1</sup>Instituto Nacional de Deportes, Caracas, VENEZUELA

**ABSTRACT:** The cardiovascular exploration on of the fundamental pillars in the comprehensive evaluation of the high performance athlete. Periodically is high impact news sudden death of some famous athlete in one of the most popular sports, such as football or basketball, and although this is rare, the event cause consternation in both the common citizen, as in the medical guild and the community of athletes. However, despite the striking of these cases, the number of deaths is much higher among the population who plays sports and are not as well known. It is estimated that sudden death from cardiac causes event occurs between 200.000 to 300.000 people who practice sport. This is more than sufficient reason to implement cardiovascular fitness test prior to incorporation into an exercise program a routine and mandatory, but even when the majority of these deaths could be avoided with early diagnosis of the corresponding anomaly.

On the other hand, if the omission of the examination for the practice of physical activities is completely reprehensible, it is equally include an excessive number of explorations, often unnecessary and costly, that if they join the magnification of the results "abnormal", may lean to wrong decisions in life athlete's sport. It is well known that high-performance athletes in long duration tests develop adaptive responses that could be interpreted as pathological in untrained subjects.

**THE CASE:** This is a male subject 28 years of age, career specialist 1500 meters dash in athletics, who attended cardiology consultation in private medical center, experience dizziness, insomnia and feeling of

fatigue. You practice physical examination and Holter, showing PVC, severe bradycardia, AVB 1° and AVB 2° Mobitz I. Continue exploration with a stress test with 99mTc-MIBI which resulted in: high scintigraphic criteria risk of coronary artery disease associated with hypertrophy cardiomyopathy. Reason why you practice cardiac catheterization, which resulted in: Coronary healthy.

**COMMENT:** This athlete had forbidden him compete, however carefully analyzing more appropriate criterion and the specialist in sports cardiology was permitted to compete and won the eighth place in the World Athletics Championships 2011 to be held in the city of Daegu (South Korea) with a time of 3 min 36 sec 94/100 sec. It is a typical example of an incorrect application of the test and interpretation of results.

PP-07-93

### CONVENTIONAL ECHO MODALITIES FOR PRE-PARTICIPATION CARDIOVASCULAR SCREENING IN SPORTS: TIME TO CHANGE THE MIND – A PILOT STUDY IN INTERNATIONAL COOPERATION

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M. MROSKOVA<sup>1</sup>, M. MIKULAK<sup>2</sup>, J. STASKO<sup>2</sup>, O. HORLENKO<sup>3</sup>, N. KISHKO<sup>3</sup>, V. SVYSTAK<sup>3</sup>, A. SHYP<sup>3</sup>

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The three main features requested for the “ideal” pre-participation screening (PPS) in sports are high diagnostic accuracy, cost-effectiveness and feasibility in large populations. Recently, ESC or AHA guidelines appear to be the best for detecting cardiovascular conditions with potentials for sudden death. Controversy exists concerning of increasing an efficacy of the PPS by using echocardiography (ECHO). The postulate that including ECHO into the PPS protocol is not cost-effective should be revised today.

Currently conventional techniques like M-mode and 2D are enough inexpensive (about 6, 00 Euros in Slovakia and 5,00 Euros in Ukraine), technically can be simply perform by pocket-hold but enough powerful for efficient screening advanced ultrasound systems and thus hold the potential to enter a screening protocol. 500 healthy athletes (age: 16-32 years, average  $21 \pm 5$  years, 446 males and 56 females [8:1], participating in sports like football, athletics, handball, cycling, basketball, gymnastics) were examined in 2011-2013 in a pilot international study focused on prevention of cardiovascular complications in sports. All athletes were screened according to European PPS protocol with history taking, physical examination and 12-lead ECG registration. In no one case cardiovascular abnormality was detected. After that conventional ECHO (M-mode and 2D modalities) exam was performed in all athletes.

Thanks to conventional ECHO modalities quite broad spectrum of cardiovascular abnormalities was found in 14 cases (2.8%). In 7 (1.4%) athletes it was mitral valve prolapse (hemodynamically significant in 1 case), in 3 (0.6%) - bicuspid aortic valve (significant aortic stenosis in 1 case) and in other 4 cases (0.8%) it was myocarditis, myocardial bridge, noncompaction of left ventricle and coronary artery fistula. In 4 athletes abnormalities founded required a temporary or permanent sports activities interruption.

Well-constructed, sufficiently powered, randomized and long-term controlled study will allow an objective evaluation of ECHO contribution to the diagnosis of life-threatening cardiovascular abnormalities in athletes. On the basis of these evidences, a modified PPS protocol should probably be applied to the sports cardiology practice.

PP-07-94

## A TEENAGER WITH TETRALOGY OF FALLOT BECOME SOCCER PLAYER: A CASE REPORT

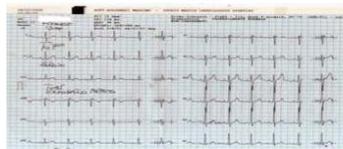
M. BOLOGNESI<sup>1</sup>, D. BOLOGNESI<sup>2</sup>

<sup>1</sup>Sports Cardiology Center Medicine Cesena - ITALY

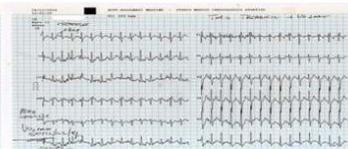
<sup>2</sup>Junior Doctor Fellow - Cesena ITALY

Tetralogy of Fallot (ToF) is the most common form of cyanotic congenital defect. Adult subjects with results of repair of Tetralogy of Fallot may present post-surgical consequences that limit their physical capacity and thus their suitability to competitive sport. Conversely, adults with excellent repair of congenital heart disease may have a chance to compete in competitive sports. This case report illustrates the clinical course of a teenager with an outcome of surgical repair for ToF and demonstrates boy's excellent physical capacity that ensures his suitability for the soccer play. This case report raises the question of the possible revision of the criteria of the Italian COCIS protocol in terms of correct congenital heart disease. In fact, in the light of these findings, in agreement with the pediatric cardiologist referent, this athlete has been considered as qualified and suitable for competitive sport of soccer, overcoming the restrictions of COCIS 2009. The individual adult or teenager bearer of congenital heart disease is a relatively rare but valuable individual, direct witness of the progress of medicine and cardiac surgery over the past 50 years. The increased survival of this population of individuals and their progressive integration into social life, work and sports then also makes it essential collaboration between clinics in the suburbs and centers of excellence in the assessment of racing, which looks like an exciting challenge for modern sports medicine.

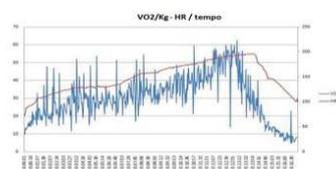
### • Resting ECG



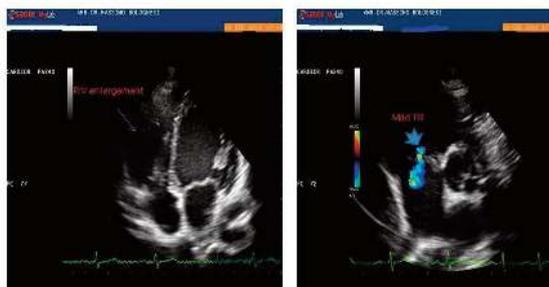
### • ECG exercise testing



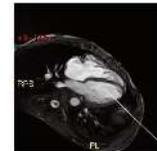
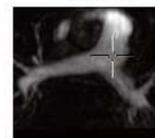
### Bruce Treadmill test for cardiorespiratory fitness evaluation



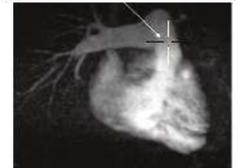
### 2D TT Echocardiography Exam



### CMR



Cine RM short axis/4 chamber view: mild right ventricle enlargement, mild hypertrophy lateral wall



## ETUDE DES EFFETS DE LA RÉADAPTATION CARDIAQUE PAR L'EXERCICE PHYSIQUE CHEZ LES CORONARIENS (ETUDE RÉTROSPECTIVE SUR CERTAINS CAS EXPÉRIMENTÉS À L'EHS DR MAUCHE (EX CNMS) D'ALGER)

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Compte tenu de la discordance entre son apport bénéfique certain chez ces patients, démontré par toutes les études et le peu de centres existants principalement dans les pays en voie de développement, d'autant plus que ces effets sont obtenus avec un excellent rapport coût-bénéfice, la présente étude, réalisée en collaboration avec le service de médecine du sport qui a lancé cette discipline, se propose de rapporter l'expérience du premier service de réadaptation des coronariens en Algérie.

Il s'agit d'une étude rétrospective comprenant l'étude des dossiers de 158 patients pris charge en réadaptation ambulatoire.

- 148 hommes âgés entre 45 à 76 ans et 10 femmes âgées entre 56 à 78 ans.
- 98 pontés, 45 stentés et 15 patients traités médicalement.

Le programme dont les paramètres à évaluer sont la TA et la FC est étalé sur 20 séances (3/semaine), à 50% de la puissance max du test avec des incréments de 5 à 10 Watt selon la tolérance et l'aisance respiratoire jusqu'à arriver à la fréquence du seuil calculée, en général entre 60 à 80% FMT. L'intensité est déterminée sur le principe de la FC cible à atteindre selon la formule de Karvonen et al.  $FCC = FC \text{ de repos} + 60 \text{ à } 70\% (FC \text{ max} - FC \text{ repos})$ .

Si on note une totale cohérence en comparant les résultats de notre recherche et ce qui a été rapporté dans la littérature et les études internationales (OMS ; Oldridge et al. et O'Connor et al) qui ont en évidence les bénéfices de la réadaptation au plan médical, psychologique, social et de santé publique par l'amélioration de la capacité physique, de l'état psychique et le retour à la vie professionnelle qui permet une meilleure réinsertion sociale, Il n'en demeure pas moins que le nombre amoindri de malades et le recul, jugés insuffisants, en comparaison avec des sujets non réadaptés ne permettent pas l'analyse sur la réduction de la morbi-mortalité comme notée dans les études des auteurs ci-dessus cités et autre celle de Taylor et al. Méta-analyse faite sur 8900 patients.

L'analyse des sous-groupes de patients a montré la meilleure amélioration de la capacité physique maximale des patients traités médicalement/coronariens pontés et ceux stentés (45W - 72 W / 60 % de plus).

Le groupe des coronariens avec angioplastie est celui qui a amélioré le moins son niveau d'effort (75 - 110W /47% de plus), ce qui n'est pas étonnant étant parti de plus haut.

Le groupe des coronariens opérés a surtout montré une amélioration de leur composante psychologique avec un gain en confiance en soi. Elle concerne 100% de ces patients. Cet acquis a permis d'aider les patients à reprendre leurs activités professionnelles, en moins d'un an, pour 75% d'entre eux

Il y a un grand intérêt pour notre pays à développer ces structures qui ont un moindre coût et surtout à les utiliser à bon escient. Cela nous paraît d'autant plus important que l'Algérie est actuellement en pleine transition épidémiologique, avec une augmentation progressive des maladies non transmissibles et principalement les maladies cardiovasculaires

PP-07-96

### COMPARATIVE RESPONSE TO CARDIOPULMONARY EXERCISE TESTING DURING TRANSIENT LEFT BUNDLE BRANCH BLOCK AND NORMAL INTRA-VENTRICULAR CONDUCTION IN YOUNG FEMALE ATHLETES

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**METHODS:** from January 2004 to December 2012 two cases of transient LBBB were detected on 7917 (0.2‰) consecutive female athletes referred to our Centre for cardiac preventive screening to competitive sports activity. According to protocol both athletes, respectively a 25 years old roller skater and a 27 years old water-polo player, performed a CPET, and were invited to come back every six months for control. Have been made twenty-six CPET, respectively twelve during LBBB and fourteen during NIVC. The rest and peak oxygen uptake (VO<sub>2</sub>), oxygen pulse (O<sub>2</sub> pulse), heart rate (HR), blood pressure, and the peak work load (PWL) sustained, measured during CPET performed in LBBB and NIVC were compared using the primer software.

**RESULTS:** the CPET data collected during LBBB and normal conduction expressed as mean plus/minus standard deviation (SD), and the P value were shown on table 1. During the follow up the LBBB spontaneously disappear after fifty-four months in both females.

**Table 1:** CPET results during LBBB vs NIVC

CPET Measure	LBBB vs NIVC at rest	P value	LBBB vs NIVC at peak exercise	P value
Heart Rate b/min	73.9+/-8,6 vs 73.1+/-7.9	P=0.820°	176.7+/-4 vs 176.3+/-3.7	P=0.798°
SBP mmHg	128.1+/-2.3 vs 128.2+/-2.3	P=0.915°	182.2+/-2.3 vs 221.7+/-2.3	P=0.000*
DBP mmHg	82.18+/-2.3 vs 81.07+/-1.9	P=0.190°	92.7+/-4.2 vs 91.4+/-3.3	P=0.386°
VO <sub>2</sub> ml/Kg/min	8.3+/-1.9 vs 8.2+/-1.8	P=0.863°	50.3+/-9.06 vs 50.1+/-8.05	P=0.954°
O <sub>2</sub> pulse ml/beat	6.01+/-1.3 vs 5.87+/-1.4	P=0.802°	13.06+/-2.3 vs 12.8+/-2.4	P=0.790°
PWL watt			168.8+/-2.3 vs 167.1+/-2.3	P=0.749°

**CONCLUSIONS:** this study is the first to compare the CPET response in female athletes with transient LBBB during the transitory conduction disturbance and NIVC. The above results support the notion that except the significant minor increase in peak SBP, the peak HR as well as the overall functional capacity expressed as peak VO<sub>2</sub> achieved and PWL sustained in LBBB remain unchanged during NIVC.

PP-07-97

### DOES PHYSICAL ACTIVITY IN THE YOUTH INFLUENCE ON CARDIO-RESPIRATORY SYSTEM IN THE MIDDLE AGE?

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**AIM:** Few data exist about influence of long-term exercise training in the youth on cardio-respiratory system in the middle age.

**MATERIALS AND METHODS:** 46 medium level athletes 32-82 yrs (mean, M+/-m, 57.1+/-1.9 yrs) with

previous >10 yrs exercise training in different sports in the youth were included in the athletes (A) group, 53 out-patients (56.9+/-1.8 yrs) with CAD and mild arterial hypertension were studied as controls (C). Ambulatory 24-h Holter monitoring (ECG, blood pressure (BP) and respiration; Cardiotehnika, Incart, SPb, Russia) was conducted in all patients.

**RESULTS:** All A did not have any health problems obtained by repetitive preparticipation ECG-screening during training time. 11 A were wrestlers, 13 were involved in team games (football, volleyball, basketball and tennis), 17 – in endurance sport (cycling, swimming, athletics (marathon) and cross-country skiing), 5 - in other sport disciplines. Only 10 A (21.7%) were moderately active while been examined.

5 pts (3 endurance athletes, 1 soccer and 1 volleyball player aged 47-67 yrs) experienced acute myocardial infarction (AMI), 1 marathon runner – 3 anterior STEMI led to heart failure (but he was physically active!), 1 – GABG; 2 A (48 and 55 yrs) - stroke. Only 2 patients in the C group had STEMI and 1 – GABG.

A reported less symptoms (palpitation, dizziness) and had lower body mass index (BMI, 27.8+/-0.6 vs 29.1+/-0.6 kg/m<sup>2</sup>, p<0.05). Heart rate at the day (74.7 vs 77.9) and night (58.6 vs 61.3 beats/min) did not differ/ A had more frequently transient II degree AV- block predominantly in the night (13.0 vs 0%, p=0.006), II degree CA-block (10.9 vs 0%, p=0.01), transient long QTc interval >480 ms (34.7 and 7.5%, p=0.005), premature ventricular couplet contractions (21.7 vs 7.5%, p=0.02) and repetitive supraventricular premature beats (32.6 vs 17.0%, p=0.04). 13.0% of A and 18.9% of C had AF.

Power spectral analysis of heart rate variability revealed that relative power of HF band in the day (nHF%, 20.3+/-1.6 vs 24.8+/-1.8%) and power of LF band in the night in A were significantly lower than in C. It seems to be due to sympathetic predominance in past A.

No difference was found in systolic BP in the day (135.6 vs 135.6 mm Hg and night) (123.8 vs 123.2 mm Hg) and diastolic BP (79.8 vs 79.0 mm Hg in the day; 70.2 vs 70.2 mm Hg in the night). 24% of A and 37.5% of C were nondippers; 16% and 4% - reverse dippers, respectively.

Apnoea/hypopnoea index was slightly lower (12.8 vs 16.3 episodes/hour, p>0.05) and count of apnoea had tendency to be lesser in A (42.6 vs 62.2; p=0.06).

**CONCLUSIONS:** Sports activity in the youth does not have significantly protective influence on cardio-respiratory system in the middle-ages sedentary behavior men. More often were seen couplet ventricular and supraventricular extrasystoles and conduction disturbances (AV- and CA-block). More regular breathing during sleep in athletes allows using of moderate physical activity as treatment means in patients with obstructive sleep apnoea syndrome.

PP-07-98

## GENDER DIFFERENCES IN CAROTID INTIMA-MEDIA THICKNESS OF YOUNG ADULTS

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**OBJECTIVE:** The intima-media thickness (IMT) is acknowledged as a surrogate marker for atherosclerosis which is a structural change of the arteries that increases the risk for cardiovascular events [1]. Epidemiology has shown that the risk stratification for cardiovascular morbidity and mortality is different for males and females [2]. Gender differences of the IMT have been proven in middle-aged to elderly healthy, as well as in diseased populations [1,2], but there is missing evidence in younger cohorts. Therefore, the purpose of this study was to investigate the presence of gender differences in a younger population between 18 and 35 years.

**METHODS:** 39 healthy subjects (17 males:  $28 \pm 4$  years;  $82 \pm 8$  kg;  $182 \pm 7$  cm, 22 females:  $26 \pm 4$  years;  $63 \pm 7$  kg;  $169 \pm 6$  cm) without hypertension ( $<139/95$  mmHg) were included. IMT of the left and right common carotid artery (CCA) was measured with high resolution B-Mode ultrasound (GE Vivid q, IMT analyze package with automated edge detection software, linear 12MHz transducer). Data were analyzed descriptively (mean  $\pm$  SD). Mean difference for the overall thickness was tested with an unpaired t-test. For the side comparison between left and right CCA the paired t-test was used.

**RESULTS:** The overall IMT for both groups was  $0.49 \pm 0.04$  mm with  $0.51 \pm 0.05$  mm for males and  $0.48 \pm 0.04$  mm for females. There was no statistically significant gender difference in this cohort ( $0.025$  mm;  $p=0.087$ ). Between left and right CCA there was no statistically significant side difference ( $0.02$  mm,  $p=0.087$ ) in the whole cohort. Pearson correlation ( $r=0.33$ ,  $p=0.04$ ) revealed a moderate relationship between age and overall IMT in the whole group.

**CONCLUSION:** In contrast to studies in cohorts older than 40 years [2] there seem to be no significant gender differences in young adults. This implies that structural changes due to gender have not developed yet. Limitation of this study was the missing consideration of the phase of cardiac cycle although there could be changes in IMT between systole and diastole [3].

#### REFERENCES:

1. Schmidt-Trucksass, A.; Grathwohl, D.; Schmid, A.; Boragk, R.; Upmeier, C.; Keul, J.; Huonker, M. (1999): Structural, Functional, and Hemodynamic Changes of the Common Carotid Artery With Age in Male Subjects. In *Arteriosclerosis, Thrombosis, and Vascular Biology* 19 (4), pp. 1091–1097.
2. Kozàková, M.; Palombo, C.; Morizzo, C.; Nolan, J.J.; Konrad, T.; Dekker, J.M et al. (2013): Gender-specific differences in carotid intima-media thickness and its progression over three years: A multicenter European study. In *Nutrition, Metabolism and Cardiovascular Diseases* 23 (2), pp. 151–158.
3. Polak, J. F.; Johnson, C.; Harrington, A.; Wong, Q.; O'Leary, D. H.; Burke, G.; Yanez, N. D. (2012): Changes in Carotid Intima-Media Thickness During the Cardiac Cycle: The Multi-Ethnic Study of Atherosclerosis. In *Journal of the American Heart Association* 1 (4), pp. e001420.

#### PP-07-99

### CARDIOVASCULAR RESPONSES AND TIREDNESS PERCEPTION THROUGH TWO ERGOCYCLE INCREMENTAL EXERCISES IN JUDOKAS

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**INTRODUCTION:** Several exercise protocols are used in sportsmen or active subjects' evaluation. The ideal in sport would be to test each one in his favourite field. Because of practical difficulties, cycle ergometer is commonly used in laboratory, but the choice of protocols is not easy. Judo is a combat sport with predominant static component. Objective: to study cardiovascular responses (heart rate and blood pressure) and effort tiredness perception through 2 ergocycle incremental loads in judokas.

**METHODOLOGY:** Six male judokas of Dakar University Club (DUC) performed one week apart a 20 W/min and 40 W/2min incremental exercise test (IET1 and IET2). The carrying out order was drawn lots for protocols. The exercise started with a warm period of 2-min zero W pedaling followed by the work load at 60 rpm until exhaustion. Recovery was supervised during 10 min and was active in 5 first ones.

Heart rate (HR) was recorded min by min and blood pressure (BP) measured every 2 min. At the end of each test, the effort tiredness was judged by subjects from the Borg scale.

**RESULTS:** No significant difference was noted between performances expressed as work time ( $690 \pm 50,2$  seconds vs  $730 \pm 79,75$  for IET1 and IET2 respectively;  $p = 0,102$ ). It was the same for maximal heart rates (HRmax), differences between HRmax and resting HR(deltaFC), systolic and diastolic BP and for the tiredness perception between the 2 incremental loads. The only significant difference was found for the reached HR when the same work time was considered ie in 10 min of effort ( $173,66 \pm 9,93$  vs  $169 \pm 10,8$  beats/min;  $p = 0,031$ ); the 20 W/min protocol raising this one more.

**CONCLUSION:** Our study suggests that the protocols of 20 W/min and 40 W/2min would be comparable as for their effects on heart rate and blood pressure evolution during maximal exercise test performed by judokas. However, the first seems to be more suitable in this type of sporting discipline.

**KEY WORDS:** exercise test, heart rate, blood pressure, tiredness, judoka

## PP-07-100

### ATRIAL ECHOCARDIOGRAPHIC ANALYSIS IN ELITE AND YOUNG RUGBYMEN

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**BACKGROUND:** Few studies exist about the analysis of echocardiographic parameters in rugby men, especially about atria.

**AIM:** To compare atrial echocardiographic parameters in rugby men with high level of performance. The impact of the player's position on the field was also analysed.

**METHODOLOGY:** Three groups have been compared in this study : Rugby men from Elite French Team (EFT,  $n = 29$ ,  $27,9 \pm 3,8$  yrs), from Young National Rugby Center (YNRC,  $n=42$ ,  $17,4 \pm 0,5$  yrs) and controls (C,  $n=15$ ,  $25,1 \pm 4,2$  yrs). Body Surface Area (BSA) values were different between the three groups, with  $2.4 \pm 0.1$  m<sup>2</sup> for EFT,  $2.1 \pm 0.2$  m<sup>2</sup> for YNRC and  $1.9 \pm 0.1$  m<sup>2</sup> for C ( $p<0.05$ ).

**RESULTS:** Concerning the left ventricular (LV), the end-diastolic internal diameter (LVIDd,  $58,3 \pm 4,4$  for EFT vs  $55,9 \pm 3,9$  for YNRC vs  $50,7 \pm 3,8$  mm for C,  $p<0,05$ ) and the end-systolic internal diameter (LVIDs,  $38,2 \pm 4,6$  for EFT vs  $35,4 \pm 4,1$  for YNRC vs  $32,7 \pm 4,2$  mm for C,  $p<0,05$ ), were higher in rugby men groups compared to control one, and higher in EFT compared to YNRC. Same results were obtained concerning the LV interventricular septum ( $9,2 \pm 0,9$  for EFT vs  $9,2 \pm 1,1$  for YNRC vs  $8,0 \pm 1,2$  mm for C,  $p<0,01$ ) and posterior wall ( $9,5 \pm 1,1$  for EFT vs  $9,1 \pm 1,1$  for YNRC vs  $7,9 \pm 1,2$  mm for C,  $p<0,001$ ) thicknesses. After indexation by BSA, both LVIDd ( $26,1 \pm 1,7$  for EFT vs  $26,2 \pm 2,1$  for YNRC vs  $26,0 \pm 1,5$  mm/m<sup>2</sup> for C) and LVIDs ( $17,1 \pm 1,8$  for EFT vs  $16,6 \pm 2,0$  mm/m<sup>2</sup> for YNRC vs  $16,7 \pm 1,7$  mm/m<sup>2</sup> for C) did not differ between groups.

Concerning the left (LA) and right (RA) atria, areas (LA :  $20,1 \pm 4,2$  for EFT vs  $19,2 \pm 3$  for YNRC vs  $16,1 \pm 3,6$  cm<sup>2</sup> for C,  $p<0,01$  ; RA :  $19,2 \pm 3,1$  for EFT vs  $17,9 \pm 2,3$  for YNRC vs  $15,9 \pm 2,6$  cm<sup>2</sup> for C,  $p=0,01$ ) and LA volume ( $58,4 \pm 15,2$  for EFT vs  $45,6 \pm 12,5$  for YNRC vs  $43,3 \pm 13,2$  ml for C,  $p<0,001$ ) were the highest in EFT, and higher in YNRC compared to C. After indexation by BSA, only the LA volume remained the highest in rugby men from EFT ( $25,7 \pm 6,0$  in EFT vs  $21,0 \pm 4,8$  in YNRC vs  $22,0 \pm 6,3$  ml/m<sup>2</sup> for C,  $p<0,001$ ).

The diastolic function with E/Ea ratio was lower in the EFT group in comparison with both YNRC and C groups (respectively,  $3,9 \pm 0,8$  vs  $4,8 \pm 0,9$  and  $5,2 \pm 0,9$ ,  $p < 0,001$ ).

No significant difference was observed for all echocardiographic parameters according to the rugby-player's position on the field, both in EFT and YNRC groups.

**CONCLUSION:** The intensive and extended practice of rugby seems to increase moderately the left atrial volume without alteration of the diastolic function and without difference according to the player's position on the field.

## PP-07-101

### ROLE OF THE AUTONOMIC NERVOUS SYSTEM IN THE REGULATION OF BLOOD FLOW BY EXTREME IMPACT

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**INTRODUCTION:** It is known that adapting to a variety of hemodynamic stress condition depends on the state of regulatory systems, including the autonomic nervous system (ANS) (Aubert A., 2003). The conclusions of many authors on adaptive responses of central and peripheral hemodynamics remain controversial. This applies especially to participate in the reactions of the ANS (Rietjens GJ et al., 2005).

A model to determine ways to adapt to the circulatory apparatus of stress and emotional impact may be studying adaptive response of the cardiovascular system (CVS) of athletes-runners of varying skills in adaptation to prolonged physical and emotional stress. The goal was - to clarify the role of ANS in the physiological mechanisms of adaptation of the CVS runners for short distances to limit physical activity.

**METHODS:** The two groups of runners, aged 18-20 years, male: high (category I - MS) ( $n = 23$ ) and low (grade II-III) ( $n = 25$ ) qualifications. Limit physical activity (FA) modeled with ergometer test «to failure» (Conconi F. et al., 1982). With automated computer program ReoCom and CardioLab (Kharkiv) was evaluated for tolerance to FA changes of central hemodynamics (CHD) and analysis of heart rate variability (HRV). These statistically processed.

**RESULTS:** Discovered heterogeneity of parameters CHD in runners high and low. In highly skilled athletes adaptation of the CVS goes through, known in the literature mainly for stayers (Otto F. Barak et al., 2008), economization functions towards the formation of hypokinetic type, with decreased heart rate, decreased cardiac index and coefficient of efficiency of circulation and occurs at rest and during recovery. Hemodynamic responses to limit FA in runners defined functional state of ANS.

Athletes qualified after FA marked overall heart rate variability (TP), decreased activity of the sympathetic units (LF%) ( $P < 0,05$ ), less inhibition of parasympathetic level (HF), a significant increase in capacity is very low frequency component of variability VLF ( $P < 0,01$ ) and the index of centralization, indicating a relatively greater role in the regulation of cardiac rhythm suprasegmental levels. Since VLF-power fluctuations of heart rate variability is a sensitive indicator of metabolic control (Fleishman AN, 1999), which reflects conditions with energy deficit, changes in the power spectrum of VLF-range may reflect the mobilization of energy reserves and metabolic conditions limiting FA.

**CONCLUSIONS:** More adequate hemodynamic response threshold FA athletes demonstrated qualifications, which alone was observed economization circulation, and after FA had higher rates of heart pump function and high functional reserves CVS, which conditioned the highest degree of centralization of the suprasegmental level control heart rhythm. Thus, hemodynamic support boundary FA in the largest extent predetermined ANS indicators such as the total power spectrum of HRV and power and the relative contribution of superlow components in the total power spectrum of heart rate (VLF).

## ECHOCARDIOGRAPHIC EVALUATION OF PULMONARY PRESSURE IN YOUNG ATHLETES

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**BACKGROUND:** Few studies analysed the normal systolic Pulmonary Arterial Pressure (PAP) values and right heart dimensions and their relationship in adolescent athletes.

**AIM:** To provide a prospective study on PAP in athletes at the beginning of the sportive season, and at regular intervals during the high level training compared to a control population for age and sex.

**MATERIAL AND METHODS:** 450 teenagers (76% male) between the ages of 14 and 18 years underwent serial echocardiography studies. Utilising the GE Vivid E portable echography The study population was composed of 300 competitive athletes, with a median age of 16 years (range 14-18), whilst the control population was made up of 150 non-athlete subjects cross-matched for age, sex, body weight and systemic arterial pressure. In the study population 157 (52%) young athletes were trained in power sports (martial arts, boxing), 143 (48%) in resistant sports (football, basketball, swimming). Both the control and study group were subjected to a basal trans-thoracic echocardiogram (T0) before their athletic preparation training and this was later repeated in the study group (T1) 8 months after intense training. From the apical 4 chambers view have been echocardiographically evaluated: the PAPs with measurement of tricuspid valve regurgitation peak velocity, the end diastolic diameter of the right ventricle (EDD RV mm), the RV systolic function determined through tricuspid annulus systolic excursion (TAPSE) and the Right Atrium area (RA cm<sup>2</sup>); the relationship between tricuspid regurgitation peak velocity (TRV m/s) and the stroke RV output t/v integral (RVOTTVI) has been correlated with the pulmonary vascular resistances of the RV (TRV/RVOTTVI m/s/cm).

**RESULTS:** The tricuspid regurgitation peak velocity in resistance sport athletes was 2.3m/sec (2-2.4), in power sport athletes was 1.9m/sec (1.7-2.3) and in the control group was 1.8m/sec (1.7-2.0). The PAPs in resistance sport athletes was 42mmHg (40-44), in power sport athletes was 31mmHg (30-34) and in the control group was 22mmHg (16-25mmHg). Right atrium area in resistance sport athletes was 16cm<sup>2</sup> (14-19), in power sport athletes was 12cm<sup>2</sup> (11-14) and in the control group was 11cm<sup>2</sup> (10-13). The end diastolic diameter of RV in resistance sport athletes was 28mm (27-33), in power sport athletes was 27mm (25-31) and in the control group was 27mm (24-29). The TRV, PAPs and area of RA results are therefore significantly greater in the resistance sport athlete group compared to the power sport athlete group and control group. The pulmonary vascular resistance (TRV/RVOTTVI, nv

PP-07-103

## THE CARDIAC FUNCTION AND DIMENSION IN A GROUP OF YOUNG FOOTBALLERS COMPARED WITH SEDENTARY CONTROL POPULATION AGED 13-16 YEARS OLD

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**BACKGROUND:** Few studies analysed the changes in the cardiac dimensions and function in young athletes.

**AIM:** we compared the study population of adolescent football players with a sedentary control population

**MATERIAL AND METHODS:** at the echo lab of the San Marco Juventus 80 football players have been studied. The same operator performed echocardiography studies using the GE Vivid E. 76 sedentary teenagers have been chosen as control population. The study population had 80 subjects with age between 13 e 16 years (median 15), heart rate (HR) at rest of 50 e 80bpm (median 60), blood pressure (BP) at rest of 110/60 -125/75 mmHg ( median 115 /65), oxygen saturations in air (Sat) of 98- 99% (median 98.8%). All the football players were playing sport for a median of 7 hours a week and recognised to be fit for agonistic sports.

The control group 76 subjects with age between 13 and 16 years (median 15), rest HR between 68 and 85 bpm (median 74bpm), BP at rest 120/65 -130/75 mmHg (126/72 mmHg), Sat of 97-99% (98%); they were not used to play competitive sport

**RESULTS:** the Left Ventricle end diastolic Diameter (LVdD) was 40-56mm (median 48 mm) in the study group, while it was 42-52 mm (45 mm) in the control group. The Interventricular Septum diastolic Diameter (IVSdD) was 8-11 mm (10,5 mm) in the athletes while it was 7-10 (8 mm ) in the control group. The left posterior ventricular wall diastolic diameter (LPWdD) was 8-10,5 mm (9,5 mm) in the football players while was 7 -10 mm (7,5 mm) in the sedentary one. The left ventricle Ejection Fraction (EF) was between 60 and 75% in the athletes (median 67%) while in the sedentary group was 65 -77% (median 72%).

6 athletes (7,5%) showed trivial mitral regurgitation and in 2 cases due to mitral valve prolapse (2,5%). In the sedentary group 11 (14%) showed trivial mitral regurgitation and in 2 cases due to mitral valve prolapse. Trivial tricuspid regurgitation with normal valve was noticed in 37 athletes (46%), while 8 (10%) in the control group. Trivial pulmonary regurgitation in 42 football players (52%), and in 9 (11%) sedentary.

**CONCLUSIONS:** the LVdD, IVSdD and LPWdD are increased in the athletes population compared to the control one, while the EF appears reduced in the athletes compared to the sedentary population. The athletes have more incidence of minimal TR and PR while the non athletes have more incidence of MR. the findings are may related to the cardiac screening that all the athletes underwent initially, screening that is not performed routinely in the adolescents.

**MEN AND WOMEN HAVE IMPORTANT DIFFERENCES IN CARDIAC AUTONOMIC MODULATION THAT ARE NOT MODIFIED BY AEROBIC CAPACITY**H. SOUZA<sup>1</sup>, S. DUTRA<sup>1</sup>, A. P. PEREIRA<sup>1</sup><sup>1</sup>University of Sao Paulo, Ribeirao Preto, BRAZIL

**INTRODUCTION:** Aerobic physical capacity plays an important role in reducing morbidity and mortality rates in subjects with cardiovascular diseases. This action is often related to an improvement in the autonomic modulation of heart rate variability (HRV). However, controversies remain regarding the effects of physical training on cardiac autonomic control in healthy subjects. Therefore, our objective was to investigate whether aerobic capacity interferes with the autonomic modulation of HRV and whether gender differences exist.

**METHODS:** Healthy men and women (N=96) were divided into groups according to aerobic capacity: low (ACL=VO<sub>2</sub>:22-38 ml/kg-1 min-1, medium (ACM=VO<sub>2</sub>:38-48 ml/kg-1 min-1) and high (ACH=VO<sub>2</sub>: >48 ml/kg-1 min-1). We evaluated the hemodynamic parameters and body composition. The autonomic modulation of HRV was investigated using spectral analysis. This procedure decomposes the heart rate oscillatory signal into frequency bands: low frequency (LF=0.04-0.15Hz) is mainly related to sympathetic modulation, and high frequency (HF=0.15-0.5Hz) corresponds to vagal modulation.

**RESULTS:** Aerobic capacity, regardless of gender, determined lower values of body fat percentage, blood pressure and heart rate. In turn, the spectral analysis of HRV showed that this parameter did not differ when aerobic capacity was considered. However, when the genders were compared, women had lower LF values and higher HF values than the respective groups of men.

**CONCLUSION:** The results suggest that aerobic physical capacity does not interfere with HRV modulation; however, the cardiac modulatory balance differs between genders and is characterized by a greater influence of the autonomic vagal component in women and by the sympathetic component in men.

**KEYWORDS:** aerobic physical capacity, cardiac autonomic modulation, gender

PP-07-104bis

**NINE WEEKS INTERMITTENT EXERCISE WORKING PROGRAM IMPROVES LEFT VENTRICLE EARLY FILLING IN OLDER PEOPLE PRESENTING WITH DIASTOLIC DYSFUNCTION**E. SCHMITT<sup>2</sup>, B. GENY<sup>3</sup>, P. OLIVIER LANG<sup>4</sup>, G. KALTENBACH<sup>5</sup>, T. VOGEL<sup>1</sup><sup>1</sup>MD, PhD. Professor, Geriatric Department, University Hospital of Strasbourg<sup>2</sup>MD, PhD. Geriatric Department, University Hospital of Strasbourg<sup>3</sup>MD, PhD Professor, Department of physiology and EA-3072, Faculty of medicine and University Hospital of Strasbourg<sup>4</sup>MD, PhD, Translational Medicine Research group, Cranfield Health, Cranfield University, Cranfield, UK and Nescens Centre of preventive medicine, Clinic of Genolier, Genolier, SWITZERLAND<sup>5</sup>MD. Professor, Head of the Geriatric Department, University Hospital of Strasbourg.

One of the hallmarks of cardiac aging is the altered early diastolic filling of the left ventricle. Effect of physical activity among older subjects with relaxation dysfunction estimated by a low E/A ratio remains controversial. We reported the effect of a short-term intermittent work exercise program (IWEP) on diastolic function among older people.

**POPULATION AND METHOD:** 164 healthy community-dwelling older women (mean age 65 years) performed the IWEP, an incremental exercise test and an echocardiographic examination were performed. Two groups of women and two groups of men were constituted according to their mitral E/A ratio :  $> 0.8$  and  $\leq 0.8$ . Analysis included inter and intra group comparison of both echocardiographic and aerobic parameters at baseline and after IWEP.

**RESULTS:** at baseline, women with an  $E/A \leq 0.8$  had significantly more hypercholesterolemia, took less hormonal substitutive treatment and practiced more swimming. More men with an  $E/A \leq 0.8$  took ACE. Endurance and maximal cardio-respiratory parameters were similar in all groups before and after training. For women with an  $E/A$  ratio  $\leq 0.8$ , IWEP was significantly associated with an increase of mitral E wave, mitral E/A ratio (from  $0.7 \pm 0.1$  ms to  $0.8 \pm 0.2$  ms) and mitral E/Ea ratio. For men with an  $E/A$  ratio  $\leq 0.8$ , only the mitral E/A ratio was significantly increased after the IWEP.

**CONCLUSION:** Our short-term endurance program is associated with a modest but significant improvement of diastolic function among older healthy people who have left ventricle relaxation abnormalities ( $E/A$  ratio  $\leq 0.8$ ).

### PP-08-105

#### EFFECT OF ANKLE INTERMITTENT COMPRESSION SYSTEM ON PAIN AND EDEMA OF ANKLE SPRAINS

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**INTRODUCTION:** Ankle sprains constitute very common injuries and the most common type is due to an inversion trauma. There is significant pain and edema. A common treatment for these injuries is the RICE (rest, ice, compression, elevation) method. The aim of this study was to compare the effect of RICE protocol with the combination of RICE protocol with an intermittent ankle compression system in the reduction of pain and acute edema of ankle sprains.

**PATIENTS AND METHODS:** Forty eight athletes, 18 to 43 years old, with severe acute ankle sprain were randomized in two groups. All were treated with the same treatment protocol (PRICE). Group A athletes (24) used an intermittent ankle compression system for the first 4 days for compression every 6 hours and after that cryotherapy and elastic bandage. The athletes of the group B (24) used only elastic bandage and cryotherapy every 6 hours. Four athletes were lost to follow up. We compared the pain with the VAScale and the edema of the ankle joint with a volumetric method at arrival, at the forth and at the tenth posttraumatic day between the two groups.

**RESULTS:** The two groups had no significant differences concerning their baseline values ( $p>0,05$ ). The ankle joint edema was decreased significantly in both groups at the third day and at the tenth day ( $p<0,001$ ). The edema was more in the group B than in group A at the third and tenth posttraumatic day ( $p<0,05$ ). The pain level was more in group A patients the third posttraumatic day ( $p<0,05$ ), but it was not significant different between groups the tenth posttraumatic day ( $p>0,05$ ).

**CONCLUSION:** According to these results intermittent ankle compression system had better effect on acute ankle edema, but the pain level was more the forth posttraumatic day.

### PP-08-106

#### THE EFFECT OF HUMAN TECAR SYNERGISTIC HEALTHCARE METHODOLOGY TO REDUCE PAIN AND EDEMA AFTER THE GRADE II ANKLE'S SPRAIN

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The main problem in rehabilitation of sprain and athlete's return to sports are the pain and the edema of the area. The conventional physical therapy uses various physical methods to reduce pain and edema for the early mobilization of the joint.

The aim of this study is to evaluate the effectiveness of Human Tecar Synergistic Healthcare Methodology in rehabilitation of a grade II ankle's sprain as a unique – therapy to reduce pain and edema in short time.

**METHODS:** Twenty patients with a 2nd grade ankle sprain were treated by Human Tecar Method. There were 12 men and 8 women with an average age of 23 years at injury. The sprain happened during the

sports activity. All of them were treated with the Human Tecar Synergistic Healthcare Methodology therapy for 45 minutes once a day, the therapy was standardized. As primary outcome parameter we measure the mass of the edema in cc with eureka method and the pain were evaluated using a Visual Analogue Scale from 1 (no pain) to 10 (maximum pain).

**RESULTS:** On the sixth day of injury after five therapies the pain was reduced from 7 to 2 at VAS and the mass of the foot was returned to normal with an average reduction of the edema at 3cc.

**CONCLUSION:** The Human Tecar Synergistic Healthcare Methodology can be used as unique therapy to reduce the pain and the edema at foot after a grade II ankle's sprain in a short time can give us outcomes better than the classical physical therapy.

## PP-08-107

### GRANDE PREVALENCE DE L'HYPOVITAMINOSE D CHEZ L'ATHLETE D'ELITE TUNISIEN AU COURS DE LA SAISON HIVERNALE

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**INTRODUCTION ET OBJECTIF:** De part son action sur les systèmes squelettique, musculaire et immunitaire, la vitamine D (VD) est susceptible d'influencer la santé et la performance des athlètes. Cette étude avait pour objectif d'étudier le statut en VD et les principaux facteurs de risque de l'hypovitaminose D chez l'athlète Tunisien.

**MATÉRIEL ET MÉTHODES:** L'étude a porté sur 150 athlètes des 2 sexes pratiquant différentes disciplines sportives, recrutés dans les centres sportifs d'élite entre janvier et février 2012. La 25-hydroxy vitamine D (25-OHD) a été dosée par méthode radio-immunologique (Diasorin). L'insuffisance en VD, le déficit en VD et le déficit sévère en VD ont été considérés pour des taux sériques de 25-OHD < 30 µg/L, < 20 µg/L et < 10 µg/L, respectivement. Un modèle de régression logistique binaire a été appliqué pour préciser les facteurs de risque du déficit en VD chez le sportif.

**RÉSULTATS:** Les taux sériques de 25-OHD chez les athlètes variaient de 4 à 46 µg/L avec une moyenne de 17,3 (± 8,05) µg/L. La grande majorité des athlètes (91.3%) présentaient un statut insuffisant en VD, 70% étaient déficitaires et un déficit sévère touchait 14,7% d'entre eux. En analyse multivariée, le déficit en VD était associé au sexe féminin [OR (IC à 95%): 5,85 (1,25-27,4); p=0,025], à la pratique sportive en salle [3,61 (1,24-10,5); p=0,019] et à un âge < 18 ans [3,22 (1,11-9,36); p=0,032].

**CONCLUSIONS:** L'athlète d'élite Tunisien est exposé à un grand risque d'hypovitaminose D en hivers. Le risque est d'autant plus élevé que l'athlète est jeune, de sexe féminin et qu'il pratique un sport en salle. La haute prévalence s'intègre dans le contexte de pandémie mondiale d'hypovitaminose D, mais est surprenante dans un pays ensoleillé et chez le sportif d'élite, sensé être bien pris en charge sur le plan nutritionnel. Il est essentiel d'évaluer le statut en VD chez le sportif et de corriger toute carence par une exposition optimale au soleil, une meilleure nutrition et une supplémentation en VD si nécessaire. Ces mesures contribueraient à préserver la santé et probablement à améliorer la performance de nos athlètes.

PP-08-108

## VITAMIN D AND SPORT: WHICH IMPACTS AND INCIDENCES OF HEALTH ON SPORT AND ESPECIALLY IN ATHLETICS?

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**INTRODUCTION:** the vitamin D plays a role in the life of an athlete at least because of its impact on the immunizing functions and on the bones and muscular metabolisms. No value of the status in vitamin D at the top-level athletes of French Athletics Federation (FFA) was recently published. Having located during the biological follow-up of the athletes of the FFA in 2012 numerous deficits even deficiencies, the medical committee of the FFA wondered about the impacts on the health of this situation and on the course to follow and decided to launch two studies in 2013/2014.

**PURPOSE:** in this pre-study, it was a question of making the bibliography before launching a study to validate a screening questionnaire of the risk of deficit in vitamin D in top-level athletes and another one to make the link enters low prevalence of the French athletes reaching in the winter period and the optimal values recognized by 25 vitamin D 3 and the incidence of their injuries.

**METHODS:** we questioned in April, 2013 databases: scopus, sciences direct, pubmed with different combinations using keywords in English: vitamin D 3 or vitamin D + ' athletes, sport, physical activity, athletics, develops the muscle, injury, of stress break, bone, physical performance, supplementation '.

**RESULTS:** we located 80 articles affecting several different sports and after analysis we kept about forty more specific articles for our two themes. We shall present the recent data of the literature and the values of the dosages of vitamin D in serum realized during the biological follow-up FFA on 2012.

**DISCUSSION:** we shall suggest a questionnaire of screening of the risk of deficit in vitamin D validating so that a project of forward-looking study on the links enters deficit vitamin D and wounds.

**CONCLUSION:** The links between blood status of vitamin D and injuries at the French athletes questioned us, the possibility of detecting the deficits by a questionnaire questioned us and we launch studies which aims to be multicenter even with others sports federation on these two questions.

PP-08-109

## VITAMIN D STATUS IN TUNISIAN ATHLETES DURING THE WINTER SEASON

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**INTRODUCTION AND OBJECTIVE:** Vitamin D influences the health and performance in athletes since it acts on the skeletal, muscular and immune systems. This study aimed to investigate vitamin D status and the main risk factors for vitamin D deficiency (VDD) in Tunisian athlete.

**MATERIALS AND METHODS:** A total of 150 athletes, 57 females and 93 males aged 15 to 25 years, were enrolled from elite sporting centers between January and February 2012. Serum 25-hydroxy vitamin D [25(OH)D] was measured by radioimmunoassay (Diasorin). Vitamin D insufficiency, deficiency and severe deficiency were defined as serum 25-OHD < 30 ng/mL, < 20 ng/mL and < 10 ng/mL, respectively. A binary logistic regression modeling was used to identify risk factors for VDD in athletes.

**RESULTS:** Serum 25(OH)D ranged from 4 to 46 ng/mL [mean (SD), 17.3 (8.05)]. Most athletes (91.3%) had vitamin D insufficiency. Vitamin deficiency was observed in 70% of athletes and was severe in 14.7%

of them. Multivariate analysis showed that indoor sports [OR (95% CI), 4.88 (1.59-14.9);  $p=0.006$ ], female gender [3.74 (1.44-9.67);  $p=0.007$ ], and age below 18 years [2.36 (1.01-5.78);  $p=0.05$ ] are the independent risk factors for VDD in these athletes.

**CONCLUSIONS:** Tunisian elite athletes are exposed to a high risk of vitamin D inadequacy in winter. The risk VDD is greater when the athlete is female, young or practices indoors. Vitamin D status appraisal is needed in athletes, especially females, young or practicing indoors. Any deficiency should be corrected through adequate sun exposure and diet in order to maintain good health and likely enhance performance in athletes.

### PP-08-110

#### RELIABILITY OF STANDARD CIRCUMFERENCES IN DOMAIN-RELATED CONSTITUTIONAL APPLICATIONS

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**OBJECTIVES:** There may be no doubt that circumferences, measured at different sites of body segments, have a variety of applications. Studies using girths are based on assumed logic, but within a general context no literature is found as to the origin of choice of a particular circumference for a particular application.

The purpose of this study is to relate each circumference (i) with the segmental tissue masses and (ii) with all whole-body tissue masses; in order to provide a complete constitutional reliability report of each girth available.

**METHODS:** Subsequent to an anthropometric protocol, 23 (9 male aged  $74.8 \pm 65.7$  years and 14 female aged  $79.2 \pm 67.3$  years) well-preserved white Caucasian cadavers, of lean subjects were dissected according to the 5-component model and expressed on its tissue-system level, for example, skin, muscle, adipose tissue, viscera, and bones.

**RESULTS:** The relations range from  $r = 0.80$  to  $r = 0.99$  ( $P < 0.01$ ). A majority of circumferences (e.g., head, neck, upper thigh, mid-thigh, and calf) do represent what is expected. Other girths (e.g., waist, upper arm, elbow, forearm, and wrist) do not relate adequately to the assumed constituent.

**CONCLUSION:** This study suggests the appreciation of the waist circumference. This measure is not valid for lean individuals, but might be for the obese. It is suggested likewise that a combination of chest and hip circumference may have a more general application within the public health sector. In summary, evidence confirms the reliability of a series of circumferences but creates doubts or rejects other colloquially established perimeters.

### PP-08-111

#### ALOE GEL TOPICAL USE VS LASER THERAPY IN THE TREATMENT OF THE ACUTE TENDINOPATHIES IN ELITE VOLLEYBALLERS: PROSPECTIVE STUDY

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**INTRODUCTION:** Several studies emphasize the anti-inflammatory properties of aloe in mice and rats, but no systematic investigation exist in humans. The aim of this study is to evaluate if the topical use of aloe gel is effective and safe for the treatment of the acute tendinopathies in athletes, compared with low-laser therapy.

**METHODS:** During 2 consecutive championship sessions, we enrolled 46 healthy elite volleyball players

affected by patellar or Achilles tendinopathies, divided in: GROUP A, 25 male ( $28.3 \pm 4.9$  years; weight  $93.1 \pm 11.6$ ; height  $198 \pm 7.0$ ) treated by 3 topical applications/day of aloe gel (Alevix gel® - Vita Research - Italy) for 10 days; GROUP B, 21 male ( $28.8 \pm 4.4$  years; weight  $93.4 \pm 13.4$ ; height  $198.6 \pm 6.5$ ) treated by 1 session/day of low laser therapy for 10 days. Using a VAS score, we evaluated local pain (T0=basal; T1=after 5 days and T2=after 10 days from the beginning of the therapy) and considered the number of the days from the beginning of the treatments to the restarting of the gym training and back to the competitions. All parameters are reported as mean  $\pm$  standard deviation and were processed by T-test and considering significant values of  $P < 0.05$ .

**RESULTS:** About the local pain, in both groups there was an important pain relief after 5 days (GROUP A:  $T1 = 4.3 \pm 1.5$ ; GROUP B:  $T1 = 4.8 \pm 1.4$ ), but without significant statistical differences. Instead at T2 we noted a significant reduction of the local pain in GROUP A:  $T2 = 1.2 \pm 1.4$  respect to GROUP B:  $T2 = 2.1 \pm 1.6$  ( $P < 0.048$ ). Moreover we observed a very significant statistical difference about the days need to restart the gym training (GROUP A:  $4.5 \pm 1.4$ ; GROUP B:  $6.1 \pm 1.2$ ;  $P < 0.0001$ ) and back to the competitions (GROUP A:  $8.3 \pm 2.9$ ; GROUP B:  $11.3 \pm 2.2$ ;  $P < 0.0001$ ). No side effects were observed.

**DISCUSSION:** These data demonstrate that both therapies are effective to obtain the pain relief, but using Aloe gel should be possible to have a larger reduction of the symptom, supporting a quicker back to the sport activity and with the advantage to make the therapy at home. So, considering his effective and safety, in our experience the topical use of Aloe gel can be considered a valid alternative in the treatment of the athlete's acute tendinopathies.

## PP-08-112

### POST-MAXIMAL EXERCISE ANKLE TO BRACHIAL INDEX MEASUREMENT: A COMPARISON OF MANUAL AND AUTOMATIC RECORDINGS

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**CONTEXT:** The measurement of the Ankle Brachial Index (ABI) at rest with either a manual ultrasonic doppler or an automatic oscillometric tool is reproducible. However, in case of moderate arterial lesion, such as endofibrosis, an early post-exercise ABI measurement is needed to improve the diagnostic accuracy. To date, little is known on the reliability of ABI following heavy-load incremental exercise.

**AIM:** The purpose of this study was to analyze the reproducibility of ABI measurements using the manual and automatic techniques after incremental cycle exercise (ABI post-ex).

**METHOD:** Fifteen healthy trained participants performed two incremental tests with a minimum of two days interval between the tests. Measurements were performed at the 1st, 3rd, 5th and 7th minutes of recovery after the maximal exercise. Measurements were done by two investigators using manual or automatic measurements simultaneously (one on each side).

**RESULTS:** Mean difference of ABI post-ex between test 1 and test 2, at minute one was  $0.09 \pm 0.10$  and  $0.07 \pm 0.05$  for the manual method and the automatic tool, respectively. The standard deviation from the mean was larger with the doppler method than the oscillometric at minute one and then trended to reach resting values at minute 3.

**CONCLUSION:** The first measurement after exercise is less reproducible with the manual doppler technique than with the automatic oscillometric method. This could be explained by a longer time needed to collect data while blood flow decreases in the period from maximal exercise. Automatic measurements should probably be preferred when dealing with athletes performing heavy load exercise.

PP-08-113

**NERVE CONDUCTION STUDIES OF ULNAR AND MEDIAN NERVES IN ELITE ROWERS**T. COLAK<sup>1</sup>, B. BAMAC<sup>1</sup>, S. MULAYIM<sup>2</sup>, O. DINCER<sup>3</sup>, S. COLAK<sup>3</sup>, MH. SELEKLER<sup>2</sup>, M. TURKER<sup>3</sup>, A. OZBEK<sup>1</sup><sup>1</sup>Kocaeli University School of Medicine, Department of Anatomy, Kocaeli, TURKEY<sup>2</sup>Kocaeli University School of Medicine, Department of Neurology, Kocaeli, TURKEY<sup>3</sup>Kocaeli University, School of Physical Education and Sport, Kocaeli, TURKEY

Elite rowers are exposed to considerable impact on the musculoskeletal system. Rower injuries are primarily overuse related (1). Injuries concerning the wrist are common because of the sweep and sculling grip position. This study was performed to evaluate the effect of rowing performance on the ulnar and median nerves crossing the wrist region in elite rowers.

**MATERIALS AND METHODS:** The rower group consisted of 20 elite male rowers and the control group consisted of 20 non-active males. The neurophysiological study consisted of motor and sensory nerve conduction of ulnar and radial nerves. Nerve conduction studies were performed using standard techniques of supramaximal percutaneous stimulation with a constant current stimulator and surface electrode recording on both extremities of each subject. Sensory responses were obtained by antidromically stimulating at the wrist and the recording from the index finger (median nerve) and little finger (ulnar nerve) with ring electrodes. The median motor nerve was examined by stimulating the median nerve at the wrist between the tendons of the flexor carpi radialis and palmaris longus. The nerve was stimulated with bipolar surface electrodes and the recording was carried out over the abductor pollicis brevis muscle with surface electrodes. The ulnar motor nerve was examined by stimulating the ulnar nerve at the wrist with bipolar surface electrodes. The motor response was recorded from the abductor digiti minimi muscle with surface electrodes.

**RESULTS:** The sensory conduction velocity of the ulnar and radial nerves were significantly delayed in both extremities of rowers compared with control subjects. There were no statistical differences in motor conduction velocities of ulnar and median nerves between the control group and rowers in both right and left extremities.

**CONCLUSIONS:** This study shows that rowers have a tendency toward developing median and ulnar sensory nerve damage in the wrist region, despite being asymptomatic. The sculling grip position (The wrist dorsiflexes and causes the oar to rotate. Both hands rotate their oars simultaneously) (2) may lead to delayed sensory conduction velocities in the median and ulnar nerves. Repetitively exerting high stress on the wrist during rowing performance may cause traction injuries to the nerves that traverse the region.

**REFERENCES:**

1. Smoljanovic T, Bojanic I, Hannafin JA, Hren D, Delimar D, Pecina M. Traumatic and overuse injuries among international elite junior rowers. *Am J Sports Med.* 2009;37(6):1193-1199.
2. Hosea TM, Hannafin JA. Rowers injuries. *Sports Health.* 2012 May;4(3):236-45.

PP-08-114

**LES DOULEURS DU BASSIN CHEZ LE SPORTIF**R. GEORGE<sup>1</sup><sup>1</sup>Centre Méditerranéen du Sport, MARSEILLE, FRANCE

- 1) historique
- 2) terminologie

- 3) démembrément
- 4) classification anatomique par localisation
- 5) biomécanique du bassin
- 6) les phénomènes tendineux
- 7) les phénomènes associés
- 8) les phénomènes divinatoires
- 9) traitements : repos/ alimentation/ traitement médical
- 10) examens paracliniques
- 11) la rééducation
- 12) qui rééduquer ? et Quoi ?
- 13) Principes de rééducation
- 14) rééducation Spécifique
- 15) les étirements
- 16) le travail excentrique
- 17) correction du morphotype
- 18) les chaînes dorso lombaire
- 19) les abdominaux
- 20) les récidiives
- 21) les cures chirurgicales
- 22) NOS RESULTATS EN REEDUCATION : sur 5 ans et 155 patients pour pubalgie basses
  - 143 patients pour arthropathie pubienne sans lésion du canal inguinal
  - 12 patients avec petite hernie haute
- RÉSULTATS:** 138 patients traités totalement / 8 très améliorés avec reprise d'activité sportive / 9 sans amélioration: chirurgie
- 23) Discussion

## PP-08-115

### SYMPTOMATIC INFRAPATELLAR PLICA: REPORT OF TWO CASES

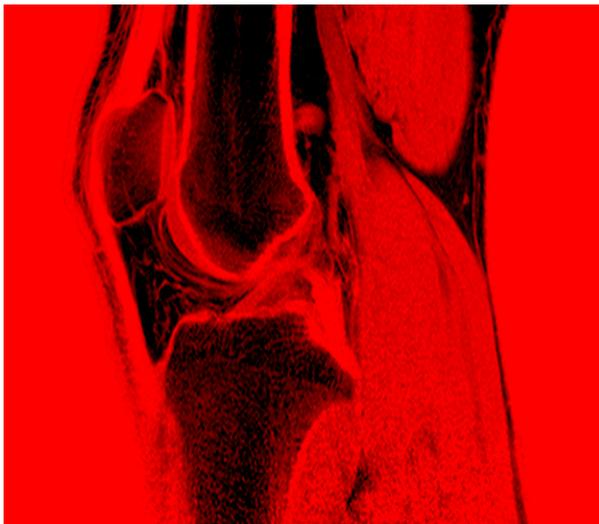
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<sup>1</sup>Hakkari Military Hospital Orthopaedics and Traumatology Clinic, HAKKARI, TURKEY

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**INTRODUCTION:** Residual anatomical structures during the embryonic development of the knee are called as synovial plicas. They sometimes may be symptomatic and affect the daily life of patients. In this study, we aimed to report two cases who have limited knee extension and anterior knee pain that diagnosed as infrapatellar plica by magnetic resonance imaging and arthroscopic images.

**CASE REPORTS:** 23 years old male patient admitted us with the complaints of limited knee ROM and anterior knee pain. He had 100 extension limitation and 2 cm atrophy at right thigh. With MR and arthroscopic imaging a



cord-like infrapatellar plica is observed. We noticed that with intraoperative knee extension infrapatellar plica is rubbing against lateral condyle and limited knee extension by creating mass effect. Plica considered to be quite tightened and excised.

21 year old male patient was admitted with complains of knee pain while crouching, and limited knee movement. He had 80 limitations at knee extension. MR images of the patients did not reveal any evidence of infrapatellar plica but with arthroscopic imagines we noticed that infrapatellar plica prevents knee extension mechanically. Plica excised and early physical therapy program was started.

**DISCUSSION:** Although knee plicas are usually asymptomatic, they may lost their elasticity and become symptomatic because of recurrent micro trauma or blunt trauma. In the presence of anterior knee pain and limitation of knee motion complaints symptomatic knee plicas should be kept in mind.

## PP-08-116

### RUNNING RACES: STUDY OF THE STRESS AND CARDIAC BIOMARKERS

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<sup>2</sup>Université de Liège, Liège, BELGIUM

**BACKGROUND:** Cardiac troponins (cTn) are considered as the best biomarkers for detection of myocardial cell injury and NT-proBNP as the best for the cardiac insufficiency. In this study, cTnT was measured by new commercially available high-sensitive methods in subjects undergoing a marathon and an ultra-trail. Our aim was to compare cTnT and NT-proBNP levels before and after the stress tests, in sportive subjects.

**MATERIALS AND METHODS:** Twenty eight subjects (26 men,  $42.5 \pm 11$  yo) ran the Maasmarathon (42.195 kilometers) between Visé (Belgium) and Maastricht (The Netherlands) and 33 subjects (33 men,  $45.7 \pm 9.3$ yo) ran the Ultratour of Liège (Belgium ; 67 km). We took blood sample before (T0), just after (T1) and 3 hours after the race (T3). In all the patients, cTnT concentrations were measured by high sensitive methods (hsTnT, Roche Diagnostics) on heparin plasma. The NT-proBNP was also determined with the kit Roche on heparin plasma. The protocol was approved by the Ethics Committee of the University of Liège (Belgium). All subjects gave their informed consent. All statistical analyses were performed using Medcalc version 8.1 for Windows. p-value <0.01 was regarded as statistically significant.

**RESULTS AND DISCUSSION:** A significant difference between hsTnT concentrations at T0 and T1 ( $p < 0.0001$ ), and between T0 and T3 ( $p < 0.001$ ) for NT-proBNP have been observed, but not between T1 and T3. This observation appeared only after a strenuous exercise. However, up to now this type of exercise is not reproducible easily in a laboratory. Moreover, nobody knows if these observations would have cardiac consequences at long terms.

**CONCLUSIONS:** Measurement of cardiac troponins by high sensitive methods allows detecting significant release of biomarkers from the heart during exercise. The value of NT-proBNP are also significant but less than TnThs. We think that the TnThs could be an interesting tool in the future to help sport medicine to detect risk of developing a cardiac problem in the future or a sudden death.

PP-08-117

## MEDICAL PROBLEMS REQUIRING HOSPITAL REFERRALS DURING LE GRAND RAID DE LA REUNION, ULTRAMARATHON TRAIL RUNNING IN 2009

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<sup>2</sup>Centre Hospitalier Gabriel Martin, Saint Paul, REUNION ISLAND

**OBJECTIVES:** To present a description of injuries and illnesses requiring emergency services consultation or hospitalisation in one of the four main hospitals on the island, during the 17th edition of LE GRAND RAID.

The objective is to report the major medical problems in this long distance running trail.

**METHOD:** We analyzed data from injuries encountered during the race and few days after, to make an inventory of medical problems which required hospital consultation.

**RESULTS:** 3756 runners have taken part in the races GRAND RAID (147.8km) or SEMI RAID (78km) on the Reunion Island, in 2009.

44 runners referred to hospital of which 28 only visited emergency department and 16 were hospitalised:

- 23 suffered from musculoskeletal injuries: 65.2% were microtraumatic and 34.8% were due to acute accidents,
- 9 from cardiovascular accidents: one viral pericarditis and 8 acute coronary syndrome (2 of them benefited from coronarography which did not show any coronary abnormalities),
- 1 ischemic colitis associated with rhabdomyolysis and acute renal failure,
- 1 rhabdomyolysis with acute renal failure requiring dialysis,
- 5 dehydration syndromes of which 1 associated with hypoglycemia and 2 with hypothermia,
- 5 for asthenia, of which 1 was associated with hypothermia.

**DISCUSSION/CONCLUSION:** Despite the lack of exhaustivity of the total accidents which occurred during this race, this study describes almost all those which required hospital referrals.

The rate of 11.7 participants admitted in hospital units per 1000 is quite important compared to other long distance races. This study emphasizes the potential vital risk of participating in ultramarathons due to metabolic and cardiac events.

Since this study, participating in the race LE GRAND RAID DE LA REUNION requires a specific medical certificate.

PP-08-118

## RESPIRATORY SINUS ARRHYTHMIA AND COMPETITION OUTCOME IN LEISURE-TIME LONG-DISTANCE RUNNERS

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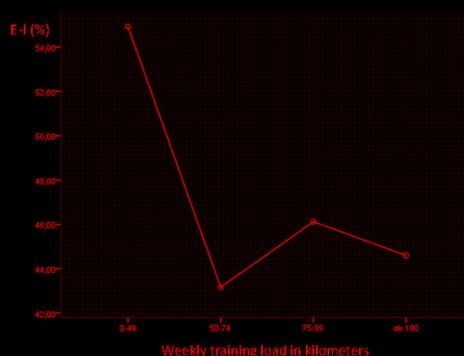
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**BACKGROUND:** Physical activity is believed to be associated with improved autonomic regulation resulting in higher heart rate variability (HRV) and better health status due to reduced sympathetic and increased parasympathetic tone. Lowered HRV is related to higher risk and worsened outcome of cardiovascular events. However, there is no research analyzing the relations of HRV to competition outcome in a large cohort of leisure-time athletes.

	Half marathon (n = 219)	Marathon (n =360)	Total (n = 579)	p
Age (y)	39 (30 - 47)	44,5 (37 - 50)	43 (34 - 49)	0.000
Gender				
male	163 (74 %)	303 (84 %)	466 (80 %)	0.004
female	56 (26%)	57 (15 %)	113 (20%)	
Running experience (y)	6 (3 - 13)	10 (5 - 16)	8 (4 - 15)	0.000
Preparation time (m)	3 (3 - 5)	3 (3 - 4)	3 (3 - 5)	0.608
Weekly training load (km)	35.5 (25 - 50)	55 (45 - 70)	50 (40 - 65)	0.000
Break duration prior to race (d)	6 (0 - 7)	7 (3 - 14)	7 (0 - 10)	0.002
Trainings frequency (times per week)	3.25 (3 - 4)	3.5 (3 - 4.5)	3.5 (3 - 4.5)	0.013
E-I (%)	49.0(23.8-83.5)	44.2(16.4-75.5)	46.0(18.7-78.3)	0.034

**Table 1.** Runners characteristics for half marathon, marathon and all participants in median (25. - 75. percentile). d = days, km = Kilometer, m = months, y = years.



**Figure 1:** Relation of E-I and weekly training load.

**METHODS:** To assess E-I as one time-related parameter of HRV, 1-channel ECG measurement of respiratory sinus arrhythmia (RSA) for 1 minute under controlled breathing conditions of 6 breathing cycles per minute was used in 579 healthy long-distance-runners prior to 5 marathon races in Germany in a cross-sectional study. For analysis we applied age-independent order statistics measured in the general population. We report about median values and 25. - 75. percentile. Additionally, a questionnaire was applied to gain information about the participants' health status, training parameters and race outcome.

**RESULTS:** 219 half marathon (HM) and 360 marathon (M) runners with a median age of 43 years (34-49) have been included in this study. 113 (20 %) are females and 466 (80 %) males (Table 1). Median E-I was 46.0 % (18.7-78.3). HM had higher values (49.0 %; 23.8-83.5) compared with M (44.2 %; 16.4-75.5;  $p = 0.034$ ). 72 runners showed highly decreased HRV values ( $E-I < 10\%$ ). 6 of them (8%) experienced cardiovascular symptoms during or immediately after the race. One participant (1.4 %) was not able to finish the race. These results are not different to athletes with high HRV:  $E-I > 90\%$  was found in 79

participants, of which 13 (17 %) complained about cardiovascular symptoms, and one had to end the competition prematurely (1.3 %). None of the participants of this study had to seek medical assistance during or immediately after the race. Our results show generally low correlations between E-I and different training parameters as well as competition outcome. Relation between E-I and weekly training loads appear u-shaped ( $p=0.008$ ). Highest E-I is found in participants with weekly training loads between 0-49 km, followed by lowest values when training 50-74 km weekly, and again increased measures when training 75-99 km or more than 100 km per week (Figure 1). Runners taking a break prior to competition show higher E-I than those without break ( $p = 0.042$ ). There was no relation between E-I and duration of training break and preparation time, training frequency, intended and reached target times, feeling while running, ability to end the race, or cardiovascular symptoms during or immediately after the competition.

**CONCLUSION:** A single measurement of RSA prior to a competition is not helpful in predicting cardiovascular complaints, premature race terminations, or competition performance in leisure-time endurance athletes. This study suggests that influence of training loads on E-I is dose-related and not linear. Further research is needed to clarify the influence of long-distance running on HRV.

PP-08-119

## FUNCTIONAL POPLITEAL ARTERY ENTRAPMENT AND EXERCISE-RELATED LEG PAIN: A NOVEL TREATMENT BY BOTULINUM TOXIN. A CASE DESCRIPTION

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**INTRODUCTION:** Exercise-related leg pain is frequent in sport pathology. Functional popliteal artery entrapment, in absence of anatomical vascular or muscular abnormality, may be the cause. Its diagnosis is difficult, requiring the performance of dynamic tests. Surgical exploration confirms the absence of anatomical abnormality, but provides uncertain results from a therapeutic point of view.

We report the case of a patient presenting with exercise-related leg pain, in link with bilateral functional popliteal artery entrapment, who was proposed a treatment by botulinum toxin injection in the gastrocnemius muscles.

**OBSERVATION:** Patient X, 27 years old, presents with typical exercise-related pain in the posterior side of both legs during running.

He is initially treated for bilateral tibial periostitis, without any efficacy on pain at running resumption. After a two years evolution, Patient X underwent surgery of bilateral aponeurotomy of the antero-external compartments of the legs for an exercise-related compartment syndrome. No improvement is noted, and the patient remains very limited during effort.

After 6 years of evolution, the diagnosis of bilateral functional popliteal artery entrapment is made and confirmed by the different static and dynamic imaging examinations. A right, then left surgical popliteal arteriolysis is performed, and allows a partial and transient improvement of pain.

In view of the persistence of pain after 9 years of evolution, Patient X consults in our department. We then perform a botulinum toxin injection in two sites, in each gastrocnemius, after having reconfirmed the diagnosis of functional popliteal entrapment. At 18 months, the results are very positive, with absence of painful recurrence despite resumption of sport practice. The disappearance of signs of arterial compression during dynamic Doppler ultrasound is also noted, as well as an improvement of the indices of systolic arterial pressure in the ankles following effort.

**CONCLUSION:** This observation highlights the difficulty to diagnose symptomatic functional popliteal artery entrapment. In view of limited therapeutic possibilities, the injection of botulinum toxin in the gastrocnemius muscles appears to be an efficient treatment. Further investigations are needed.

PP-08-120

**MEAN VELOCITY OF TRUNK ROTATION DISCRIMINATES ATHLETES WITH DIFFERENT SPORT-RELATED DEMANDS**E. ZEMKOVÁ<sup>1</sup>, M. JELEN<sup>1</sup>, G. OLLÉ<sup>1</sup>, D. HAMAR<sup>1</sup><sup>1</sup>Comenius University, Faculty of Physical Education and Sport, Department of Sports Kinanthropology, Bratislava, SLOVAK REPUBLIC

**OBJECTIVE:** The majority of core field tests assess muscular endurance. These tests are performed exclusively isometrically to task failure. Contrary to this, in the laboratory isometric and isokinetic dynamometers are used to assess core strength. However, these tests are not specific to the demands imposed by most sports. In addition, the external validity of these tests to sport-specific tasks is ambiguous. To avoid these drawbacks, one should evaluate the power and/or velocity of trunk movement in functional positions. However, it is unknown whether such testing distinguishes athletes with different demands on trunk rotation velocities. Therefore, the study compares mean velocity in acceleration phase of trunk rotation in athletes of different sports.

**MATERIALS AND METHODS:** Altogether 92 athletes (age  $23.4 \pm 4.1$  years, height  $178.1 \pm 8.4$  cm, weight  $85.6 \pm 15.7$  kg) of different sports, i.e. karate, ice-hockey, tennis, golf, ballroom dancing, rock & roll dancing, judo, wrestling, canoeing, rowing, weightlifting, and bodybuilding performed 5 rotations of the trunk to each side in a seated position with barbell of 1 kg and 20 kg placed on the shoulders. The system FiTRO Torso Dynamometer was used to monitor basic biomechanical parameters involved in exercise. In this study, mean velocity in acceleration phase of trunk rotation was analysed.

**RESULTS:** Mean velocity in acceleration phase of trunk rotation with weight of 1 kg was significantly higher in tennis players than in golfers ( $422.4 \pm 34.1$  °/s and  $368.1 \pm 32.3$  °/s,  $F = 7.196$ ,  $p = 0.024$ ,  $\eta^2 = 0.392$ ). However, its values did not differ significantly between these groups when weight of 20 kg was used ( $162.7 \pm 20.1$  °/s and  $157.4 \pm 19.8$  °/s,  $p = 0.454$ ). Significantly higher mean velocity in acceleration phase of trunk rotation in rock & roll dancers than in ballroom dancers was found with weight of 1 kg ( $501.3 \pm 41.5$  °/s and  $321.0 \pm 27.9$  °/s,  $F = 18.916$ ,  $p = 0.002$ ,  $\eta^2 = 0.624$ ), as well as 20 kg ( $189.1 \pm 24.5$  °/s and  $141.0 \pm 17.5$  °/s,  $F = 9.864$ ,  $p = 0.009$ ,  $\eta^2 = 0.481$ ). On the other hand, there were no significant differences in mean velocity in acceleration phase of trunk rotation between judoists and wrestlers with weight of 1 kg ( $466.5 \pm 39.6$  °/s and  $455.9 \pm 37.5$  °/s,  $p = 0.332$ ) and 20 kg ( $184.3 \pm 23.8$  °/s and  $179.0 \pm 22.0$  °/s,  $p = 0.457$ ). Also individual differences between athletes in mean velocity in acceleration phase of trunk rotation with weight of 1 kg and 20 kg were found, i.e. higher values in ice-hockey player than in karate competitor (7.8 % and 13.1 %, respectively), in canoeist than in rower (17.0 % and 26.7 %, respectively), and in weightlifter than in bodybuilder (21.7 % and 36.5 %, respectively).

**CONCLUSION:** Mean velocity in acceleration phase of trunk rotation is a sensitive parameter able to identify group and individual differences. These differences may be attributed to specificity of training involving trunk movements of different velocities under different load conditions.

PP-09-121

### SAN MARCO JUVENTINA LAB A NEW MEDICAL HEALTH PROJECT TO FOLLOW YOUNG ATHLETES FROM 13 TO 16 WHO PLAY FOOTBALL CHAMPIONSHIP

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Football, like many other sports, is undergoing major innovations in how it is organised, Playing soon becomes competing and by the age of 13 or 16 children are fully involved in sporting events like football championships. The St Mark's Juventine, decided to set up an innovative health project that not only treats match-related trauma but also offers very young athletes a scientific nutrition and sports medicine centre (CESMEN). Over the past 9 months the following assessments were carried out on 90 children who were 13-16 years of age : anthropometric parameters, nutritional intake diary, body impedance assessment, the optojump springboard test, varicocele detection, echocardiogram, podiatric evaluation, individual emotional state assessment.

By investigating innovative updated parameters that until this study had been reserved for professional footballers in some First Division League teams this sporting life check-up (SLC) provided an in-depth assessment of each young athlete's state of health. The anthropometric parameter assessment included age, development percentile, weight, lack of overweight or obesity and also took puberty into account. It provided the clinical background for an optimal training programme based on objective findings. The Food and Drink Intake Diary was a cornerstone of the SLC as it established the correct diet for the young athlete and proposed suitable foods to eat before training sessions and matches was reduced overweight and obesity in the cohort of young athletes, improved diets, optimised glycogen stores in muscle and reduced fatigue, lactic acid release, cramps and muscular injuries. Boys changed their diets, substituting ham, cheese, milk and pasta for foods that were rich in hydrogenated fats, snacks and sugary drinks. Body Impedance Assessment introduced innovative, experimental data. Thin and fat masses etc were measured in each child and provided interesting information that led to adjustments in diet and exercise and at the same time, motivated subjects to safeguard their health. The Optojump Springboard measured baseline dynamic fitness and improvements over the football season. The Varicocele Detection Study Detecting varicocele in the 30% of young players and may help prevent problems from arising later in life. The echocardiogram investigated major cardiac parameters from: aortic, mitral and pulmonary valve function to right and left ventricular status which established baseline cardiac data.

Podiatric evaluation led to the creation of specific plantar orthotic devices for some athletes, the disappearance of difficulties in foot positioning and in the end, triggered off "The Right Shoe" Project.

Training emotions was extremely interesting. With the coach as mediator we considered performance anxiety and match stress which are physiological not only in competitive sports and school but also in the passage to adulthood.

With the "St Mark's Juventine Lab" Project we introduced several innovations to safeguard the health of young athletes from 13 to 16 years old with major interventions in growth, cardiac evaluation, dietary education and all the athletes never undergone to trauma events and the project also demonstrated athletes' parents were positively involved in their children's sports activities.

PP-09-122

**ADEQUATE RECOVERY IMPORTANCE FOR ATHLETES WITH DISABILITIES**S. ROZENSTOKA<sup>1</sup>, A. LACE<sup>1</sup>, S. RINKULE<sup>2</sup><sup>1</sup>*Sports Laboratory, RIGA, LATVIA*<sup>2</sup>*RIGA Stradins University, RIGA, LATVIA*

Nowadays athletes with disabilities could take part in many different sports or sports disciplines. Regular participation in intensive physical exercise should be associated with cardiac and pulmonary adaptations, musculoskeletal functionality, developed all physical possibilities and good recovery.

The evaluation of the wheelchair sportsmen usually is done according to the Medical classification or after their technical skills but without Functional and cardiopulmonary testing. The Functional evaluation methods for this testing are based on the Cardiopulmonary testing same tests used for healthy players.

**THE AIM OF RESEARCH:** assess the recovery processes of the wheelchair athletes.

**MATERIALS:** 30 wheelchair athletes who, do sports regularly  $6,8 \pm 1$  years, 2 days per week, 2.0 hours each. Average age  $32 \pm 2$  years, mean weight  $75.4 \pm 1.9$  kg, mean height  $178.3 \pm 1.1$  cm and mean body mass index  $23.7 \pm 0.8$ .

**METHODS:** Complex cardiopulmonary load testing on arm ergometer and Master Screen CPX system (ISO certified), Training regime estimation, Statistical analysis methods.

**RESULTS:** The functional abilities of wheelchair athletes depend on Physical work capacity and adaptation to the physical load. During the maximal load sportsmen reached mean absolute load  $130 \pm 5$  W or mean relative load  $2,0 \pm 0,2$  W/kg when mean maximal heart rate is  $163 \pm 2$  bpm but mean systolic blood pressure  $136 \pm 2$  mmHg, diastolic blood pressure  $74 \pm 2$  mmHg. During the 6 minutes recovery individuals mean heart rate decreases till  $103 \pm 2$  bpm, mean systolic blood pressure decreases till  $126 \pm 2$  mmHg, mean diastolic blood pressure decreases till  $73 \pm 1$  mmHg, but mean lactate level is  $4.8 \pm 0.4$  mmol/l.

**CONCLUSIONS:** The training regime adequacy is evaluated after functional measurements changes during the physical load and recovery processes. It is very important to consider all training parts: warm up, load part and cooling down. Recovery estimation should be an integral part for wheelchair athletes. It is essential for full recovery between trainings, before competition and for avoiding overtraining.

PP-09-123

**PHYSICAL LOAD TOLERANCE OF THE AMATEUR SPORTSMEN**S. ROZENSTOKA<sup>1</sup>, A. LACE<sup>1</sup>, J. RAIBARTS<sup>2</sup><sup>1</sup>*Sports Laboratory, RIGA, LATVIA*<sup>2</sup>*RIGA Stradins University, RIGA, LATVIA*

The physical load tolerance is very important in amateur sports. In amateur sport high performance is based on the body functionality and physical possibilities like endurance, strength, speed and others. The performance of muscular work requires physiological responses of cardiovascular and pulmonary systems.

**THE AIM OF RESEARCH:** assess the basic parameters of physical load tolerance for amateur sportsmen.

**MATERIALS:** 60 amateur sportsmen who do sports regularly  $8 \pm 1$  years, 3 days per week, 1.5 hours each. Average age  $35.2 \pm 1.6$  years, mean weight  $88.6 \pm 2.4$  kg, mean height  $182.3 \pm 1.1$  cm and mean body mass index  $26.6 \pm 0.6$ .

**METHODS:** Complex cardiopulmonary load testing on Master Screen CPX system (ISO certified), Training regime estimation, Statistical analysis methods.

**RESULTS:** The physical load tolerance shows functional abilities of the body and adaptation to the physical work. In research group 77 % of amateur sportsmen does high dynamic and middle statistic load: cycling, running, basketball, orienteering, others. There is direct correlation between physical work capacity and functional ability of the body.

During the rest amateur sportsmen shows normal mean values of cardiovascular and pulmonary systems. During the maximal load individuals reach mean absolute maximal load  $289 \pm 7$  W, mean relative maximal load  $3.3 \pm 0.1$  W/kg. Mean heart rate increase 254 % till  $178 \pm 3$  bpm, cardiac output – 402 % till  $22,1 \pm 0,6$  L/min.. There is too high systolic blood pressure reaction: mean systolic blood pressure  $210 \pm 2$  mmHg, diastolic arterial blood pressure decrease  $49 \pm 4$  bpm. Amateur sportsmen reaches mean aerobic threshold 69 % of maximal heart rate in absolute load  $142 \pm 7$  W or relative load  $1.6 \pm 0.1$  W/kg, but mean anaerobic threshold 89 % of Maximal heart rate in absolute load  $236 \pm 8$  W or relative load  $2.7 \pm 0.1$  W/kg.

There is adequate reaction of breathing system functional measurements: frequency and ventilation, but relative oxygen uptake in aerobic threshold increases  $20.7 \pm 0.8$  ml/kg/min; in anaerobic threshold  $32.3 \pm 1.2$  ml/kg/min; in maximal load 39.5 ml/kg/min.

**CONCLUSION:** Amateur sportsmen health and functional abilities estimation is very important. It should be done with Complex cardiopulmonary load testing. Amateur sportsmen cannot always choose individually suitable training regime and they need sports doctor consultation for better load planning and cardiopulmonary adaptation.

PP-09-124

## HIGH PREVALENCE OF MEDIAN NERVE NEUROPATHY IN WHEELCHAIR ATHLETES

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**INTRODUCTION:** Median nerve neuropathy is caused due to compression of the median nerve as it traverses the carpal tunnel. Wheelchair users have been reported to have a higher prevalence in comparison to nondisabled population. Incidence of median nerve neuropathy is 27% 1 - 10 years from injury onset. Wheelchair athletes present to have even higher prevalence since the propelling of the wheelchair is performed with intensity during sports.

**OBJECTIVES:** Wheelchair basketball players (n=16) and wheelchair racers (n=12) were studied electrodiagnostically to confirm the prevalence and severity of median nerve neuropathy at the wrist of these athletes.

**METHODS:** We performed clinical examination and bilateral upper limb nerve conduction studies to each athlete. All athletes were between 1-10 years from injury onset. All the basketball players and all the racers had the same training load.

**RESULTS:** 57.1% (n=16) of all athletes had pathologic electrodiagnostic findings of median nerve. Basketball players had higher prevalence among the athletes (62.5%, n=10). Only 15.3% (n=4) of all athletes presented pathologic findings bilaterally.

**CONCLUSION:** Wheelchair athletes have a tendency to present median nerve neuropathy which is much higher than in general disabled population. Basketball players seem to have higher incidence in comparison to the racers. Early diagnosis is important and provides the doctor better therapeutic plans. Proper biomechanics, proper technique and specially designed gloves should be considered as protective measures.

PP-09-125

**CHARACTERISTIC OF PERSISTENT STAPHYLOCOCCUS AUREUS NASAL CARRIER IN RUGBY FOOTBALL TEAM**K. SUZUKI<sup>1</sup>, N. ARAI<sup>2</sup>, T. SHIMAZAKI<sup>1</sup>, T. FURUKAWA<sup>1</sup>, A. NAKAGAWA<sup>1</sup>, K. TAGAMI<sup>1</sup><sup>1</sup>Faculty of Health and Sport Sciences, University of Tsukuba, Tsukuba, JAPAN<sup>2</sup>Faculty of Education, Hakuoh University., Oyama, JAPAN

**BACKGROUND:** Staphylococcus aureus (SA) is one of the major pathogens that cause wound infection in rugby football player 1. The nasal cavity is the main ecological niche where the SA. Colonization of the nasal SA represents a risk factor in physical contact athletes for two following reasons. First, majority of SA infection originate from the carrier's own strain. Second, the hands often act as the main vectors for transmitting SA from nasal to another in physical contact sports. Therefore, eradication of SA nasal carriage reduces the contact infection. However, characteristic of an SA nasal carrier in the physical contact players has remained elusive. In this study, we describe SA outbreak of rugby football team, and report the characteristic of a persistent SA nasal carrier in based on the survey.

**METHODS:** From September 10 through October 21, 2011, SA outbreak occurred in a rugby football team. In October 2011, player who had been hospitalized for an abscess resulting from SA. To investigate SA outbreak, a questionnaire was administered to all players requesting information regarding basic demographic and clinical data concerning the following possible risk factors. Next we investigated an SA nasal carrier in a rugby football player during 2012 season (March through November). Using sterile swabs, we obtained swab specimens from the anterior nares of all players. Rated the swab in the anterior nares, placing the swabs in PBS. Swab samples were inoculated and incubated at 37C for 24±2h, SA grows as blue colonies on the compact Dry X-SA media (CD-XSA; Nissui Pharmaceutical Co., Ltd., Tokyo, Japan). The number of blue colonies per plate were counted exactly.

**RESULTS:** We identified 14 of 69 (20%) symptomatic cases. The peak distributions of infected persons were trimodal, giving 28% as Sept 10 to 20, 50% as Oct 2 to 10 and 21% as Oct 20 to 21. The occurrence rate was associated with player position. Forward players had a higher attack rate (28%) than that of backs players (7%). Nine of 14 cases with infection at a crural leg (knee and curs) have a wounding or abrasions affected area. Nasal SA colonization survey after the outbreak, there were 12 (17%) persistent, 11 (16%) intermittent, 13 (19%) occasional, and 34 (49%) non carriers in this team. By comparing their colony number of distinct carrier groups, the persistent carrier (73.3 CFU/ml) showed a significantly larger count than a mean count of the occasional carrier ( 38 CFU/ml) (P<0.05).

**CONCLUSION:** SA was likely spread predominantly during practice play, with skin breaks. Persistent carriers could contribute to the outbreak as a reservoir, and who had rich SA in the nose. This notion is of major importance for future direction in the development of new decolonization strategies.

**REFERENCES:**

1. Stacey AR, Endersby KE, Chan PC, et al. An outbreak of Methicillin resistant Staphylococcus aureus infection in a rugby football team. Br J Sports Med 1998;32:153-4.

## EFFECT OF 16 WEEKS OF PILATES MATWORK EXERCISE ON THE SKINFOLDS

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**OBJECTIVE:** to analyze the influence of Pilates Matwork exercise on eight individual skinfolds, and the sum of six and eight skinfolds on active adult women.

**MATERIAL AND METHODS:** twenty-six women (mean age:  $42.19 \pm 7.23$  years) participated in this study. They are involved in a Pilates matwork program during 16 weeks (one hour, twice a week). The inclusion criteria were: 1) more than 1 year' Pilates matwork practice; 2) women between 25 and 55 years-old; 3) completed at least 80% of the sessions. The instructors were certified in both Matwork Pilates method and Physiotherapy and had almost one year experience as instructor. They taught all sessions and only directed the progression of exercises throughout the intervention. Intervention program was based on postural control of the pelvic, spine and lower extremities; core training (transversus abdominis, rectus abdominis, internal and external obliques, gluteus and lumbar paraspinal muscles); trunk mobility in the sagittal and transverse planes; scapular stability; and flexibility training of hamstrings, calves, gluteus, piriformis, erector spinae, pectoralis major and minor, iliopsoas and hamstrings muscles. A Level 2 anthropometrist certified by the ISAK took all anthropometric variables, in concordance with the ISAK guidelines standard techniques [1]. The intra-rater technical error of measurement was set up in 3.05% for skinfolds. Participants completed baseline measures over one week before starting the exercise program. Post-test was taken one week after finishing it. Instruments were calibrated in advance to avoid measurement errors. The temperature of the laboratory which the measurements were performed was standardized at 24°C. The hypotheses of normality of the variance were analyzed via Shapiro-Wilk test. A paired t test was used to identify the differences between the pre-test and the post-test. The level of significance was set at  $p < 0.05$  and data was analyzed using the Statistical Package for Social Sciences (SPSS Inc, version 21.0, Chicago, ILL, USA).

**RESULTS:** The mean ( $\pm$  standard deviation) of the individual skinfolds (SF) and differences between the pre-test and the post-test were: 1) triceps SF:  $17.38 \pm 4.51$ mm and  $15.46 \pm 5.15$ mm, respectively ( $p=0.068$ ); 2) subscapular SF:  $15.00 \pm 4.13$ mm and  $14.23 \pm 4.06$ mm, respectively ( $p=0.174$ ); 3) biceps SF:  $9.23 \pm 4.04$ mm and  $8.62 \pm 2.56$ mm, respectively ( $p=0.26$ ); 4) iliac crest SF:  $17.27 \pm 4.52$ mm and  $15.50 \pm 4.25$ mm, respectively ( $p=0.014$ ); 5) supraspinale SF:  $15.65 \pm 5.02$ mm and  $13.12 \pm 3.89$ mm, respectively ( $p<0.001$ ); 6) abdominal SF:  $21.54 \pm 5.52$ mm and  $16.54 \pm 3.55$ mm, respectively ( $p<0.001$ ); 7) front thigh SF:  $24.19 \pm 6.45$ mm and  $22.31 \pm 6.61$ mm, respectively ( $p = 0.043$ ); 8) medial calf SF:  $18.73 \pm 6.07$ mm and  $15.62 \pm 4.20$ mm, respectively ( $p<0.001$ ). Significant differences ( $p<0.001$ ) were found in the sum of six skinfolds (triceps, subscapular, iliac crest, abdominal, front thigh and medial calf SF) between the pre-test and the post-test ( $112.42 \pm 26.15$ mm and  $97.31 \pm 18.42$ mm, respectively) and in the sum of eight skinfolds ( $138.88 \pm 33.04$ mm and  $121.38 \pm 24.10$ mm, respectively).

**CONCLUSION:** The present study demonstrated that Pilates Matwork program significantly reduces trunk and legs individual skinfolds and the sum of six and eight skinfolds in active adult women.

### REFERENCES:

1. Stewart A, Marfell-Jones M, Olds T, de Ridder H. International standards for anthropometric assessment. Lower Hutt (New Zealand): International Society for the Advancement of Kinanthropometry. 2011.

PP-09-127

## THE PROFILE OF PATIENTS ATTENDING NATIONAL HEALTH SERVICE SPORT AND EXERCISE MEDICINE CLINICS: A QUESTIONNAIRE BASED SURVEY

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**BACKGROUND:** In 2005, the Department of Health approved sport and exercise medicine (SEM) as a specialty in the United Kingdom to provide expert treatment of musculoskeletal injuries and promote physical activity upon the backdrop of London's bid to host the 2012 Olympic Games.<sup>1 2</sup> There exists no published research on the utilisation of state-funded SEM clinics.

**OBJECTIVE:** To investigate National Health Service (NHS) SEM patients' sociodemographics, exercise participation, injuries, implications of injury on sport and occupation, pathways to clinics, previous diagnoses and treatments, management by SEM specialists and onward investigations and referrals. We intended this to be useful for policymakers concerned with resource management, developing public SEM services and SEM specialist training to meet patients' demands, and evaluating the accessibility of these clinics.

**METHODS:** A longitudinal observational study was conducted using a two-part questionnaire, Part A completed by patients and Part B by clinicians. We attempted to include all patients seen between December 2011 and April 2012 at all NHS SEM clinics in the London Deanery and two clinics in the Oxford and West Midlands Deaneries. Exercise medicine referrals were not seen in these clinics so could not be included.

**RESULTS:** Two clinics in London, four clinicians, 27 patients participated. Overall: 70% (19/27) male, 67% (18/27) white, mean age 30, all employed, in full-time education or retired. Eighty-five percent (23/27) patients were referred by GP, two by rheumatologist, two by physiotherapist and data was missing for one. Thirty-three percent (5/15) new patients had no previous treatments, the remaining 66% (10/15) had received 22 treatments among them. Injuries were chronic instability, joint sprain, muscle, cartilage and tendon injury, highest in running 26% (7/27), football, other, non-sports each 15% (4/27) [Figure 1], during training independently 39% (9/23), recreational activity 35% (8/23), organised training 17% (4/23), formal competition and "other" reported as unknown each four percent (1/23). Levels of expertise were "recreational" 52% (14/27), "club" 19% (5/27), "regional" 11% (3/27), "national" and "semi-professional" each four percent (1/27). Eleven percent (3/27) did no sport. Seven percent (2/27) required time off work due to injury, 37% (10/27) had time off sport. Seven questions on investigations were completed, replies were magnetic resonance imaging (MRI), x-ray in combination with MRI (each two), x-ray, ultrasound scan (USS) and "none". Referrals were made to orthopaedics, physiotherapy, general practice and podiatry.

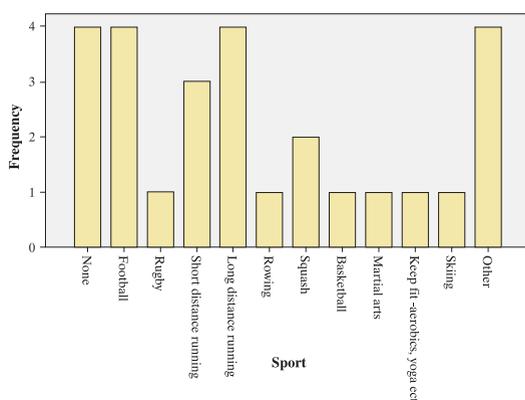


Figure 1. Bar chart showing the frequencies of sports at time of injury

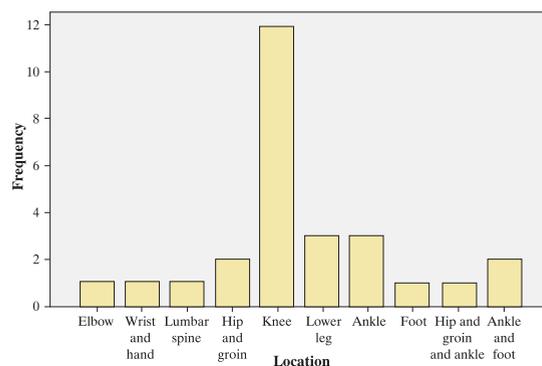


Figure 2. Bar chart showing injury locations seen in clinics

**CONCLUSIONS:** Descriptive analysis showed clinic demographics reflected area residents. Injuries were most frequently incurred during running and located at the knee. There was relatively high demand for MRI and referral to orthopaedic services. Future studies should increase clinic and patient sample sizes to better understand the sociodemographics of public SEM clinics. It would also be useful to investigate whether patients see multiple physicians before appropriate referral to SEM,<sup>3</sup> whether injury types are generalisable across clinics, and if exercise medicine as a treatment for chronic disease is being represented in state-funded SEM clinics alongside care of musculoskeletal injuries.

**REFERENCES:**

1. Cullen M et al. 2005. *Br J Sports Med.* 39:250.
2. Faculty of Sports and Exercise Medicine. <http://www.fsem.co.uk> (accessed 08/01/12).
3. O'Halloran P et al. 2009. *Br J Sports Med.* 43(14):1143-8.

PP-09-128

**A SO-CALLED LAZY, FINALLY DISEASED, SCHOOL CHILD: REPORT OF A NEW MITOCHONDRIAL (TRNA PROLINE A15992T) MUTATION**

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Exercise intolerance in a young boy reporting limitation when walking, climbing stairs and doing everyday tasks was investigated and linked to a mitochondrial RNA tRNA proline mutation (A15992T).

We learned that his mother and his two aunts experienced exercise intolerance which was reported as a «lack of motivation for sport » during their youth. As a consequence all them have spent their lives doing no sports or making no significant effort. His brother (13 years old) cannot practice any sports and feels breathless and tired in sustained or prolonged everyday tasks. His two cousins (a boy of 14 and a girl of 10) also have moderate exercise limitation but practice roller hockey, dance and volleyball respectively, as well as sports at school for both.

They were investigated in the department of genetics. The same mitochondrial mutation was found in all patients.

Thereafter, the young boy's mother (40 years old), his brother and two cousins performed an incremental test to determine maximal oxygen consumption (VO<sub>2</sub>max). Blood samples (lactate (L), pyruvate (P), ammonium (A) blood concentrations and lactate/pyruvate ratio) were taken at rest at 5 and 15 minutes of recovery. The recovery was active for 2 minutes if possible for the subject. Then the subject was sitting or lying down until 15 minutes of recovery had passed.

Maximal oxygen consumption, maximal aerobic power and ventilatory thresholds were determined. We found a VO<sub>2</sub>max < 20 ml/min.kg (less than 40% of theoretical values) for his mother his brother, and in the range 55-63 % of theoretical value for the cousins. Power output for all patients ranged 55 and 120 Watts. Blood lactate concentrations were normal at rest except for the brother (resting L = 2.1 mmol/l) but was high during recovery (6.66 to 10.95 mmol/L at minute 5 and 5.72 to 9.74 mmol/L at minute 15 of recovery). L, L/P and A showed slow decrease during recovery

The first interest of this case-report is the description of a new mitochondrial tRNA proline mutation (A15992T). We recently found the same results and the same tRNA mitochondrial mutation in another subject, a 32 years old female suffering severe exercise intolerance. She lives in the same area as the initial family but, to date does not appear to be from the same familial origin. Pathogenic studies and genetic investigations are still in progress.

The second interest of this case-report is to underline the importance of the incremental test with blood sampling to accurately detect mitochondrial disease.

**PP-09-129****THE EFFECT OF MOBILISING THE L4/5 ZYGAPOPHYSEAL JOINTS ON HAMSTRING EXTENSIBILITY IN ELITE FOOTBALLERS**

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**PURPOSE:** To compare the short-term effects of L4/5 Mobilisations on the neurogenic and myogenic extensibility of the Hamstring muscle group, on healthy asymptomatic male football players.

**SUBJECTS:** Twenty-five male soccer players, from Sunderland AFC, England with no current injury history were recruited.

**METHODS:** Subjects were randomly assigned to one of two groups. The intervention group received specific lumbar mobilisations to the unilateral L4/5 zygapophyseal joint nominated by dominant kicking foot. The second group, the control, received no intervention. Neurogenic hamstring extensibility was measured pre and post test by the straight-leg-raise (SLR) whilst the myogenic hamstring complex was measure by the passive knee extension test (PKE). Data was analysed by the paired t-test (SLR group) and the Mann Whitney test (PKE group)

**RESULTS:** A significant interaction between L4/5 mobilisations and the myogenic extensibility of the hamstring complex measured by the PKE exists ( $p=0.035$ ). Though a difference ( $p=0.014$ ) was found between the neurogenic SLR group and control this could not be associated to the intervention.

**CONCLUSION:** Specific lumbar mobilisations have the ability to increase the myogenic extensibility of the hamstring muscle group in male footballers. No relationship was found between lumbar mobilisations and neurogenic extensibility of the hamstrings.

**PP-09-130****THE EFFECTS OF COMPRESSION GARMENTS AND ELECTROSTIMULATION ON ATHLETE'S MUSCLE SORENESS AND RECOVERY**

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**INTRODUCTION:** Therapeutic interventions for recovery period on athlete's health and sportive performance are very important issues that have been researched nowadays (1, 2, 3). In our study; we have tried to explain the effects of compression garment and electrostimulation on athlete's recovery period by evaluating blood lactate and isokinetic peak torque parameters.

**METHOD:** 9 female volleyball players and 11 male basketball players at average  $15.55 \pm 0.510$  years old were included to our study. Methodologically, our study lasted in 5 days. In the first and second laboratory visits, anaerobic threshold pulses and isokinetic physiological basal values have been evaluated. Other 3 laboratory visits, the study group exercised at % 85 of anaerobic threshold individual pulse value for 30 minutes by using treadmill and then sit on a chair for 30 minutes. At this recovery period, blood samples were taken for lactate values at 0, 3, 5, 15, 30 minutes. The isokinetic strength test was performed on right ankle at 15. minutes and on the left ankle at 30. minutes of recovery period. The same protocol was performed for compression garment and for electrostimulation and results were compared.

**RESULTS:** There was not any significant difference on blood lactate levels within measurements. At women; we didn't find any significant difference on isokinetic peak torques within compression garment measurements and control measurements. At electrostimulation measurements we found significant increases on RPF (right ankle plantar flexion peak torque values) ( $p = 0.007$ ), RDF (right ankle dorsal flexion peak torque values) ( $p = 0.034$ ) and LPF (left ankle plantar flexion peak torque values) ( $p = 0.012$ ) values compared to control measurements. At men; with compression garment measurements, we found significant increase on LPF ( $p = 0.037$ ) values compared to control measurements. At electrostimulation measurements, we found significant increases on RPF ( $p = 0.045$ ) and LPF ( $p = 0.041$ ) values compared to control measurements.

**CONCLUSION:** During recovery, when compared to control measurements, there is not any beneficial effect seen on blood lactate level within compression garment measurements and electrostimulation measurements. When compared to passive rest, compression garments and electrostimulation interventions effects on force generation capacity at recovery were statically significant. There has to be more comprehensive studies needed among bigger populations to evaluate the effectiveness of compression garments and electrostimulation on athletes recovery period.

**KEY WORDS:** Compression garment, electrostimulation, recovery, isokinetic torque, lactate

#### REFERENCES:

1. Duffield. R, Edge J, Merrels R, Hawke E, Barnes M, Simcock D, Gill N, The effects of compression garments on intermittent exercise performance and recovery on consecutive days, *International journal of sports physiology and performance*, 2008, 3(4):454-468
2. Tessitore A, Meeusen R, Pagano R, Benvenuti C, Tiberi M, Capranica L (2008) Effectiveness of active versus passive recovery strategies after futsal games. *J Strength Cond Res* 22:1402–1412
3. John R. Jakeman, Chris Byrne , Roger G. Eston, Lower limb compression garment improves recovery from exercise-induced muscle damage in young, active females, *Eur J Appl Physiol* (2010) 109:1137–1144

PP-09-131

### PAINFUL ACCESSORY MUSCLE IN 3 ATHLETES: FIRT CASES TREATED BY BOTULINUM TOXIN A

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**INTRODUCTION:** The surnumerary muscles, in particular the accessory soleus, can become painful without clearly known aetiology. Currently the only treatment is the muscle excision. The aim is to test the hypothesis that botulinum toxin A (BTA) is an effective treatment to avoid surgery.

**MATERIAL AND METHOD:** 3 preliminary cases. Pain was present on exertion at the level of a small mass in the posteromedial aspect of the ankle. The diagnosis was confirmed by RMI. Additional examinations looked into the cause of the pain. The BTA injection (70UI Botox (n=1), Dysport (n=2)) in the 2 sites of the accessory soleus was guided by palpation and electrostimulation.

**RESULTS:** The intramuscular pressures were normal, excluding an exertional compartment syndrome. Doppler was normal. The EMG found an entrapment syndrome of the tibial nerve at the level of the accessory soleus mass only in one patient. The exertional pain disappeared in the 3 patients. The first patient was relieved for 5 years. A second injection early 2012 was relieved without recurrence since. The second patient was relieved for 10 months with 2 injections but the pain recurred. A new TBA injection was performed with again a good result during 3 years and a recurrence on april 2012. The last patient with the tibial nerve compression has been painless for 4 months. The pain was gone for 10 months with 2 injections and reappeared with less intensity. With the forth injection, he was relieved with 2 years of follow.

**DISCUSSION:** Our 3 cases of painful accessory soleus are the first to be treated by BTA injection. These first results are interesting and must be confirmed on a higher number of patients and in a long-term. The hypothesis of the effectiveness is that TBA decreases the volume and/or the tonus of the accessory soleus muscle.

**KEY WORDS:** supernumerary muscle, accessory soleus, botulinum toxin.

PP-09-132

### RELIABILITY OF POSTURAL CONTROL DURING STABLE AND UNSTABLE SITUATIONS IN YOUNG ATHLETES

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**OBJECTIVE:** Oscillating platforms (OP) recently have been used as a simple method to characterize balance ability in unstable situations in athletes. Yet, standard values for one-legged stance (OLS) and reproducibility are poorly verified. Alternatively, OLS-tests in stable situation have been implemented on ground reaction force plates (FP) showing good reliability. However, these findings are mainly validated in adult athletes. The aim of this study was to evaluate the test-retest reliability of one-legged stance tests on an oscillating platform and on a force plate in young athletes.

**METHODS:** Thirteen healthy adolescent athletes (2 female, 11 male;  $16 \pm 2$  yrs;  $69 \pm 17$  kg;  $1.73 \pm 0.10$  m; exercise/wk  $16 \pm 8$  hrs) were assessed in a test-retest design (2 weeks interval). In two different setups OLS-tests were performed (3 trials/leg, randomized order). The first test was executed on an OP measuring total displacement (mm) during 15 s after a perturbation stimulus (pretension by 1 cm deflection). Secondly, centre of pressure displacement (mm) during 10 s of OLS on FP was recorded. Data was analysed descriptively (mean  $\pm$  SD). Intraclass correlation coefficient (ICC, 2.1), test-retest-variability (TRV, %) and Bland-Altman analysis with Limits of Agreement (Bias  $\pm$  1.96\*SD) were calculated for the best trial (minimum displacement).

**RESULTS:** OLS minimum displacement for both legs was  $556 \pm 366$  mm (OP) and  $601 \pm 116$  mm (FP). ICC for OP was 0.49, TRV  $57.8 \pm 33.2$  %. Bland-Altman analysis showed a systematic bias of  $-140 \pm 664$  mm absolute and  $-25 \pm 187$  % relative, respectively. ICC for OLS on FP was 0.53, TRV was calculated  $13.7 \pm 9.9$  %. Absolute and relative Bland-Altman results were  $-45 \pm 219$  mm and  $-8 \pm 38$  %, respectively.

**CONCLUSION:** Measurements of postural control on OP are less reliable and include a high systematic error compared to measurements on FP in adolescent athletes. However, since measures under dynamic conditions are important in athletes, future test-setups on OP investigating young subjects should operate with decreased deflection and/or differentiated measures. Also, more extensive test trials implemented before measurement may reduce bias caused by learning effects.

PP-09-133

## VALIDITY OF BIOELECTRIC IMPEDANCE ANALYSIS AND ANTHROPOMETRIC METHODS TO DETERMINE BODY COMPOSITION BETWEEN THE AGES 15 AND 17 YEARS OLD MALE ATHLETES

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Bioelectric Impedance Analysis (BIA) and anthropometric regression formulas have been using frequently in order to analyse body fat percentage or lean body mass for the athletes. The purpose of the study is to determine validity of two different bioelectric impedance analysis and anthropometric methods for 15-17 years old male athletes.

**METHODS:** 65 male adolescent athletes (basketball, football, handball, swimming and skiing, training for at least 1 year, 2 hours/3 days/week.) participated voluntarily. Body density, body fat percentage, and lean body mass were determined by using Hydrostatic Weighting as a criterion method. Oxygen dilution method was used to determine residual volume. Body weight in kg, height in cm, skinfold thicknesses in mm, and circumferences in cm were measured. Resistance (ohm), body fat percentage and lean body mass were measured by using two different BIA (Jawon Segmental Body Composition Analyser, model AVIS 333 Plus and Tanita BIA analyser, 401A, Japan) and commonly used anthropometric formulas; Açıkada ve ark., (1991), Durnin-Womersley (1974), Slaughter (1988). All measurements procedures were conducted on the same day for each subject. The consistency between anthropometric method and BIA regression equations were determined by the Bland-Altman analysis and repeated measures analysis of variance. Two different BIA methods and Slaughter (1988) were found valid and consistent between methods, whereas other anthropometric regression equations to estimate body fat percentage and lean body mass were found significantly ( $p < 0.05$ ) different for male athletes. Results approved that regression equations were population specific. Consequently, population specific or validated regression equations have to be used for specific populations.

PP-09-134

## SPATIAL FATIGUE ANALYSIS OF THE LUMBAR REGION DURING SUPPORTED SORESENSEN TEST IN YOUNG AND ELDERLY MEN

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**BACKGROUND:** In order to estimate the fatigability of the lumbar muscles, the Sorensen test (unsupported compensation of gravitational force against the upper body while lying prone) is often used. Due to pain or other restrictions, the unmodified procedure is often not applicable to use with patients. In addition, coordination and force-related deficits are observed in patients with low back pain. A more precise identification of lumbar coordination deficits could be achieved by means of higher spatial resolution of muscle activity. The aim of this study was to determine back muscle fatigue characteristics separately for each lumbar segment during a defined strain level (50% of the upper body mass) in young and elderly men.

**METHODS:** A total of 66 symptom-free men in the third (Young group: N=32, 24 years (SD 2)) and sixth

(Elderly group: N=34, 55 years (SD 3)) decades of age were examined. The task was a 10-minute endurance extension test of the trunk in a horizontal position supporting 50% of the upper body mass (UBM). In order to standardise the load individually, the UBM had been previously determined (Centaur, BfMC). Surface EMG (SEMG) signals were recorded bilaterally from lumbar erector spinae muscles at levels L4, L3, L2 and L1. Relative changes of electrical activity (RMS%) and mean frequency (MF%) at the end of the test compared to baseline values were calculated. Furthermore, the isometric maximum voluntary capacity (MVC) of trunk extension force was measured. Within groups differences of SEMG parameters between the lumbar segments were verified using Friedman tests (post hoc tests by calculation of contrasts using the critical rank difference (CRD)), for between groups the Mann-Whitney U tests were applied separately for each segment.

**RESULTS:** All participants, except from five of the Elderly group (15%), were able to maintain 50% of their UBM for 10 minutes in a horizontal position. Friedman analyses revealed significant spatial differences of Young group RMS% on the left side ( $P=0.001$ ; mean ranks L4: 2.02, L3: 2.09, L2: 2.75, L1: 3.14; CRD at  $\alpha=5\%$  was 0.83 and 1.00 at  $\alpha=1\%$ ) and Elderly group MF% of both sides ( $P<0.02$ ; e.g. mean ranks of left side L4: 1.97, L3: 2.29, L2: 2.88, L1: 2.85; CRD at  $\alpha=5\%$  was 0.80). The only between group difference was detected at the L1 level: magnitudes of MF% differed between groups (e.g. left side, Young group: -8.6 (-4.1/-12.1), median (quartiles), Elderly group: -4.3 (-1.2/-8.9);  $P<0.03$ ). None of the results correlated significantly with the MVC values.

**CONCLUSIONS:** Independently from age, the electrophysiological assessment of fatiguing trunk extension tasks has to consider spatial differences. This has consequences for the judgment of such tasks. Age related normative fatigue data seem not necessary at lower lumbar areas, but are to be expected at more cranial regions. A direct correlation between trunk extension force and fatigue resistance of the lumbar back muscles was not found. Therefore, MVC trunk extension tests do not seem appropriate to assess lower back muscle sensitivity to fatigue.

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### PP-09-135

## LUMBAR DISC PROSTHESIS IN PHYSICALLY ACTIVE PATIENTS WITH LUMBALGIA: A MONOCENTRIC STUDY WITH 83 PATIENTS

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Surgical treatment by non-constrained disc prosthesis of chronic lumbalgia for disc insufficiency is an interesting alternative to the treatment by arthrodesis, particularly in physically active patients, eager to continue exercising their practice. In terms of efficacy on pain, both treatments have similar results; however, the treatment by prosthesis enables preserving the mobility of the operated spinal segment, and limiting the adjacent segments wear.

This monocentric study, with 83 patients who had non-constrained disc prosthesis surgery for lumbar disc degeneration between 2003 and 2008, aims to evaluate the impact of physical and sports activities on the postoperative evolution in terms of pain (VAS), quality of life and delay before resuming work.

The 83 patients with non-constrained disc prosthesis surgery were distributed into three groups, according to their level of physical and sports activity : intensive physical and sports activity ( $n = 18$ ), regular physical and sports activity ( $n = 22$ ), and settled way of life ( $n = 43$ ).

After a mean follow-up of 36 months, the results in terms of pain, quality of life and delay before resuming

work are all better in the group of subjects with intensive physical and sports activity compared to the group with settled way of life.

Moreover, at a 36 months distance, no displacement of material occurred which could have compromised the functional prognosis of the prosthesis, in spite of intensive sports practice including in some cases the practice of competitive sports.

This study highlights the beneficial role of physical and sports activity, even intensive, on the effects of a surgical treatment by lumbar disc prosthesis. The practice of preoperative sports activity and its postoperative resumption appears actually as a factor of good prognosis. Intensive sports activity, even competitive, does not seem to be a contra-indication to disc prosthesis.

Other studies are needed to assess the impact of physical and sports activities on the wear and displacement of the disc prosthetic material.

PP-09-136

## THE HIGH PATELLA: AN UNDERDIAGNOSED CONDITION IN CEREBRAL PALSY ATHLETES

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**INTRODUCTION:** Paralympic games are becoming popular and have its elite athletes; more individuals with Cerebral Palsy (CP) are getting involved in sport. We highlight the risk of Knee Extensor Disruption (KED) in diplegic athletes with mild knee crouch, presenting examples in three young footballers 1.

**METHODS:** We have reported the diagnostic kinematics during gait analysis of KED in 10 CP patients 2, which was evident in the knee flexion -extension sagittal graph and was confirmed as patella Alta on plain X-rays. Using this kinematic pattern we identified three athletes suffering from KED and confirmed the condition with X-rays.

**RESULTS:** The most significant changes between pre and post rupture gait was found in the return to extension in midstance (P value <0.001) and shock absorption in the initial contact (<0.009). Underlying risks involved most importantly the degree of crouch > 30°, and higher BMI. In three athletes with mild crouch, two had fractures of the patella and one had an avulsion fracture of the tibial tubercle combined with an undisplaced fracture of the patella diagnosed in gait analysis and confirmed radiologically.

**CONCLUSION:** KED is relatively common in diplegic CP, and the risk increases in those who play sport with crouch knees, due to the possibility of increased crouch angle as a result of muscle fatigue while playing sport. Trainers and supervisors should have a high index of suspicion of KED when these children complain of pain around the knee or when gait deteriorates.

PP-09-137

**VALIDITY OF THE SIT-AND-REACH AS MEASURE OF HAMSTRING EXTENSIBILITY IN PILATES MATWORK**R. VAQUERO CRISTÓBAL<sup>1</sup>, F. ALACID<sup>2</sup>, F. ESPARZA ROS<sup>1</sup>, J. M. MUYOR<sup>3</sup>, P. A. LÓPEZ MIÑARRO<sup>4</sup><sup>1</sup>Chair of Sport Traumatology, Catholic University of San Antonio of Murcia, SPAIN<sup>2</sup>Department of Physical Education, Catholic University of San Antonio of Murcia, MURCIA, SPAIN<sup>3</sup>Department of Physical Education, University of Almer a, ALMERIA, SPAIN<sup>4</sup>Department of Physical Activity and Sports, University of Murcia, MURCIA, SPAIN

**OBJECTIVE:** To determine the concurrent validity of the score and pelvic position in the sit-and-reach test (SR) in women who practiced Pilates matwork.

**MATERIAL AND METHODS:** Forty adult women (mean age:  $42.37 \pm 8.84$  years) participated in this study. They participated in a Pilates matwork program of one hour, twice a week. The inclusion criteria were: 1) more than 1 year' Pilates matwork practice; 2) women between 25 and 55 years-old; 3) the instructors were certified in both Pilates matwork method and Physiotherapy and had almost one year of experience as instructor. Hamstring muscle extensibility was determined in both legs by passive straight leg raise test (PSLR). The ankle of the tested leg was restrained in plantar flexion. The score of hamstring extensibility was the maximum angle (degree) read from a digital inclinometer at the point of maximum hip flexion. Pelvic inclination was measured in the SR test when the participants reached maximal trunk bending with knees extended using a Spinal Mouse® (Idiag, Fehrltdorf, Switzerland). The Spinal Mouse was guided along the midline of the spine (or slightly paravertebrally in particularly thin individuals with prominent processus spinosus) starting at the processus spinosus of C7 and finishing at the top of the anal crease (approximately S3). The position of the sacrum and the hips (difference between the sacral angle and the vertical) were recorded. A positive value reflected an anterior pelvic tilt while a negative value reflected a posterior pelvic tilt. The measurements were made in a randomized order. The temperature of the laboratory which the measurements were performed was standardized at 24°C. The hypothesis of normality was analysed via Kolmogorov-Smirnov test. A paired t test was used to compare PSLR values between both legs. The average between the right and left leg angles was used for subsequent validity analysis. Bivariate correlation analysis and multiple regressions were used to analyse the concurrent validity between PSLR and SR tests.

**RESULTS:** The means ( $\pm$  standard deviation) of right and left leg in the PSLR were  $90.82 \pm 18.38^\circ$  and  $91.18 \pm 18.07^\circ$ , respectively. No significant differences between legs were found. The mean ( $\pm$  standard deviation) values of score and pelvic tilt in the SR test were  $1.23 \pm 8.55$  cm and  $0.79 \pm 11.48^\circ$ , respectively. Significant correlations were found between the PSLR test the SR scores ( $r=0.81$ ;  $p<0.001$ ), the PSLR test and the pelvic tilt angle in the SR test ( $r=0.482$ ;  $p=0.002$ ); and the scores and the pelvic tilt in the SR test ( $r=0.51$ ;  $p=0.001$ ). Multiple regression analysis examining the association among tests showed that PSLR test had a high regression coefficient with the SR scores ( $PSLR=1.71 * SR \text{ score} + 88.82$ ;  $\beta=0.81$ ;  $t=8.33$ ;  $p<0.001$ ). Pelvic tilt in the SR test was excluded because it was not a significant variable from the model ( $p=0.39$ ). The variance explained a moderate association between these tests (R-squared value=0.65).

**CONCLUSION:** The SR score is a moderately valid measure to determine hamstring extensibility in women who practiced Pilates matwork. However, pelvic tilt when maximal trunk flexion is achieved in the sit-and-reach test is not a valid measure for determine hamstring muscle extensibility.

### PP-10-138

#### VISUAL PERFORMANCE AND EYE-HAND COORDINATION – A CLINICAL CASE

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**BACKGROUND:** The link between vision and proprioception is long known. Physical performance and accuracy can be linked to visual performance. The use of prismatic lens, improving eye coordination and responsiveness, can enhance visual performance. The purpose of this study was to determine the effect of prismatic lens on visual performance and eye-hand coordination.

**MATERIAL AND METHODS:** One selected patient was elected to this study. He was asked to use glasses with prismatic lens (55° and 125°) during a 6 weeks period. The subject was tested in the beginning and at the end. Tests with charts and with a touchscreen, Sanet Vision Integrator (SIV), were applied. The chart test was done with the Dinamic fixator test MK II. On the SIV two default tests/exercises were chosen: rotator 3 and verbal 1. For each test, the complete time was recorded and for the SIV tests the reaction time was also recorded. On the last evaluation test were done with and without prismatic glasses.

**RESULTS:** The evaluation after the use of prismatic glasses for 6 weeks, showed an improvement in all parameters studied. The Dinamic Fixator test MK II was completed (before/after without glasses/after with glasses) in 25,85/16,29/14,88. Improvements from 21 to 16 seconds on the rotator test time and from 65 to 52 seconds on the verbal test, were recorded.

**CONCLUSION:** The results of this clinical case suggest and improvement in visual performance and eye-hand coordination with the use of prismatic glasses. More studies, with larger samples and linked to sport performance, are need.

#### BIBLIOGRAPHY:

1. Quercia P et al, Dislexia de evolução e propriocepção, Minerva, Massamá 2004
2. Reininga IHF et al, Attentional and visual demands for sprint performance in non-fatigued and fatigued conditions: reliability of a repeated sprint test, BMC Musculoskeletal Disorders 2010, 11:84
3. Reed-Jones RJ et al, Vision and agility training in community dwelling older adults: Incorporating visual

### PP-10-139

#### INFLUENCE OF KINESIO TAPING ON MOTOR ABILITIES IN ELDERLY PEOPLE

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**INTRODUCTION:** The risk of falling in the elderly is a major problem of modern health care. As a result of falling in the elderly are frequent injuries of the musculo-skeletal system that can lead to lifetime limited mobility

in the elderly people. In addition, this problem is a big cost to the state and to the community. Therefore, a number of researches study prevention of risk of falling in the elderly. Kinesio taping is one of the methods which ergogenic properties are promoted by the selling companies, and might be a potential solution. The aim of this study was to investigate the influence of the Kinesio taping on the motor abilities of the elderly

**SUBJECTS AND METHODS:** This study included 32 male subjects ( $71.3 \pm 1.5$  years old). Kinesio tape was applied on the lower back in Y position, along the paravertebral musculature and on hip-gluteal region by an experienced therapist. All subjects were motorically tested before and after the administration of the Kinesio tape. For assessment of motor abilities next tests were used: flexibility – sit and reach test and trunk rotation test; balance – star excursion balance test (SEBT); strength – chair stand up test for 30 seconds and agility – 8 foot up and go test.

**RESULTS:** Results showed a statistically significant difference, before and after the administration of the Kinesio tape, in the tests of flexibility - sit and reach test ( $p = 0.039$ ), trunk rotation test ( $p = 0.037$ ) and in the test of balance – SEBT test ( $p = 0.028$ ). In tests of strength ( $p = 0.078$ ) and agility ( $p = 0.069$ ) no statistically significant difference were found.

**DISCUSSION:** The results of this study suggest a positive impact of the kinesio taping on balance and flexibility in the elderly. Positive impact on balance and flexibility might be important since these two motor abilities by previous researches correlate with the risk of falling. However further studies with a control group, which would eliminate the possibility of placebo effect are needed.

**PP-10-140**

## **TECHNOLOGY OF THE USING OF BIOLOGICAL FEEDBACK CONNECTION IN REHABILITATION OF CHILDREN WITH MOVEMENT DISORDERS**

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Physical therapists have already known the important role in the using of feedback signals for the forming of movement skills. Biological feedback connection is the return of the information about functioning of internal organs and systems to a person.

The goal of the research is to define efficiency of the using of biological feedback methods for rehabilitation of children with movement disorders.

Cerebral palsy is an organic injury of the cerebrum, which occurs in the period of the prenatal development, in the process of childbirth or in the period of infancy. It accompanies motor, speech and mental disorders.

The most common authors' methods of the rehabilitation of children with cerebral palsy, in which physical therapy is in the basis, are:

- a. neurodevelopment approach (Berta and Karel Bobath);
- b. method of reflex locomotions (Prof. Vojta);
- c. method of the conductive pedagogy (András Peto);
- d. method of dynamic proprioceptive correction (K. Semenova).

Physical education is the most important part of the total system of education, upbringing and therapy of children with cerebral palsy. Motor development of the child causes large complexity, especially for infants and preschool children.

For the successful rehabilitation of children with cerebral palsy it is necessary to use the integrated approach in the learning of motor actions, which is the balance between medical and pedagogical technologies.

Devices of biological feedback connection are successful combination of medical and pedagogical technologies. It significantly eases and improves the process of the using.

In the modern time the method of biological feedback connection with using of electromyography has become general accepted in Russian Federation.

Biological feedback connection by electromyography is the learning of the managing of the function by special devices – skin electrodes. Electrodes register biopotential of the controlled muscle and convert them into different feedback signals: light, sound or combined. The child is able to see how the muscle is working by watching cartoons or playing some computer games. The patient could also use the muscle as a joystick. Thus rehabilitation process transforms into a game. Both the patient and the specialist could assess a level of the muscle tone during the entire workout.

The research was carried out in terms of Ural Federal University development program with the financial support of young scientists.

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## EVALUATION DE LA DÉTENTE VERTICALE ET SA CORRÉLATION AVEC LES PARAMÈTRES ANTHROPOMÉTRIQUES DES JEUNES BASKETTEURS ALGÉRIENS

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### BODY

Le but de cette recherche est d'évaluer la détente verticale et sa corrélation avec quelques paramètres anthropométriques.

Cent vingt-trois jeunes basketteurs (57 filles et 66 garçons) des quatre sélections régionales ont participé à l'étude (moyenne d'âge 16 ans). Ils ont réalisé quatre tests de la détente verticale « le Squat jump (SJ), le Contremouvement Jump (CMJ), le Contremouvement Jump bras (CMJB) et le test de réactivité (Tr)» sur l'Ergotest. Les mesures anthropométriques nous ont permis de déterminer les paramètres suivants : le poids corporel, la taille, la longueur du membre inférieur et supérieur et le périmètre de la cuisse et de la jambe.

Il existe des corrélations négativement significatives entre la détente verticale et la longueur du membre supérieur, le poids corporel et le périmètre de la cuisse et de la jambe. De même, la détente verticale est significativement corrélée avec la taille.

**MOTS CLÉS:** Tests, basketball, détente verticale, paramètres anthropométriques

**PP-10-142****TIBIAL TUBEROSITY ABRUPTION FRACTURE IN AN ADOLESCENT FOOTBALL PLAYER. A CASE REPORT**

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**INTRODUCTION:** Tibial tuberosity abruption fractures are relatively uncommon sports injury among youngsters. It usually occurs when the quadriceps is violently contacted during knee extension. More common in adolescent boys and the presence of Osgood Schlatler's lesion seems to be predisposing factor.

**CASE REPORT:** A 16-year old boy presented sharp pain in his right knee after landing from a jump during a football game. The boy was unable to extend his knee actively and percussion revealed severe pain at the tibial tuberosity. Radiographic evaluation demonstrated at the lateral view an abruption of the tibial tubercle. The patellar tendon was fixed after thorough debridement from bone elements and drillings at the fixation area. Postoperative immobilization with a splint at 30° flexion was maintained for three weeks and non-weight bearing walking was recommended. After splint removal full flexion was progressively allowed and closed kinetic exercises between 0 and 60° were permitted for muscle strengthening. Sports activities were permitted after six months.

**DISCUSSION:** This kind of injury is rare but when the patient fails to extend the knee actively should be considered as a possible diagnosis. The fixation of the patellar tendon must be followed by proper rehabilitation plan. Return to sports must be done after a thorough clinical and radiographic examination.

**PP-10-143****EVALUATION AND TREATMENT OF LUMBAR SPINE INJURIES DURING SPORTS ACTIVITY**

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Aim of this retrospective study was to describe the management and the outcome of cases with lumbar spine injuries during sports activity admitted our hospital during a 10 year period (2001-2010). A retrospective analysis was performed in all of the case notes of consecutive cases of cervical spine injuries during sports activity. 131 individuals (90 men, 41 women, median age 39 years, range 16-62 years) presented to the outpatient department and 44 were admitted. The average length of stay was 10 days. The major parts of the injuries were caused by sports accidents. Accurate support for patients with lumbar spine injuries appears to be necessary during the hospital permanence.

## FREQUENCY OF INJURIES AND HEALTH STATUS OF FOOTBALL PLAYERS IN BOSNIA; CLASSIFICATION BY GENDER AND AGE

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**INTRODUCTION:** Football plays very important role in modern days and in our lives. It affects our health habits and reduces stress. Football has always been most represented and most popular sport among youngsters and the older population around the world. But is it really that healthy?

There for the aim of this study was to analyze health status of Football players in Bosnia and how it affects different genders and age groups.

**METHODS:** Research was conducted on Institute for Sport and Occupational Medicine in Banja Luka, Bosnia in time period of one year. Total number of 917 Professional Football players took part in this study. All players were members of the premier league teams. Both males and females athletes were examined through systematic examination and medical records check out and diagnosis were classified using ICD-10 (10th revision of the International Statistical Classification of Diseases and Related Health Problems) system.

**RESULTS:** In observed period total number of 917 athletes were examined, 875 (95,4%) males and 42 (4,6%) females and subdivided according to their ages. Total number of 281 (30,6%) were younger than 15 years of age. Interesting was that there were no major differences in diagnoses between generations. Only 35 (3,8%) total athletes were healthy. 570 (62,1%) were diagnosed with two or three diseases and 36 (4,7%) had even more than four diagnosis. Both sexes were equally diagnosed with injuries and illnesses of muscular tissue and of the digestive system as well as cardiovascular problems. Males had more frequent diagnosis of dental diseases, vision problems, birth deformities and injuries of musculature system. Females suffer more common from anemia and foot deformity. Obesity was diagnosed with 63 (6,8%) athletes, predominantly females.

**CONCLUSION:** This study has proven that Football is not as it seems. Its fun but doing it professionally carries a lot of health risk with it. Differences in diagnosis have proven that intensity of activity with males is bigger and due that injuries in particular areas are typically male as weaker female constitution has been proven through this exams.

### REFERENCES:

The World Health Organization (2010). International Statistical Classification of Diseases and Related Health Problems, 10th Revision.

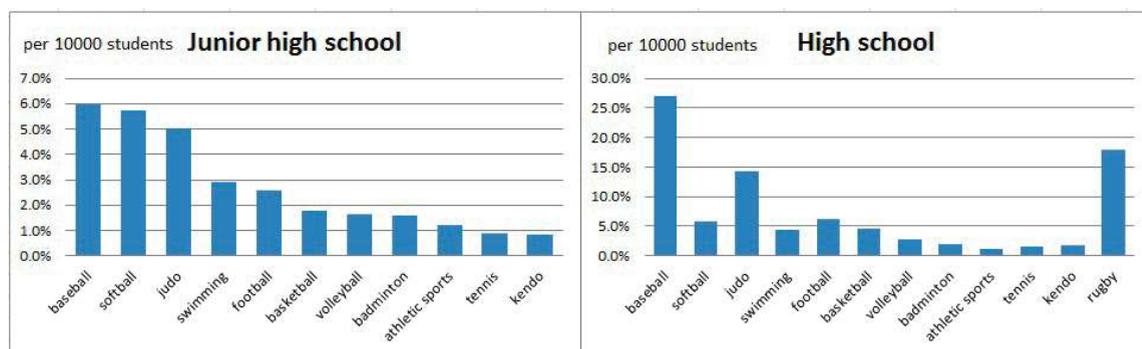
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**SPORT INJURIES AND DEATHS IN JAPANESE SCHOOL CLUB STUDENTS**T. KAWAME<sup>1</sup>, H. SUGIMORI<sup>1</sup>, S. TAKAHASHI<sup>2</sup>, S. TADAKUMA<sup>2</sup>, T. ODAJIMA<sup>3</sup>, T. TADANO<sup>2</sup>, T. TANBA<sup>2</sup><sup>1</sup>Daito Bunka University Graduate School of Sport and Health Science, Department of Preventive Medicine, Higashimatsuyama, JAPAN<sup>2</sup>Daito Bunka University School of Sport and Health Science, Faculty of Health Science, Higashimatsuyama, JAPAN<sup>3</sup>Japanese Red Cross Kanto-Koshinetsu Block Blood Center, Tokyo, JAPAN

**BACKGROUND:** Injuries are one of the leading cause of death among Japanese students and are responsible for a substantial proportion of hospitalizations and emergency department visits. Furthermore, a policy of making Japanese martial arts mandatory in schools is prompting growing safety concerns among teachers and parents. Therefore, to provide an evidence-based safety management and prevention in school club activity, we conducted a descriptive epidemiological study to clarify sports accidents in Japan.

**SUBJECTS AND METHODS:** We used the 'School Accidents Search Database' in the Japan Sports Council, collected in fiscal year from 2005 to 2011. During the period, 1,157 students from junior high-school (n=737) to high school (n=420) throughout Japan (participating rate 99.5%), were registered as sports accidents (injury and death) cases. We also used both the Nippon Junior High School Physical Culture Association database and the All Japan High School Athletic Federation database to estimate player number by type of sport. Statistical analysis was performed using SAS 9.1.3 software.

**RESULTS:** Following figures show estimated incidence rate of sport injury cases in junior high-school and high-school according to type of sport.



**CONCLUSION:** Incidence rate of sport accident cases differed widely according to type of sport. Ongoing further studies in sports accidents and school-based educational programs to prevent sport injury are eagerly awaited.

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**THE CLINICAL MENTAL DISORDER AS CONSEQUENCE OF OVER TRAINING SYNDROME**L. ZHU<sup>1</sup><sup>1</sup>Zheng Zhou University, Zheng Zhou, CHINA

Over training syndrome, which is characterized by fatigue and underperformance precipitated by stress of training (Budgett, 1990). Several important studies in 90's (Morgan, 1988; O'Connor, 1989; Raglin, 1991, 1993) have made a milestone for health issue on sport psychology development, due to method applied, most explores are still on the symptom level.

The aim of this study, is to explore the achievement stagnation caused by over training syndrome. An ethnically, and linguistically homogenous sample (n=7) of Chinese athletes suffering from over training syndrome and achievement stagnation identified by key informants was included in the study. The authors primarily apply an empirical qualitative inductive study to gain relevant data from athlete informant, evaluation applied content analysis (Mayring, 2000); the secondary step is using DSM IV TR to make a sport psychiatrically assessment after over training syndrome. The results indicated the symptoms of athlete are severe enough to constitute a clinical diagnosis; those athletes may suffer under clinical depression. Therefore we must not always indicate display tenacity under exhaustion could be a symbol of strong toughness in sport. More refer to Clinical Sport Psychology Perspective West and East Volume II: Clinical Psychology of over training syndrome.

PP-10-147

**WORLD COUNCIL FOR PSYCHOTHERAPY – BIOAT AND SPORT PSYCHOTHERAPY INTERVENTION**L. ZHU<sup>1</sup><sup>1</sup>Vienna medical University, Vienna, AUSTRIA

BIOAT is an efficient relaxation technique developed by Chinese clinical sport psychologist, psychotherapist, Professor Zhu Li Jing, The chair of WCP (World Council for Psychotherapy ) division on Exercise and Sports Psychotherapy, authorities by Austria patent Bureau in 2009. Vienna, Sigmund Freud home town and USA trained sport psychotherapist, introduced TCM (traditional Chinese medicine) basic concepts into Autogenic training's approach, developing BIOAT as a new method for uncovering the unconscious, a method for influencing one's autonomic nervous system. This patent language is using Latin and English, German medical terminology.

It is special designed for achievement athlete. The idea is come from the personal experiences as professional athlete and study and training in sport science, psychology and psychotherapy in China, Austria and USA, teaching and researching intensive with Olympic athlete in different discipline (water sport, land sport and aviation sport); as well as teaching mental training strategy for many years at Vienna University, is inspired by transcultural scientific thinking, reflected the power from 5000 years unbroken history medicine.

BIOAT can be widely utilized in sport for long term mental training and before the championship, offer athlete an excellence and reach the "peak performance state"; it is also efficient for industrial athlete.

**PP-10-148****APPLYING TRADITIONAL CHINESE MEDICINE AS SPORT PSYCHIATRIC INTERVENTION FOR ANOREXIA FOR COMPETITIVE ATHLETE**L. ZHU<sup>1</sup>, T. WENZEL<sup>2</sup><sup>1</sup>Beijing Normal University Hong Kong Baptist University UIC, Zhu Hai, CHINA<sup>2</sup>Medical University of Vienna, Vienna, AUSTRIA

The eating disorders often happen in competitive sport (Sundgot Borgen, 1994; Augestad et al., 1999; Tiggemann, 2001; Davis & Cowles, 1989; Byrne et al., 2002; Rhea, 1999; Lindeman, 1994). Wang et al. reported, The treatment of 488 cases with anorexia in children showed that the curative effect of the group using Chinese medicines based on the differentiation of symptoms and signs by (1) activating the Spleen, (2) invigorating and activating the spleen were significantly higher than the control using concentrated vitamin B complex(1991). Wang, S. J., et al. reported anorexia after respiratory tract infection, the successful rate of treatment is 92% (2009.11). Another papers Tongue Changes and Interfering Effects of TCM Activating Spleen in 60 Children with Anorexia (Wan, L.S., 2007); DU C. Y., Clinical Observation on Child Anorexia by the Treatment of Infantile Tuina Combined with Chinese Medicine(2008); Study of TCM Activating Spleen Treatment Effect and Relationship between Cell Apoptosis and Changes of Tongue Cells of Children with Anorexia (WAN L.,S., et al., 2005). A Clinical Report Manipulation study on spleen-stomach deficiency type of child anorexia treated by Tuina (Pan, Y.H.; Gui, C., H., 2008).

The therapeutic principle of activating the Spleen can improve appetite, help the body to absorb and utilize various nutrients which contain many kinds of essential trace elements. The researchers will present some studies from perspective TCM, it is an intervention option for Chinese, Asia athlete, might essential for athlete worldwide.

**PP-10-149****SPORT PSYCHIATRY, CLINICAL SPORT PSYCHOLOGY AND SPORT PSYCHOTHERAPY IN SPORT**T. WENZEL<sup>1</sup>, L. J. ZHU<sup>2</sup><sup>1</sup>Vienna medical University, Vienna, AUSTRIA<sup>2</sup>Zheng Zhou University, Zheng Zhou, CHINA

Recent research (Murphy, 1988; Raglin, 1993; Heil, J.,1993; Baron, 2007, Zhu, LJ, 2005, 2011a, 2011b) reported the elite Olympic athlete, professional athletes suffer under clinical mental traumata. Despite public interest for athletic achievements, the cognitive, emotional strains of athlete are more investigated and recognized. Even though the widespread assumption that only mentally strong athletes are able to compete at the Olympic level and therefore mental disorders do not exist in professional sports.

With respect to depression, suicide, somatoform, impulse control disorder, eating disorder, substance and doping abuse etc. not only from psychological perspective, but also from sport science such as overtraining syndrome, sport injury, training world champion syndrome etc.. We attempt to demonstrate the etiology, diagnostics, and treatment from sports psychiatry and psychotherapy. Scientifically, sport psychiatry, clinical sport psychology and psychotherapy can make investigation, treatment, recreation and prevention of sports-specific mental disorders. Mental disorders can be treated and the athletic achievement can be sustained. With the support from World Psychiatry Association and World Council for Psychotherapy, scientific research, further education, prevention, and treatment for mental disorders in professional sports will be improved.

PP-10-150

**SUICIDE CASE STUDY OF ASIAN ATHLETES**L. ZHU<sup>1</sup>, D. BARON<sup>2</sup><sup>1</sup>Zheng Zhou University, Zheng Zhou, CHINA<sup>2</sup>University of South California, California, USA

Post match blues appears after the Olympic Games. Repeated by researcher Henderson, Surprisingly, suicide experts are finding that more and more suicide victims tend to be high achievers in school and sport as well as seemingly well balanced individuals. Media reports of recent suicides of Olympic level athletes in Canada, USA and Australia suggest that athletes are a group who are being overlooked as potential suicide victims (Henderson, 1999).

Some studies might lead to the assumption that suicide attempts are always happening in Western countries athletes due to cultural factors, but the researcher has identified similar reports on Asian Athletes.

A Japanese athlete committed suicide (hara-kiri/seppuku); A South Korean former baseball star was found dead hours after police named him as a suspect for the murder of a woman and her three daughters; Probe into the death of 19-year-old athlete identified as A. Kumar, had committed suicide by jumping before a moving train in India; and China's Diving Queen, collected medication for her suicide plan in Barcelona, if she couldn't reach her gold medal; she would take all the medication and jump from the highest place in Barcelona.

The authors link depression but also underline the importance of a careful diagnostic approach, the consideration for the crises intervention in sport and call attention on the mental health of elite competitive athlete.

PP-10-151

**WORLD PSYCHIATRIC ASSOCIATION – A SCREENING SCALE FOR DEPRESSION IN ATHLETES**D. BARON<sup>1</sup><sup>1</sup>University of South California, California, USA

The chair of the WPA Section on Exercise and Sports Psychiatry, Professor David Baron, has recently copyrighted a screening scale for depression in athletes (Baron Depression Scale for Athletes; BDSA). The Section is currently translating it for global use. It is the first of to be used and tested on an international scale.

The BDSA is the culmination of having been an athlete, coach, sports medicine doctor and sports psychiatrist. The idea to develop a depression screener for athletes began in 1979, while working with the Special Olympics and taking care of high school athletes. During the 1984 Olympic Games, while working in the Olympic Village and with the aquatic sports athletes, his original observations were confirmed while working with a number of athletes who later were diagnosed with clinical depression. Over the past 25 years he has been work as a Doping Control officer and sports psychiatrist at virtually every level of competition. They have discussed another depression screener utilizing an athlete observing a video of a poor performance. It was time I spent working with Prof. Aaron Beck that inspired me to develop and

copyright the BDSA (Baron). The items are in many ways a sports version of the Beck Depression Inventory. In order to be clinically useful, he has been able to trim the final version down to 10 items. It is currently being validated by a collaborative effort of members of the WPA Section on Exercise and Sports Psychiatry. Although copyrighted in the US, there is no charge to use the scale. He only request feedback be made available to the author and WPA Sports Section for ongoing refinement.

**PP-10-152****EATING DISORDERS IN FEMALE BALLET DANCERS AND ADOLESCENTS FROM ORDINARY SCHOOL IN LATVIA**

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**OBJECTIVE:** The current study compared the prevalence of disordered eating attitudes and behaviours among female adolescent ballet dancers and adolescents at one ordinary school in Latvia

**METHODS:** Female ballet students (n = 150; mean age = 13.7 +/- 1.3 years) from the national academy and female adolescents from an ordinary primary school (n=99 mean age 14,1 +/- 0.86 years) completed the Eating Disorder Examination-Questionnaire (EDE-Q) [1]. The subscale scores reflecting the severity of eating disorder psychopathology are: Restraint, Eating Concern, Shape Concern, and Weight concern. We used norms from German normal population [2].

**RESULTS:** There were no statistically differences between mean EDE-Q scores between adolescent ballet dances and ordinary school girls at age 13 and 17, except shape concern which was scored higher among ordinary school students (mean 0.99 +/- 0.99 for ballet dancers and 2.19 +/- 1.66 for ordinary school adolescents) p<0.000). The proportions of clinically significant scores were as follows: Restraint 2.0 % for ordinary school adolescents and 2.0% for ballet school; Eating Concern 3.1% and 2.0% accordingly; Shape Concern 18,3% and 2.0% accordingly; Weight concern 14.1% and 14.6% accordingly. The prevalence of clinically significant eating disorder (Global score) was 2.0% for ordinary school female adolescents and 2.7% for female ballet dancers.

**CONCLUSIONS:** Clinically significant eating disorders were found at the same level among adolescents and ballet dancers who exhibit high levels of perfectionism. Highlighting overweight risks in the general population may lead to an increased risk for eating disorders. Further research is warranted on eating disturbances in adolescents.

**LITERATURE:**

- 1 Fairburn CG, Beglin SJ. Assessment of eating disorders: interview or self-report questionnaire? *Int J Eat Disord.* 1994 Dec;16(4):363-70.
- 2 Hilbert A, de Zwaan M, Braehler E. How frequent are eating disturbances in the population? Norms of the eating disorder examination-questionnaire. *PLoS One.* 2012; 7(1): e29125.

## COMPARISON OF PSYCHOPHYSICAL WORKLOADS IN YOUNG FOOTBALL GOALKEEPERS WITH FIELDS PLAYERS ON OTHER POSITIONS, BASED ON THE QFES (QUESTIONNAIRE DE FATIGUE DE L'ENFANT SPORTIF) QUESTIONNAIRE OF FATIGUE

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<sup>2</sup>The Football Academy of FC Legia Warszawa, Warsaw, POLAND

**BACKGROUND:** Presented dissertation is a continuation of author's previous works about detection of a state of fatigue leading to overtraining in young football goalkeepers. Previous results showed, that probability of fatigue in goalkeepers is similar to the field players (based on the QFES questionnaire). This study is to profound the knowledge and check the level of fatigue in each group of players separately as it is possible that there are significant differences between each position.

**PURPOSE:** Check the level of fatigue in young goalkeepers, comparing them with each group of players playing on different positions, using a standardized QFES questionnaire of fatigue.

**MATERIAL AND METHODS:** 40 young football players (10 goalkeepers, 10 defenders, 16 midfielders and 4 strikers), from four organized by the year of birth, teams of The Football Academy of FC Legia Warszawa [year of birth: 1996 - n=9 (5 goalkeepers), 1997 - n=9 (3 goalkeepers), 1998 - n=10 (1 goalkeeper), 1999 - n=12 (1 goalkeeper)] were examined using a standardized QFES questionnaire of fatigue. All players were age from 13 to 16. The data was collected in August 2012, before the start of the 2012/2013 football season.

**RESULTS:** Average values for the state of fatigue of all players were very similar and not very high. The results, in both goalkeepers and field players showed that the workloads on the trainings were not too high. According to the QFES, noticeable state of fatigue occurs when a player gets more than 45 points and the examined players got less. However the results of goalkeepers were higher than other positions of football players. The second most tired group were defenders, than midfielders and least tired were strikers. What's more, 15% of players exceeded the level of fatigue and 5% were on the border of the state (2 goalkeepers were among them).

**CONCLUSION:** It was confirmed that young football players (both goalkeepers and field players) are not very prone to the occurrence of chronic fatigue. But the fact is that the more a player is on a defending position, the more tired he is, what can be caused by the stress connected with a responsibility for not losing a goal. Next research will be made to check if there is a correlation between the level of fatigue in each group of players and number of injuries that occurs to them.

## POSTER SESSION PP11 – SPORTS TRAUMATOLOGY-1

**PP-11-154**

### **GYMNASTIQUE FRANÇAISE. «MAIN COURANTE» DU SUIVI TRAUMATOLOGIQUE 2013 DES GYMNASTES DE HAUT NIVEAU**

M. ROZENBLAT<sup>1</sup>

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La gouvernance de la Fédération Française de Gymnastique a changé en 2013.

La pluridisciplinarité de la gymnastique impose un suivi médical spécialisé propre à chaque secteur. La mutualisation avec échanges des données était une évidence pour un meilleur suivi traumatologique.

La nouvelle commission médicale nationale nouvellement composée s'est donnée cet outil pour ses 350 gymnastes de haut niveau : la « main courante ».

Pour chaque gymnaste en pôle France ou Espoir, quelque soit la spécificité de son activité, un suivi au quotidien est formalisé.

Ainsi, dans le respect du secret médical partagé, des professionnels de santé médecins et kinésithérapeutes échangeant au jour le jour avec des professionnels du sport sur l'état de santé de chaque gymnaste.

La « bobologie » est traitée au jour le jour.

En cas de pathologie de plus de 48h00, une alerte informatique est lancée.

Chaque professionnel peut alors intervenir en fonction de ses responsabilités et de ses compétences. L'information, la communication, les échanges et l'évaluation de l'état de forme du gymnaste circulent à la vitesse d'Internet sous réseau sécurisé.

La prise en charge médicale, paramédicale et sportive s'en trouve renforcée avec une démarche collective cohérente et harmonieuse dans l'intérêt du gymnaste et de sa santé.

**PP-11-154 – ENGLISH VERSION**

### **GYMNASTIQUE FRANÇAISE. «MAIN COURANTE» DU SUIVI TRAUMATOLOGIQUE 2013 DES GYMNASTES DE HAUT NIVEAU**

M. ROZENBLAT<sup>1</sup>

<sup>1</sup>*Centre Coralys, OZOIR, FRANCE*

The governance of the French Gymnastics Federation has changed in 2013.

The multidisciplinary gymnastics requires specialized medical attention for each sector. Pooling with data exchange was obvious trauma to better monitoring.

The new national medical board has given new composition tool for its 350 elite gymnasts: the 'handrail'.

Each gymnast pole France or Hope, whatever its specific activity, daily monitoring is formalized.

Thus, in respect of the shared medical confidentiality, professional health doctors and physiotherapists exchange overnight with professional sport on the health of each gymnast.

The 'minor cuts and bruises' is treated daily.

If pathology over 48h00, a computer alert is triggered.

Each professional can intervene in accordance with its responsibilities and skills. Information, communication, trade and evaluation of the fitness of the gymnast circulating the internet speed in the secure network.

The medical care, paramedical and sports is enhanced with a coherent and consistent approach to the collective interest of the gymnast and his health.

PP-11-155

## EPIDEMIOLOGIC DATA ON INJURY RATE DURING OFFICIAL MATCHES IN WOMEN BOXING IN ITALY

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**AIM OF THE STUDY:** Amateur and professional female boxing has been practicing in Italy since 2001. Its effective impact on boxers' physical integrity and health it is still discussed, also in relationship with what happens in male boxing. Aim of this study is to get more information about and to verify the prevalence of health problems and injury rate in female boxers related to official competitions.

**MATERIALS AND METHODS:** In Italy for each woman boxer, it is mandatory to undergo a pre-match medical examination to achieve fighting eligibility, and a post-match clinical reevaluation, to ascertain the eventual presence of injuries. We analyzed the medical reports concerning pre and post-match exam of all the women boxing events, amateur and professional, that took place in Italy in 2008-2012, for a total number of 3462 reports concerning 1731 matches. All the injuries and clinical issues detected have been analyzed and cataloged. We also took note of the verdicts of the matches, also to find possible associations with injuries. A comparison between amateur and professional matches was conducted by means of chi-square test, with any difference considered significant for  $p < 0.05$ .

**RESULTS:** At the pre-match medical examination there were found health issues in just 5 cases out of 1674 (0.06%) among amateur boxers, and no cases were found for professionals. Three of these 5 were considered unfit to box (back pain in one, colitis in one and flu-like symptoms in another). At the post-match reevaluation, among the amateurs, just 45 out of 1679 boxers (2.68%) showed alterations worthy of note (annual incidence 0.54%). Among these reports we found 14 cases of anterior epistaxis, 12 cases of hematomas or facial bleedings different from epistaxis, 12 cases of hand traumas and 4 concerning other body districts (shoulder, knee, wrist). Just in 2 cases out of 52 (3.85%) professional female boxers showed health problems at post-match examination (annual incidence 0.77%). No hospitalization occurred during or following the competitions. No significant differences in prevalence and injury rates between amateurs and professionals were observed.

The verdict found more frequently in female athletes with health problems was, as expected, the loss by referee stop contest-injury (RSCI, 27 cases). Less frequent verdicts in amateurs were loss by points (14 cases), victory by points (8 cases), referee stop contest (RSC, one case) and no contest (one case). For professionals we found 1 technical knockout and 1 draw.

**CONCLUSIONS:** Our statistics essentially confirm that female boxing can be considered as a safe sport activity, with a low rate of injuries, very similar to what we've already reported in previous studies. These rate are sometimes lower than what observed in other, even no-combat sports. We did not find any relevant differences between amateur and professional competitions.

PP-11-156

**COL5A1 RS12722 AND MUSCULOTENDINOUS INJURIES IN PROFESSIONAL SOCCER PLAYERS**M. SCORCU<sup>1</sup>, F. PIRAS<sup>1</sup>, P. CUGIA<sup>1</sup>, L. CORRIAS<sup>2</sup>, V. BACHIS<sup>2</sup>, C. M. CALÓ<sup>2</sup>, M. MASSIDDA<sup>2</sup><sup>1</sup>FMSI CR Sardegna and Cagliari Calcio Spa, Cagliari, ITALY<sup>2</sup>Department of Life and Environmental Sciences, University of Cagliari, Cagliari, ITALY

**AIM OF THE STUDY:** Muscle injuries constitute a large percentage of all injuries in football. An altered muscle flexibility may be associated with musculotendinous injuries. A variant within COL5A1 gene (rs12722 C/T), which encodes a type V collagen subunit, is associated with injury and performance phenotypes (Mokone et al. 2006; Posthumus et al. 2009, 2011).

The aim of this study was to investigate whether COL5A1 rs12722 polymorphism is associated with musculotendinous injuries in elite soccer players.

**MATERIALS AND METHODS:** Fifty-four male professional soccer players were recruited from a team participating at the Official Italian Professional Championship during four seasons (2009-2013). The cohort was genotyped for the COL5A1 rs12722 single nucleotide polymorphism (SNP), and musculotendinous injuries data were collected during the four seasons. Injuries were categorized under 5 degrees of severity based on the number of days' absence, while musculotendinous injuries incidence was calculated per 1,000 hours of exposure to training and matches.

**RESULTS:** No significant differences were found among genotypes for incidence of musculotendinous injuries ( $P=0.683$ ). Participants with TT genotype ( $3.71 \pm 0.5$ ,  $n=4$ ) showed a not significant trend ( $P=0.193$ ) versus high severity of injuries than individuals with a TC ( $2.98 \pm 0.8$ ,  $n=10$ ) or CC ( $2.75 \pm 0.95$ ,  $n=4$ ) genotypes. The COL5A1 rs12722 accounted for 44% of severity of injuries ( $P=0.002$ ).

**CONCLUSIONS:** The results could suggest that the presence of T allele, that was previous associated with greater mRNA stability, could influence severity of musculotendinous predisposition due to the increased mRNA levels and alfa1(V) chain production.

Our result find an explanation in a recent paper by Collins and Posthumus (2011), that suggested that there is an increased type V collagen production among individuals with a COL5A1 rs12722 TT genotype, resulting in structural and architectural variations within collagen fibril, that results in altered mechanical properties of musculoskeletal soft tissues, which in turn is associated with increased risk of specific injuries. It has also been reported that an increased mean collagen fibril diameter will give greater ultimate tensile strength, whereas smaller fibrils will inhibit creep.

In conclusion, although we did not find any influences of COL5A1 rs12722 on incidence of muscle injuries, the fact that the T allele contributed significantly to the severity of muscle injuries variance suggests that this polymorphism could influence the timing of the skeletal muscle regeneration following injury in top-level soccer players.

**REFERENCES**

1. Posthumus M, September AV, O'Cuinneagain D, van der Merwe W, Schwellnus MP, Collins M. (2009). Am J Sports Med 37:2234-2240.
2. Posthumus M, Schwellnus MP, Collins M. 2011. Med. Sci. Sports Exerc 43:584-589.
3. Collins M, Posthumus M. (2011). Exerc Sport Sci Rev 39:191-198.

PP-11-157

## THE EFFECT OF TAPING VERSUS BRACING ON PATIENT OUTCOME IN ANKLE SPRAINS

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**AIM:** Functional treatment is a widely used and generally accepted treatment for ankle sprain. Comparing the different functional treatment options could not make definitive conclusions regarding the effectiveness.

**METHODOLOGY:** Patients with acute ankle sprain received rest, ice, compression and elevation with an compressive bandage at the emergency department. After 5-7 days, 150 patients with grade II and III sprains were randomized into two groups: one group was treated with tape and the other with ankle brace, both for 4 weeks. Post-injury physical and proprioceptive training was standardized. As primary outcome parameter patient satisfaction and skin complications were evaluated using a predefined questionnaire and numeric rating scale. As secondary outcome parameter the ankle joint function was assessed using the Karlsson scoring scale and range of motion.

**RESULTS:** Patient-reported comfort and satisfaction during treatment with brace was significantly increased. The rate of skin complication in this group was significantly lower compared to the tape group (16.4% versus 51.9%,  $P < 0.0001$ ). Functional outcome of the ankle joint was similar between the two treatment groups, as well as reported pain.

**CONCLUSION:** Treatment of acute ankle sprain with brace leads to significantly higher patient satisfaction, both with similar good outcome.

PP-11-159

## THE IMMEDIATE EFFECT OF STATIC MUSCLE STRETCHING ON KNEE JOINT REPOSITIONING ERROR

S. SHAHRJERDI<sup>1</sup><sup>1</sup>*Department of Physiotherapy, Shahid Beheshti University, Tehran, IRAN*

**BACKGROUND:** Despite the muscle stretching plays an important role in popular and professional sports, therapeutic exercises and rehabilitation of musculoskeletal disorders, but few studies have examined the effect of muscle stretching on joint proprioception and they show conflicting results. The present study aimed to investigate the immediate effects of static muscle stretching in agonist and antagonist muscles around knee on knee joint repositioning error.

**OBJECTIVES:** Our objective was evaluating the effect of quadriceps and hamstring stretching on knee joint position sense in -15, -30 and -60 extension angles.

**METHODS:** This quasi-experimental study with cross over design was conducted on 37 young healthy subjects in age range between 18-25 years. The subjects were randomly assigned to 4 conditions entitled Quadriceps stretching, hamstring stretching, both quadriceps and hamstring stretching and control condition. All subjects influenced by these 4 conditions in different days. The evaluation of repositioning error was done in 3 angles -15, -30 and -60 knee extension with digital photography, non-reflective markers and analysis by AutoCAD software after each condition.

**RESULTS:** The knee extension repositioning error was significantly increased in hamstring stretching and both hamstring and quadriceps stretching condition ( $p < 0.05$ ). The other comparisons don't show significant differences. Also knee joint repositioning error was minimum in -15 knee extension ( $p < 0.001$ ).

**CONCLUSION:** It seems that static stretching of antagonist muscle (hamstring) increases knee extension repositioning error. But stretching of agonist muscle (quadriceps) doesn't change knee joint repositioning error. This result can be due to reduction muscle spindle activity and decrease muscle stiffness in hamstring stretching as antagonist in extension movement. Also minimum knee joint repositioning error in end range is due to increase joint receptors activity around knee in end range of movement. So in stretching programs for athletes and rehabilitation patients we should carefully consider this deterioration in joint position sense and proprioception.

### PP-11-160

#### POSTURAL CONTROL AND INJURY IN MALE SOCCER PLAYERS 10-18 YEARS OF AGE

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**OBJECTIVE:** The purpose of this study was to investigate the relationship between postural stability and injury history in different age groups of male soccer players.

**METHODS:** 202 male soccer players from a Turkish Super League soccer club participated in the study. Their ages ranged from 10 to 18 years. Postural control and body weight distribution were measured eyes open with Posture Scale Analyzer force plate. Postural stability was evaluated using center of foot pressure (COP) parameters with anteroposterior and mediolateral displacements, sway area, and sway rate. Age effects were examined by arranging two age groups; 10-13 years and 14-18 years.

**RESULTS:** In non-injury group; 10-13 years showed better postural stability in all COP values in comparison to 14-18 years ( $p < 0.01$ ). In 10-13 years, non-injury group had better mediolateral stability, sway area, and sway rate values in comparison to injury group ( $p < 0.05$ ). On the contrary, in 14-18 years, injury group had postural stability scores better than non-injury group which were not statistically significant. Injury incidence was higher in 14-18 years in comparison to 10-13 years ( $p < 0.05$ ).

**CONCLUSIONS:** In soccer, postural control and postural stability can be affected by age differences in growth and injury history. However, higher sports experience level may alter post-injury postural control outcomes positively.

PP-11-161

**ANALYSIS OF INJURIES OCCURRING DURING COMPETITIONS OF JUDO IN FRANCE OVER A SURVEY OF 20 YEARS**F. DOR<sup>1</sup>, A. FREY<sup>2,3</sup>, L-A. MARQUET<sup>1</sup>, A. HAIDA<sup>1</sup>, J-F. TOUSSAINT<sup>1,4</sup><sup>1</sup>IRMES, PARIS, FRANCE<sup>2</sup>INSEP/Service Medical, PARIS, FRANCE<sup>3</sup>FFJDA, PARIS, FRANCE<sup>4</sup>Universite PARIS-DESCARTES, PARIS, FRANCE

Very numerous competitions of judo are organized on the French territory. Competitors are of any ages and any levels. Prevention of the competitors when they injure themselves is an important concern of the federation. The implementation of surveillance for 20 years of all the competitions on the French ground, whatever is their level, allowed to establish at the end of 10 years a first outline of the medical activity and the most frequent injuries. The present study has for object to assess the evolutions over 20 years of follow-up of the number of injuries, their nature and their gravity. The evolution of the indicators of the medical activity that are the care, the calls on tatamis and stops during the fight, seems in decrease during the last 10 years. They are more raised to the departmental level, the other levels being equivalent. The most frequent injuries are sprains, followed by dislocations and fractures in equivalent number. The only sprains represent 80 % of injuries; the knee is the most affected among which 70 % are considered as grave, followed by acromio-claviculaires and by rachis. The national level presents the highest incidences. The most affected category concerns the juniors with a maximum incidence of 16,63 for 1000 competitors at the national level for sprains. The quality of the follow-up of the competitions remains very good for all the levels of competition, excepted that departmental. The analysis of the evolution over 20 years highlights the importance of the follow-up for the national level.

PP-11-162

**EPIDEMIOLOGY OF INJURIES IN TENNIS DURING THE ATP AND WTA COMPETITIONS: INCIDENCES AND RISK FACTORS**F. DOR<sup>1</sup>, M. GUILLAUME<sup>1</sup>, K. KRYGER<sup>1</sup>, A. MARC<sup>1</sup>, G. BERTHELOT<sup>1</sup>, A. CRISTOFARI<sup>1</sup>, A. GIRES<sup>2</sup>, B. MONTALVAN<sup>2</sup>, J-F. TOUSSAINT<sup>1,3</sup><sup>1</sup>IRMES, PARIS, FRANCE<sup>2</sup>FF TENNIS, PARIS, FRANCE<sup>3</sup>UNIVERSITE PARIS-DESCARTES, PARIS, FRANCE

Literature on the question of the injuries of tennis players is not numerous. Furthermore it not concerns enough the professionals. Recently medicals agree on a consensus for their classification. The present research is a retrospective epidemiological study which aims at completing this descriptive epidemiology for the professional feminine players, by spreading it to other indicators such as withdrawals during the competition, but also to identify risk factors completing those already reported such as game surface and age, by studying the influence of the biometric characteristics of the players. The period of the study extends from 1968 till 2012 with a focus on 2002 - 2012. All the major tournaments of both circuits ATP and WTA are retained with the exception of the Davis Cup, Masters and Olympics from which the modes of participation are different. The first results show a substantial evolution of a factor 3 of the incidence of the withdrawals of the players during the major tournaments of the professional circuits during studied period.

There are as many withdrawals than retirements for men while Lucky losers were clearly superior to retirements in the 80s for the women before an inversion in the recent years. Grand slam tournaments present an increase identical to those of the other tournaments for the men; on the other hand, their incidence is much lower for the women. They are more raised on hard and clay surface than on the grass and carpet. Since 2002, reasons of these withdrawals are listed;  $\frac{3}{4}$  are related to injuries. The research of risk factors such as biometric characteristics is important for implementing adapted modalities of physical preparation and prevention.

**PP-11-163****IMPACT OF ANTERIOR CRUCIATE LIGAMENT (ACL) RUPTURE ON THE EVOLUTION OF THE FRENCH ALPINE SKIERS' PERFORMANCE**

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**BACKGROUND:** The anterior cruciate ligament (ACL) injury has become predominant in elite skiers with an incidence of 8.5 per 100 skier-seasons. The management of this injury usually requires surgery and leads to a healing period for more than six months before returning to competition. It is important to complete the epidemiological description of such an injury by studying its impact on the evolution of performance and the career length of high level skiers with preventive and care management perspectives.

**OBJECTIVE:** We developed a survey analyzing the evolution of all skiers from the French team that participated in international competitions from 1995 to 2013.

**METHODS:** The performance indicator is constructed from the International Ski Federation points (FIS points). The comparison is done pre- and post-injury using the FIS points. The evolution of the performance is modeled in three stages in function of age and sex. Based on the performance indicator, the evolution of performance is presented depending on age and sex in three stages based on the Moore model:  $[P(t) = a.expbt + c.expdt]$  with  $P$ =performance,  $t$ =time. First phase: fit the evolution of performance for athletes who have not undergone an injury. Second phase: fit the evolution of performance for athletes who had an ACL injury. Third phase: Comparing the evolution difference between injured and non-injured athletes.

**RESULTS:** The career of injured skiers is longer than the career of uninjured skiers (retirement at 32 years old for uninjured skiers and at 34 years old for injured skiers). The mean age of men uninjured Top10 is 23.5 +/- 5.2 years old for DH (DownHill) and SL (Slalom) and 24.0 years old for the GS (Giant Slalom) and SG (Super-G). The mean age of injured skiers is 23.1 +/- 4.1 years old in DH, 22.9 +/- 4.2 years old in SG, 22.5 +/- 4.2 in SL and 22.1 +/- 3.7 years old in GS respectively. In all disciplines the average of the best performance (minimum FIS points) is at 26.0 +/- 5.3 years old (FIS Points: DH min = 12.0 at 26.0 +/- 5.3 years; GS min = 8.7 at 26.0 +/- 5.3 years; SG min = 9.7 at 26.0 +/- 5.3 years; SL min = 7.0 at 26.0 +/- 5.3 years).

**CONCLUSION:** The impact of the ACL injury can be expressed as the difference between the projected model and the observed model between injured and non injured elite skiers, with significant difference in career parameters. The following analysis will offer more advanced elements in order to ameliorate the monitoring of athletes both in terms of prevention and post-injury management.

**RELIABILITY OF ASSESSING ACHILLES TENDON LENGTH**K. INTZIEGIANNI<sup>1</sup>, M. CASSEL<sup>1</sup>, F. MAYER<sup>1</sup><sup>1</sup>University Outpatient Clinic, Center of Sports Medicine, Department Sports and Health Sciences, University of Potsdam, Potsdam, GERMANY

**OBJECTIVE:** Measurements of Achilles tendon length (ATL) are clinically relevant in tendinopathies due to different pathologies. Despite several methods assessing ATL being reported (1-3), final technique and its reliability is still a matter of debate. Furthermore, clinical application requires easy, time saving and observer-independent methods. Therefore the aim of this study was to evaluate the inter-observer reliability of a clinically relevant method assessing Achilles tendon length.

**METHODS:** Ten healthy subjects participated in this study (3 males and 7 females,  $30 \pm 7$  yrs,  $1.74 \pm 0.1$  m,  $69 \pm 13$  kg). Subjects lay in a prone position with their ankles hanging over the examination table with the ankle flexed  $90^\circ$ . Distal Achilles tendon insertion and M. gastrocnemius myotendinous junction were detected sonographically. By use of fine-wires, placed between the skin and the transducer, the corresponding tendon structures were marked at the skin. The distance between the two markers was measured using a measuring tape and represented ATL. Both ankles were assessed by two observers, an experienced investigator (EI) and an inexperienced investigator (II). Data were analysed descriptively (mean  $\pm$  SD). Inter-observer reliability was calculated by Intraclass Correlation Coefficient (ICC, 2,1), Test-Retest Variability (TRV, %) and Bland-Altman analysis (Bias  $\pm$  Limits of Agreement [ $1.96 \times$ SD] (LoA)).

**RESULTS:** Achilles tendon length assessed by EI was  $22.1 \pm 2.0$  cm and  $22.3 \pm 2.1$  cm by II respectively. The inter-observer reliability revealed an ICC of 0.95, TRV of  $3.1 \pm 2.5$  % and Bias  $\pm$  LoA of  $0.2 \pm 1.7$  cm.

**CONCLUSION:** The high reliability observed in measuring ATL may be a result of a standardized and easily applicable protocol by the use of ultrasonography and fine-wire. Thus, for a comprehensive statement concerning the reliability of the method used, a day-to-day variability has to be evaluated.

**REFERENCES:**

1. Arya S, Kulig K. Tendinopathy alters mechanical and material properties of the Achilles tendon. *J Appl Physiol* 2010; 108(3):670-675.
2. Kongsgaard M, Aagaard P, Kjaer M, Magnusson SP. Structural Achilles tendon properties in athletes subjected to different exercise modes and in Achilles tendon rupture patients. *J Appl Physiol* 2005; 99(5):1965-1971.
3. Stosic J, Finni T. Gastrocnemius tendon length and strain are different when assessed using straight or curved tendon model. *Eur J Appl Physiol* 2011; 111(12):3151-3154.

**PP-11-165****EVALUATION AND TREATMENT OF CERVICAL SPINE INJURIES DURING SPORTS ACTIVITY**

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Aim of this retrospective study was to describe the management and the outcome of cases with cervical spine injuries during sports activity admitted our hospital during a 10 year period (2001-2010). A retrospective analysis was performed in all of the case notes of consecutive cases of cervical spine injuries during sports activity. 81 individuals (80 men, 11 women, median age 41 years, range 8-59 years) presented to the outpatient department and 24 were admitted. The average length of stay was 7 days. The major parts of the injuries were caused by sports accidents. Accurate support for patients with cervical spine injuries appears to be necessary during the hospital permanence.

**PP-11-166****THE EFFECTS ON POSTURAL CONTROL AND PROPRIOCEPTION AFTER THE REHABILITATION PROGRAMM FOR PATIENTS WHO HAVE HAD SURGICAL RECONSTRUCTION OF ACL RAPTURE**

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The rapture of the ACL also affects the mechanoreceptors of the joint creating a defect in its proprioception. The exercises that activate the rest of the receptors as well as the muscle spindle seem to have an effect in the function of the knee.

**OBJECTIVE:** The objective of this study is to ascertain whether after a ACL reconstruction the decreased proprioception returns to normal levels, in what time period does this occur and whether exercises for proprioception help in this.

**METHOD:** Twenty participants (7 female-13 male) were recruited, 16 to 45 years of age, without other musculoskeletal problems mainly in the lower limbs.

All participants were subjected to an evaluation of functionality of the knee and its functional ability. The tests they underwent were: 1) completion of a questionnaire which included the VAS scale for subjective perception of knee stability. 2) the dynamic balance on one leg, 3) the proprioception through subjective perception and understanding of the position of the joint. 4) assessment of the active and passive range of motion in the sagittal plane.

**RESULTS:** The result of comparing prices of speed between the eyes open and eyes closed were statistically significant ( $p = 0.013$ ). Statistically significant was the comparison of Sway of healthy limb with eyes open and eyes closed ( $p = 0.002$ ) as well as of the limb which underwent reconstruction ( $p = 0.000$ ). Statistically

significant correlation was found between VAS of stability as well as in Sway of healthy limb ( $p = 0.015$ ). Direct relationship was found between the time of surgery and kinesthesia ( $p = 0.097$ ).

**CONCLUSIONS:** Considering the methodological weaknesses that exist in the literature and in this study and the lack of negative results, we think physiotherapists should include exercises of proprioception in the rehabilitation programs after ACL reconstruction. This approach may increase neuromuscular control and functionality both short term and long term.

PP-11-167

## THE MYOFASCIAL TREATMENT IN THE DELAY OF CONSOLIDATION POST FRACTURE OF TIBIAL SPIROID

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The alteration of every normal repairing process of fracture signifies the delay of consolidation. The repairing osteogenesis of fracture evolves in three stages for months and for years, at the end to give a better structure to the existing bone that has undergone traumatic injury. The myofascia plays an essential role in the functioning of the body and also in the maintenance of its integrity. The anatomical study shows that as if there was never an interruption between the various tissues, but that at the end, everything is connected to realize the harmonious perfect functioning. The fascia have multifunctional roles like suspension, protection, holding, separation, absorption of the shock, cushioning of pressure, and hemodynamic role. The major fascia chains are the posterior superficial chain, the frontal superficial chain, the lateral chain, the spiral chain and the deep anterior chain. In our study we have taken into consideration a 26 years old patient who is diagnosed with the 'Delay of Consolidation' of spiroid fracture of 1/3 distal tibia diaphysis of the right. The patient is treated in a unhurting mode by immobilization of the plastered part (femur – podalic a knee flexion, for the first 30 days and finally, additional 30 days with knee caps). The patient later undergoes an instrumental medical therapy with shock waves, an instrumental physical therapy like magnetic therapy a stretching global activity (only global strains that inhibit every compensation that are really effective.) and a self accepted rehabilitation with a view to re-educate the patient about the re-acquisition gestures of the traumatized lower limb and the tonic – posture rebalance of the overall body. At the end of the rehabilitative treatment, the x-rays show an appreciable development of callus. Our studies have shown the evidence about how the treatment of myofascia, in concurrence with the conventional therapy that is used for the Delay of Consolidation, can help the process of consolidation of fractures itself. In fact, the myofascial treatment has guaranteed the patients a reparative osteogenesis of the fracture, enabling one to a better vascularisation of the periosteal masses, facilitating exchanges between the vascular system and the fundamental lymphatic substance - cellular tissues, contributing to the consolidation of the bones.

### BIBLIOGRAPHY

1. Garcia P, Pieruschka A, Klein M, Tami A, Histing T, Holstein JH, Scheuer C, Pohlemann T, Menger MD.: Temporal and spatial vascularization patterns of unions and nonunions: role of vascular endothelial growth factor and bone morphogenetic proteins. *J Bone Joint Surg Am.* 2012 Jan 4;94(1):49-58.
2. T.W. Myers: Meridiani Miofasciali. Tecniche Nuove
3. Serge Paoletti: Le fasce. Editore E.S.O.M.M. 2003
4. Ayeni OR, Busse JW, Bhandari M.:Using extracorporeal shock-wave therapy for healing long-bone nonunions. *Clin J Sport Med.* 2011 Jan;21(1):74-5.

5. Schnoke M, Midura RJ.: Pulsed electromagnetic fields rapidly modulate intracellular signaling events in osteoblastic cells: comparison to parathyroid hormone and insulin. *J Orthop Res.* 2007 Jul;25(7):933-40.
6. Souchard: *Lo stretching globale attivo.* Edizione Marrapese, Roma.

**PP-11-168****PREDICTIVE FACTORS OF KNEE SPRAIN ON ELITE WOMEN RUGBY PLAYERS.  
PART 1. EPIDEMIOLOGY**

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Due to the increase of knee sprains within high level women rugby players particularly Anterior Cruciate Ligament (ACL) needing surgery, the French Rugby Union carried out an epidemiologic study.

**MATERIALS:** During 2011 and 2012 seasons, this study was carried out on 49 players within the elite French championship and already selected in French national teams: XV women (senior and under 20) and Sevens.

**METHODS:** During training camps at the beginning of the season, players had medical examinations:

- a questionnaire about previous knee injuries,
- a height and weight measurement to calculate the Body Mass Index (BMI)
- a morpho-static-dynamic (MSD) examination of the lower part of the body
- an isocinetic knee quadriceps-to-hamstring ratio evaluation on Contrex<sup>o</sup> and Isocinetic ranking (Croisier's ratio mixte)

We studied first the epidemiological injuries resulting from the medical questionnaire.

**RESULTS:** Obtained data results as follows: average age of 23.8 +/- 3.8 years, average height of 1.68 +/- 0.08 meters, average weight of 73.14 +/- 11.65 kg and average BMI of 25.8 +/- 3.57. Twenty two (44.9%) play as forwards (number 1 to 8), twenty seven (55.1%) as backs (number 9 to 15). Injured group set up with 10 forwards (52.6%) and 9 backs (47.4%). Ten out of 22 forwards players (45.4%) and 9 out of 27 back players (33.3%) had knee sprain. Four out of 22 forwards players (18.2%) and 7 out of 27 back players (25.9%) had ACL sprain.

We found 19 knee sprains i.e 38.8% of the total breaking down is as follows: 1 player had Lateral Collateral Ligament (LCL) sprain (2% of the total players and 5% of injured players), 5 had Medial Collateral Ligament (MCL) sprain (12.2% of total players and 26.3% of injured players), 12 had Anterior Cruciate Ligament (ACL) sprain (24.5% of total players and 63.2% of injured players) and 2 had Posterior Cruciate Ligament (PCL) sprain (4.1% of the and 10% of injured). Average age for the knee sprain is 20.3 +/- 2.9 years.

**CONCLUSIONS:** In our study, 38.8% of all international women rugby players have a previous serious knee sprain, with is a high incidence. Fourteen cases had central pivot injuries (12 ACL and 2 PCL) i.e 27.5% of total players and 73.7% of injured group. Knee injured profile is a 20.3 years old woman but there is no significant difference between to the positions (52.6% forwards vs 47.4% backs), for ACL sprain is a 20.5 years women playing back (4 out of 12 cases = 33.3% for forwards vs 7 out of 12 cases = 58.3% for back). Due to the serious impact on the injured player (surgery and no competition for a long period) it would be useful necessary to find predictive factors in order to set up preventive actions. Because of the relatively young age of ACL injuries we need also to set up preventive actions starting from the age of 18 (their first international selection). This is even more important considering the limited number of women players in French international rugby.

PP-11-169

## AVULSION FRACTURE OF ANTERIOR INFERIOR ILIAC SPINE IN A 35 YEAR OLD RECREATIONAL SOCCER PLAYER: A CASE REPORT

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Iliac spine avulsion fractures are not uncommon cases especially in adolescents. They occur mostly from overuse of a muscle group or forced muscle stretching. Unlike avulsion fractures of the anterior superior iliac spine, the iliac crest and the pubic bone, fractures of the anterior inferior iliac spine (AIIS) are rarely encountered. It typically occurs due to eccentric contraction of the rectus femoris.

We report a case of an anteroinferior iliac spine avulsion fracture in a 35-year-old man who had represented with sudden left groin pain (acute dislocation-like) when he shoots for a free-kick, while playing soccer. After a period of time he went to a clinic, and a muscle ultrasonography (USG) was made to diagnose. Multiple inguinal lenf nodes were obtained in USG and the patient was told to rest by the physician. After two weeks rest, the patient continued to play in recreational soccer games despite his pain. One year after the first injury, he felt the same feeling about his left groin while playing soccer, but with a little less pain. He felt the pain when he was trying to change his direction while sprinting. Then he referred to our clinic and detailed physical and radiographic examinations revealed an avulsion fracture of the left AIIS.

Although, the iliac avulsion injuries seen most often in adolescents and children's apophysis, our patient is a 35 year old man. Beside this, the AIIS avulsions are more common in runners and sprinters, but in this case the patient is a recreational soccer player.

In conclusion, our case revealed that the physician must be cautious during the assessment of the skeletally mature patient, with complaint in his/her groin and keep in mind -age independent- the possibility of an avulsion fracture of pelvis.

PP-11-170

## ANALYSIS OF GÖTEBORG 2013 EUROPEAN ATHLETICS INDOOR CHAMPIONSHIPS INJURIES AND ILLNESSES SURVEILLANCE

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The objectives of this study were to continue the identification and analyses of the incidence and characteristics of newly incurred injuries and illnesses during athletics international Championships, and especially during Indoor Championships, in order to confirm previous results and to discuss injury risk factors and future prevention strategies.

**METHODS:** Using the methodology of injury and illness surveillance validated by the IOC, and implemented by the EA and IAAF during international athletics competitions, during the 2013 European Athletics Indoor Championships in Göteborg, incidence and characteristics of new injuries and illnesses

**Table 1** Athletes, exposure, injury and illness in different event groups

	Sprints	Hurdles	Middle and long distances	Jumps	Throws	Combined events	Total
<b>Population</b>							
Registered athletes	151	58	135	183	43	30	577 <sup>§</sup>
Competing athletes (excluding DNS)	137	52	128	176	40	30	563
Athletes participations	221	100	206	242	56	175	1000
<b>Injuries</b>							
Number of injuries	16	6	15	8	1	14	60
Training	1	0	1	0	0	0	2
Competition	15	6	14	8	1	14	58
Injuries per 1000 registered athletes	106.0	103.4	111.1	43.7	23.3	466.7	104.0
Injuries per 1000 competing athletes (excluding DNS)	116.8	115.4	117.2	45.5	25.0	466.7	106.6
Injuries per 1000 athlete participations	72.4	60.0	72.8	33.1	17.9	80.0	60.0
Injuries in competition per 1000 competing athletes (excluding DNS)	109.5	115.4	109.4	45.5	25.0	466.7	103.0
<b>Time-loss injuries</b>							
0 days	12	3	10	5	0	6	36
1-7 days	2	3	1	2	1	4	13
8-28 days	2	0	2	1	0	3	8
> 4 weeks	0	0	2	0	0	1	3
Time-loss injuries per 1000 registered athletes	26.5	51.7	37.0	16.4	23.3	266.7	41.6
Time-loss injuries per 1000 competing athletes (excluding DNS)	29.2	57.7	39.1	17.0	25.0	266.7	42.6
Time-loss injuries per 1000 athlete participations	18.1	30.0	24.3	12.4	17.9	45.7	24.0
<b>Illnesses</b>							
Number of illnesses	8	2	10	7	1	1	29
Illnesses per 1000 registered athletes	53.0	34.5	74.1	38.3	23.3	33.3	50.3
Illnesses per 1000 competing athletes (excluding DNS)	58.4	38.5	78.1	39.8	25.0	33.3	158.3
Illnesses per 1000 athlete participations	36.2	20.0	48.5	28.9	17.9	5.7	158.3
Number of time-loss illnesses	0	1	5	1	0	0	7

<sup>§</sup>Since some athletes competed in more than one discipline, this is not the sum of registered athletes in each different event groups but the total number of registered athletes.

were recorded prospectively by physicians and physiotherapists from national teams and local organising committee in 577 registered athletes.

**RESULTS/DISCUSSION:** Regarding the medical surveillance system, all countries with more than 11 registered athletes (n=29; 62% of 47 national teams) participated in this study covering 528 athletes (91.5% of 577 registered). A total of 116 injury and illness report forms were returned, representing a response rate of 100%! Only 0.9% (n=7) of data in the report forms were missing. That shows a constant improvement since the first studies.

Regarding the incidence and characteristics of newly incurred injuries, 60 injuries were reported, representing an incidence of 104 injuries per 1000 registered athletes, and 24 (40%) resulted in time-loss from sport. The injury incidence was lower than during IAAF World Championships, similar than during Helsinki 2012 Championships and very higher than during previous European Athletics Indoor Championships in Paris 2011. Characteristics of injuries were in agreement with previous studies: main injury diagnoses were hamstring strain, ankle sprain, but 35% of injuries were skin laceration due to fall. 70% of injuries affected the lower limb. Hamstring strain was the main diagnosis and 71% resulted in absence from sport. "Field of play conditions" was the predominant cause (31%), following by overuse (29%), and non-contact trauma 10%. Injury risk increased with age. Injury risk during finals was significantly higher than during qualifying rounds. The highest incidences of injuries were found in combined events and middle-distance events.

Regarding the incidence and characteristics of newly incurred illnesses, 29 illnesses were reported, signifying an incidence of 50 per 1000 registered athletes. The illness incidence was lower than during previous Athletics Championships surveillances. Upper respiratory tract infection was the most common reported diagnosis (28%), followed by gastro-enteritis/diarrhoea (24%). Illness risk factors remains unclear. **CONCLUSIONS:** The injury and illness surveillance system seems to have improved since the first athletics studies. During elite Athletics Championships, the age, finals and some disciplines seem to be injury risk factors. In this study, field of play conditions represented an important part of injury causes, this point should be focus for future championships. Illness risk factors remains unclear. Such as previous recommendations, preventive interventions should focus on overuse injuries, hamstring strains, and to decrease the risk of infectious diseases transmission we should focus on appropriate event scheduling, appropriate sports clothes on weather conditions and heat acclimatization.

PP-11-171

## INJURIES IN HIGH-LEVEL HEPTATHLON AND DECATHLON

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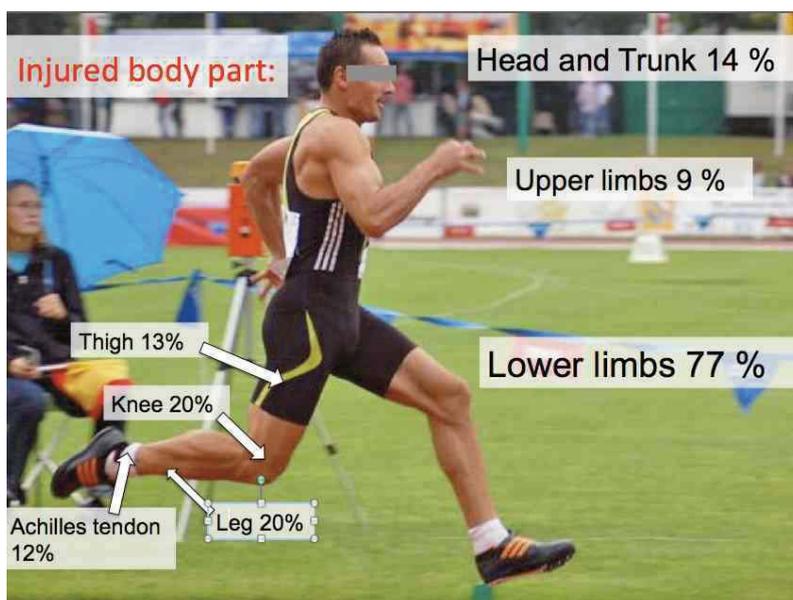
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**BACKGROUND:** Decathlon and heptathlon are track and field disciplines during which participants run, jump, and throw. The training and the competitions are highly demanding from both the physical and psychological standpoints because of the frequency and intensity of the events that could lead to important risk of injury.

**OBJECTIVE:** To prospectively determine the frequency, location and types of injuries suffered by the high-level decathletes and heptathletes.

**DESIGN:** Prospective cohort study.

**SETTING:** Athletes selected from the combined events French National team for heptathlon or decathlon competitions during the 1994 to 1998 seasons.



**PARTICIPANTS:** Sixty-nine international level athletes: 30 heptathletes ( $21 \pm 4$  yr,  $176 \pm 6$  cm,  $61 \pm 4$  kg) and 39 decathletes ( $22 \pm 6$  yr,  $186 \pm 6$  cm,  $80 \pm 8$  kg).

**MAIN OUTCOME MEASUREMENTS:** All injuries were recorded during the 1994 to 1998 seasons. For each injury data, the circumstances of onset (training or competition), the injured body part, the type and the cause of injury were collected.

**RESULTS:** Among the 69 athletes included in this study, 32 athletes presented a total of 86 injuries. The injured rate was 31.1 injuries per 100 athletes per season. Forty-three percent of the injuries occurred during competitions, 30% during training and 27% unknown. In approximately half of the cases, the injuries were caused by overuse (49%), and in the other half by non-contact trauma (43%). The majority of injuries were located on the lower extremity (77%), and 9% on the lower back. The injuries concerned tendons (41%) and muscles (23%). The most common diagnoses were knee tendinopathy (14%), followed by lower leg strain (13%), thigh strain (11%) and Achilles tendinopathy (11%).

**CONCLUSIONS:** Injuries are common in high-level decathletes and heptathletes. Specific preventive measures of the most common injuries (knee and Achilles tendinopathies, lower leg and thigh strains) should be introduced and their effectiveness evaluated by prospective surveillance.

PP-12-172

### ORTHOKINE THERAPY IN PERONEUS BREVIS SPLIT SYNDROME: A CASE REPORT

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The peroneal tendons are important stabilizers of the ankle joint. Pathology of the peroneal tendons is an infrequent cause of lateral ankle pain. Peroneus brevis split syndrome (PBSS) refers to the longitudinal tear of the peroneus brevis (PB) tendon at the retrofibular groove near the distal tip of lateral malleolus with frequent proximal and distal extension. Injury may occur because of repeated inversion injuries and ligament sprains.

Treatment of peroneus brevis tendon tear is initially conservative. Stretching, strengthening, and ankle coordination exercises are added as symptoms ease. In refractory cases and in patients with associated chronic ankle instability, surgical intervention may be performed.

The Orthokine therapy involves individual autologous proteins, derived from the patient's blood, and then applied as medication. It produces and extracts in up to 30 times higher concentrations of interleukin-1-receptor antagonist (IL-1Ra) which is antagonist of interleukin-1. Interleukin-1 plays an important role in the inflammatory process. Orthokine is most commonly used for the treatment of joint pain due to Osteoarthritis and back pain.

We report a case about a 31y old professional male soccer player who had serious lateral ankle pain. He was performing dynamic strength training that contains more than 200 times one leg and double leg high deep jumping at the soccer field. According to his history during training he sustained minimal inversion sprain of right ankle, and after training swelling and pain had occurred at lateral side of the ankle but he thought his new soccer boots was the cause of the swelling and the pain. He used ice to reduce the swelling and continued training with these complaints. But after 3 days he had to cease training because of serious pain. Then he was referred to us, after detailed physical and radiographic examination our diagnosis was peroneus brevis split syndrome without subluxation.

In our treatment we initially performed conservative therapy that contains non-steroid antiinflammatory drugs, electrophysical agents, manual therapy and strengthening. When this treatment failed, we held orthopedic consultation -any surgical treatment was not deemed necessary- and afterwards, we decided to perform Orthokine injection therapy. We injected totally four doses of Orthokine, two days apart between each injection.

3 weeks after initial injury and 1 week after orthokine injection therapy, the player felt totally pain free and participated in team training.

In our knowledge, there are no cases in the literature that used orthokine therapy for PBSS. This case revealed that orthokine therapy should be tried for PBSS that have not healed with conservative treatment, before planning surgical intervention.

**PP-12-173****LES LUXATIONS ANTERIEURES RECIDIVANTES DE L'EPAULE CHEZ LE SPORTIF**K. DINARI<sup>1</sup><sup>1</sup>Centre Régional de la Médecine et Sciences du Sport GAFSA, GAFSA, TUNISIA**AUTEUR:** DINARI Kamel/HENCHIRI Ch./ALOUI I**RÉSUMÉ:** Différentes procédures ont été proposées pour le traitement de la luxation antérieure récidivante chez le sportif parmi eux la chirurgie stabilisatrice par butée coracoïdienne de type Latarjet.

Notre étude correspond à une série de 25 cas de luxations antérieures de l'épaule survenant chez des sportifs et qui ont été opérés par cette technique au service d'orthopédie du CHU de Monastir.

L'âge moyen au moment de l'intervention a été de 26 ans avec une nette prédominance masculine (80%) et l'épaule dominante a été opérée dans (60%).

Un cas d'infection précoce a été noté et un cas de pseudarthrose de la butée.

Au terme d'un recul moyen de 3 ans et en se basant sur la fiche de cotation type Duplay, 72% de nos patients ont eu un excellent et bon résultat.

80% de nos sportifs ont continué à pratiquer le même sport et au même niveau.

Une ostéophytose stade I a été retrouvé dans 16 cas.

Parmi les facteurs qui influencent le résultat nous avons noté l'âge au moment de l'intervention, le nombre d'épisode de luxation, l'hyperlaxité constitutionnelle et la lésion des muscles de la coiffe des rotateurs.

La butée coracoïdienne type Latarjet, en aboutissant à une excellente stabilité avec un taux faible de récurrence, demeure l'intervention la plus efficace dans la chirurgie des luxations récidivantes de l'épaule chez les sportifs.

**PP-12-173 – ENGLISH VERSION****RECURRENT ANTERIOR DISLOCATION OF THE SHOULDER IN ATHLETES**K. DINARI<sup>1</sup><sup>1</sup>Centre Régional de la Médecine et Sciences du Sport GAFSA, GAFSA, TUNISIA**AUTHORS:** DINARI Kamel/HENCHIRI Ch./ALOUI I**SUMMARY:** Different procedures have been proposed for the treatment of recurrent anterior dislocation in athletes among them the stabilizing surgery Latarjet coracoid bone block types.

Our study is a series of 25 cases of anterior shoulder dislocations occurring in athletes who were operated on with this technique in orthopedics department of the University Hospital of Monastir.

The average age at time of surgery was 26 years with a male predominance (80%) and the dominant shoulder was operated on (60%).

A case of early infection was noted and one case of nonunion of the stop.

After a mean follow-up of 3 years and based on the scoring sheet Duplay type 72% of our patients had excellent and good results.

80% of our athletes have continued to practice the same sport at the same level.

Osteophytes stage I was found in 16 cases.

Among the factors that influence the result we noted the age at time of surgery, the number of episode of dislocation, the Constitutional laxity and injury to the muscles of the rotator cuff.

The Latarjet coracoid bone block type is resulting in excellent stability with a low recurrence rate remains the most effective intervention in surgery of recurrent shoulder dislocations in sports.

PP-12-174

## SPORT-RELATED INJURIES DURING YOUTH AND NATIONAL COMBINED EVENTS CHAMPIONSHIPS

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**HYPOTHESIS:** In major track and field competitions, the most risky discipline was the combined event.

**OBJECTIVE:** We aimed to record and analyze the incidence and characteristics of sports injuries incurred during the Youth and National combined events Championships.

**METHODS:** During the French Athletics Combined Events Championships in 2010, all newly occurred injuries were prospectively recorded by the local organising committee physicians and physiotherapists working in the medical centers at the stadium, in order to determine incidence and characteristics of newly occurred injuries.

**RESULTS:** In total, 51 injuries and 9 time-loss injuries were reported among 107 registered athletes, resulting in an incidence of 477 injuries and 84 time-loss injuries per 1000 registered athletes. Approximately 72% of injuries affected lower limbs and 60% were caused by overuse. Thigh strain (17.6%) was the most common diagnosis. Fourteen dropouts were recorded, 8 were caused by an injury (57.1%).

**CONCLUSIONS:** During the national and youth combined events championships, over one third of the registered athletes incurred an injury, with an injury incidence higher than in international elite track and field competitions. Interestingly, this higher injury risk concerned the younger population affecting immature musculoskeletal structures. In combined events, preventive interventions should mainly focus on overuse and thigh injuries.

PP-12-175

## MAXILLO-FACIAL AND ORBITAL TRAUMAS IN SPORT ACTIVITIES

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**INTRODUCTION:** In the last few years, the number of people who practise sporting activities in competition, education or recreation, have dramatically increased. The consequences of this is an increase of sport related traumas including cranium-maxillo-facial lesions. According to the literature, the incidence of sports related maxillo-facial trauma ranges from 4% to 15%. Orbital fractures are relatively frequent, caused by both direct or indirect traumas.

**OBJECT:** Object of this job is to analyze epidemiological data based on a retrospective study about all patients admitted to Hospital for facial skeletal fractures in Bergamo district in the last 40th years.

We also illustrate some biomechanics and anatomic features of facial skeleton that explain the different incidence between third medium facial skeleton traumatism compared to other districts.

Then we proceed to classify and illustrate the principal lesions with short mentions of their treatment on the base of the most topical surgical techniques.

**MATERIAL AND METHOD:** A study has been conducted on cases over the past 40 years within our operative unit related to accidents during sporting practise with a correlation comparison of age, type of lesions and sport.

It was possible to clearly verify the increase of maxillo/facial trauma through information collected from some of the most important districts in Italy. A study spanning a 20-year period in USA showed that sports are involved in 14,1% of isolated orbital fractures.

The mechanism of injury either transmission of a blow from the thick orbital rim bones to the thin bones of the floor and medial wall of the orbit (blow out).

Signs and symptoms include orbital edema, difficulty with eye movements, double vision, enophthalmus and numbness or tingling of the lower eyelid, nose and upper lip (V2 branch of the facial nerve), sudden orbital swelling or inflating immediately after nose blowing, entrapment of the extraocular muscles, particularly the inferior rectus.

**DISCUSSION AND CONCLUSION:** The facial skeleton structure, both for anatomic/structural and biomechanical reasons, is of a particular risk to trauma occurring from sporting practise injuries. This is especially true in sport where contact is sought however where contact is purely accidental it appears fairly frequently.

In the past 40 years, approximately 25% of maxillo/facial traumas that have been treated in our operative unit have come from sporting activities with more than 60% of these being from football (soccer).

Of particular notice is the third medium sector of the face with noses suffering 42% of the injuries, cheekbones 33% and mandible 25%. This appears to be susceptible to high deformability because it absorbs the majority of horizontal forces during an impact.

In some sports, protection systems have been adopted to protect athletes from such injuries. Although these systems continue to be modernized, the best tool of protection has proven to be a correctly fitted mouth guard.

### PP-12-176

#### A RARE ANKLE FRACTURE TYPE: ISOLATED POSTERIOR MALLEOLUS FRACTURE

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Ankle is one of the most frequently injured joints during sports activities. Although the most of injuries are ligament injury, ankle fractures are also relatively common. Ankle fracture incidence is 1-2/1000 yearly. Posterior malleolus fractures may be associated with other bone or ligament lesions frequently. But isolated posterior malleolus fractures are very seldom. Diagnosis of isolated posterior malleolus fractures can be easily overlooked due to its uncommon nature at emergency rooms.

**CASE REPORT:** 23 year old male patient admitted to our emergency department with the complaint of right foot pain that occurred after a fall from a height of 2-3 meters during military training. As he said he dropped on heels and then seated over his foot. On physical examination we did not detect ankle swelling or deformity. Ottawa ankle rules revealed no evidence of any of the injury when examining tenderness on the medial / lateral malleolus, pain on palpation of foot bones, or pain with stretching deltoid or lateral collateral ligaments. Fibular compression test that shows injury at proximal fibula was negative.

After examining ankle X-rays we detected posterior malleolus fracture that is less than 25% of the articular surface of the posterior malleolus. Computed tomography were taken to reveal out the accompanying other injuries. The fracture thought to be stable because of absence of associated injuries and presence of the fracture that is less than 25% of articular surface of posterior malleolus. Below knee cast was applied. After

6 weeks, patient was encouraged to gradually mobilized and progressive weight bearing. Two months later radiographic fracture healing was diagnosed.

**RESULT:** Due to special occurrence mechanism (compression and/or plantar flexion) isolated posterior malleolus fractures are rare type of ankle fractures. It can easily be overlooked by emergency medicine specialist who doesn't accustomed to fracture or call to mind such a fracture type and so can cause chronic pain and ankle degenerative changes at future

#### PP-12-177

### DOES SEMITENDINOSUS AND GRACILIS (STG) TENDON AUTOGRAFT USAGE FOR ACL RECONSTRUCTION SURGERY EFFECT KNEE KINEMATICS?

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Semitendinosus and gracilis(STG) tendons are most widely used autografts for anterior cruciate ligament reconstructions. In this study we investigated the effect of usage of STG auto graft on knee kinematics.

**MATERIAL AND METHODS:** 17 patients who had undergone ACL reconstruction surgery between years 2010-2011 with STG auto graft included in our study. Knee flexion, extension, internal and external rotation peak torque measurements for operated knee and contralateral knee measured with Cybex Dynamometer device. The results were evaluated statistically by using SPSS program.

**RESULTS:** Flexion, extension, internal and external rotation peak torque measurements for operated knee were reduced compared to non-operated knee. The results were statistically significant(P <0.005).

**DISCUSSION:** Knee flexion, extension, internal and external rotation peak torques decrease after STG autograft use for ACL reconstruction surgery. Postoperative rehabilitation programs should be revised using this information.

#### PP-12-178

### THE SPECIALTIES OF THE EARLY REHABILITATION OF ALPINE SKI ATHLETES AFTER ACL RECONSTRUCTION

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**KEY WORDS:** alpine ski athletes, ACL reconstruction, rehabilitation

**INTRODUCTION:** Anterior cruciate ligament (ACL) tear is one of the most common knee injuries in sports, it leads to the long training break. In our research we tried to optimize the period of rehab after ACL reconstruction and to establish the criteria for the admission of athletes to train.

**PURPOSE:** To determine the new methods of physical rehabilitation of alpine ski athletes directed to reduction of the rehab period after ACL reconstruction.

**MATERIAL AND METHODS:** We examined 26 alpine skiers aged from 18 to 25 after arthroscopic ACL reconstruction and regularly controlled in our center for 3 years. The research was opened controlled and perspective. The first group included 14 athletes who received Intensive rehabilitation. The second group included 12 athletes who used Classical method. The Intensive method was differ from the Classical in the Balance trainings on the balance platform, that started 4 weeks earlier. Trainings of the speed endurance on

the Speed Courte and Sky Teck ski simulator were added. The control took place on the 16th and the 24th week of rehab. The results were compared to the results of the same athletes before injury. Examination included: body composition analysis by bioimpedance (body fat%, body muscle%), the measurement of the isokinetic muscle strength of quadriceps and biceps femur (peak torque extensor Nm, maximal work J), balance test on the balance-platform Biodex (test trial time sec., overall stability index), stress-test with ergospirometry up to anaerobic threshold ( $VO_2$  mL/kg/min, Load power Wt).

**RESULTS:** The research determined that in the 1st group by the 16th week of rehab the maximal values for peak torque and work for knee extension amounted 23% and 19,6% respectively ( $p < 0,05$ ) higher, than in the 2nd group. Postural stability test results also were higher authentically for the difference of the test trial time was 24% ( $p < 0,05$ ), but overall stability index differed to 46% ( $p < 0,05$ ). The received results of the 1st group on the 16th week of rehab compared to the their basic level, which was fixed before injury of these athletes, weren't differ authentically. The 2nd group could reach the same indexes only by the 24th week of rehab. The indexes stress-test with ergospirometry and body composition analysis didn't identify authentic differs among all the groups of athletes during different periods of rehab. This can evidence of the good functional training among all the examined athletes.

**CONCLUSION:** We determined that if classical method is combined with the balance, Speed Court trainings and alpine ski simulator trainings, the rehabilitation period can be two months shorter, that permits to begin special alpine ski trainings on the snow 2 months earlier, after 4 months of the rehab.

**PP-12-179**

### **EFFECT OF HALLUX VALGUS CORRECTIVE EXERCISES ON DEFORMITY IMPROVEMENT RATIO, STATIC AND DYNAMIC BALANCE OF YOUNG ACTIVE AND INACTIVE GIRLS**

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**BACKGROUND AND OBJECTIVE:** The first tarso matatarsophalangeal joint is one of the three bases of human's support and weight bearing (1). Big toe has an important role in moving forward and balance maintenance. During walking, the big toe is the last force transferring axis. So any diversions from normal position may reduce the walking efficiency. The most important big toe's deformity is hallux valgus, in which the big toe inclines outward from its first phalange (2). The purpose of this study was to determine the effect of one period of corrective exercises of hallux valgus on the deformity improvement level and static (eyes open/closed) and dynamic balance of active and inactive young girls by reliable and non-expensive methods.

**METHOD:** The Hallux valgus angle, static and dynamic balance of 8 active young girls (age:  $21 \pm 3.68$ , height:  $162.5 \pm 8.2$  and weight:  $62 \pm 7.8$ ) and 8 inactive young girls (age:  $20 \pm 3.07$ , height:  $164.5 \pm 7.42$  and weight:  $63 \pm 7.7$ ) were evaluated by the foot print (3), one leg standing balance test (eyes open/ closed) and Star Excursion Balance Test (SEBT) in both pre/ posttest periods. Exercises started with two 30- minute sessions every week and every two weeks gradually the duration and number of sessions were increased and finally after three 90- minute sessions in week ten they finished. The training program included some

gentle stretching and power exercises that step by step the resistance and duration of maintaining the elasticity were increased.

**RESULT:** The results showed that the reduction of Hallux valgus deviation angle was significant ( $p < 0.05$ ) in both groups. The effect of exercises on static balance was significant ( $p < 0.05$ ) in active group but in inactive group and when the eyes were opened, it wasn't significant ( $p > 0.05$ ). Dynamic balance function improvement level was significant in active group ( $p < 0.05$ ) but about inactive group it was not significant ( $p > 0.05$ ) in Anterior and Lateral directions.

**CONCLUSION:** In conclusion it seems we can use corrective exercises of valgus deformity in order to decrease the deviation angle of hallux and to improve static and dynamic balance function.

#### REFERENCES:

1. Ballemy B. Abductor hallois exercises.2011. Available at: [http:// livestrong.com/ article](http://livestrong.com/article). Htm. Accessed Feruary 6. 2012
2. Plessis Md, Zipfel B, Brantingham J.W, Parkin- Smith G.F, Birdsey P, Globe G, Kassa T.K. Manual and manipulative therapy compared to night splint for symptomatic hallux abducto valgus: An exploratory randomized clinical trail. *The foot*, 2011, 21 (2), p: 71- 78-
3. Chen C.H, Huang M.H, Chen T.W, Weng M.C, Lee C.L, Wang G.J. The correlation between selected measurements from footprint and radiograph of flat foot. *Archive of Physical Medicine and Rehabilitation*, 2006, 87(2), p: 235- 40.

PP-12-180

### ECU RECURRENT DISLOCATION IN A HIGH-LEVEL WATER-POLO FEMALE ATHLETE

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**AIM:** To present clinical evaluation, diagnosis and treatment of symptomatic recurrent dislocation of Extensor Carpi Ulnaris (ECU) in 21 y.o female elite professional water-polo player of National Team.

**MATERIAL AND METHOD:** Clinical examination reveals painful snapping of the pathological tendon during hypersupination and ulnar deviation of the wrist. Pain, edema and significant restriction of hand related sport activity was present. Dynamic U/S and MRI of the wrist were used to establish diagnosis and the type of laceration. Treatment performed was surgical reconstruction of ECU tendon sheath. ECU tendon was elevated and 4 mini sutures anchors were placed along the distal ulnar margin. No reconstruction of the ulnar groove was applied. The sutures were passed through the ulnar border of ECU sheath and tied, securing tendon sheath to bone and piece of extensor retinaculum was used to strengthen the reconstructed sheath. Splinting of humerus- forearm was applied for 6 weeks following by a progressive rehabilitation program.

**RESULTS:** Full recovery of ECU tracking and return in previous professional level of sport activity in National water polo team after 4 month period with satisfactory results.

**CONCLUSIONS:** Recurrent dislocation of ECU is a rare pathology. Early diagnosis with dynamic U/S of the wrist requires skilled and experienced radiologist. Definite treatment is surgical reconstruction of ECU tendon sheath which provides satisfactory results.

PP-12-181

**CUSTOM MADE ORTHOTIC INSOLES AS A TREATMENT OPTION FOR BONE BRUISE IN THE ANKLE OF A WORLD LEVEL HIGH JUMP ATHLETE**E. STEFAS<sup>1</sup>, K. MANAVIS<sup>2</sup>, M. KOTZAMANIDOU<sup>3</sup>, V. PANOUTSAKOPOULOS<sup>4</sup><sup>1</sup>National Rehabilitation Center, ATHENS, GREECE<sup>2</sup>Hellenic Handball Federation, THESSALONIKI, GREECE<sup>3</sup>Faculty of Health and Human Sciences, THESSALONIKI, GREECE<sup>4</sup>Aristotle University, Sports Sciences Department, THESSALONIKI, GREECE

**INTRODUCTION:** Bone bruise in the ankle is a sports injury that occurs in sports that involve running, jumping and quick changes of direction. All these characteristics are abundant in the sport of high jump. Bone bruise can occur when multiple ligaments are injured after an ankle sprain or less frequently secondary to impaction, rotary instability of the ankle and micro avulsion vectors.

**OBJECTIVES:** A 24 year old world level high jump athlete complains for severe pain and swelling of the right ankle joint after landing from a jump. Clinical examination revealed pain located to the medial malleolus and moderate swelling of the ankle joint, with the athlete being unable to bear weight on his injured foot. Radiographic examination of the ankle joint did not detect any fracture. Ultrasound examination was performed and was negative for ligamentous rupture. MRI was negative for ligamentous ruptures but revealed a bone bruise in the medial part of talus.

**METHODS:** The athlete was prescribed painkillers and physiotherapies while the ankle was immobilized with a brace. After the pain subsided he was recommended to perform a baropodography for biomechanical analysis of gait and posture. The examination showed a high medial arch and excessive foot pronation of both feet. Custom made orthotic insoles were prepared for him after a 15 days brace immobilization. The athlete started to perform proprioceptive exercises while wearing the insoles and he was recommended to wear the orthotics also at his daily living activities. He was performing baropodographic evaluation every 12 weeks and new insoles were manufactured according to the results.

**RESULTS:** The pain was absent after 18 days wearing the orthotic insoles. He was able to return for training 7 weeks after the injury. Six months later his foot pronation was improved.

**CONCLUSION:** Custom-made orthotic insoles can eliminate the period of immobilization of the ankle joint after a bone-bruise. They can help also in the prevention of new injuries by changing the biomechanics of the foot.

PP-12-182

**INITIAL MANAGEMENT AND PRIMARY HEALTH AID IN CASES WITH TRAUMATIC BRAIN INJURIES DURING SPORTS ACTIVITY**N. SYRMOS<sup>1</sup>, N. KAPOUTZIS<sup>1</sup>, A. TELEVANTOS<sup>1</sup>, A. MYLONAS<sup>2</sup><sup>1</sup>Surgical Department, Goumenissa General Hospital, Greece, Surgical Department, Goumenissa General Hospital, GREECE<sup>2</sup>Department of Anatomy, School of Sports Science, Aristotle University of Thessaloniki, Macedonia, GREECE

Aim of this study was to describe the initial management and the primary health aid in cases with traumatic brain injuries (TBI) during sports activity admitted to a rural district hospital during a 10 year period (2000-2010). A retrospective analysis was performed in all of the case notes of consecutive cases of TBI injuries. 299 individuals (201 men, 98 women, median age 34 years) presented to the outpatient department and

71 were admitted. The average length of stay was 9 days. Accurate initial support for TBI injury patients appears to be necessary.

### PP-12-183

#### INITIAL MANAGEMENT AND PRIMARY HEALTH AID IN CASES WITH SPINAL INJURIES DURING SPORTS ACTIVITY

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Aim of this study was to describe the initial management and the primary health aid in cases with spinal injuries during sports activity admitted to a rural district hospital during a 10 year period (2000-2010). A retrospective analysis was performed in all of the case notes of consecutive cases of spinal injuries. 88 individuals (60 men, 28 women, median age 39 years) presented to the outpatient department and 21 were admitted. The average length of stay was 7 days. Accurate initial support for spinal injury patients appears to be necessary during the hospital permanence.

### PP-12-184

#### EPIDEMIOLOGICAL INJURY SURVEY IN GREEK JUDO ATHLETES

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<sup>4</sup>*EJU Didactic Committee*

**PURPOSE:** The aim of our prospective study was to record the injuries and the causes that engender them in Greek judo athletes. In addition we try to study whether the type or frequency of the injury present differences firstly between the two sexes and secondly during training and competition.

**METHODS:** Injuries were registered during the period 2008-2012. The athletes enrolled to our study were members of national teams and sport unions of Western and central part of Greece and they have been injured during competition and training. They were in total 409 (mean age 20). It must be noted that we have recorded not only the injury but also its mechanism, and the frequency rate of the re-injury.

**RESULTS:** We registered a total amount of 136 cases of injuries and according to our results the percentage of injury during the competition (85.62%) was significantly greater than the one during training (51.38%). Concerning the differences related to the two sexes, the 69% of male athletes were injured whereas the 31% of female athletes sustained an injury. In addition, the following types of injuries were presented: sprains (40.1%), dislocations (16.14%), muscle-injuries (14.6%), fractures (12.5%), ligament injuries (8.3%), skin lacerations (4.68%), and menisci injuries (3.65%). We have to mention that knee and ankle regions suffer the most sprains while fingers sustained more fractures and shoulder and elbow were dislocated more often. Additionally, muscle injuries and skin lacerations were more frequently found in the upper part of the body. Finally, most common causes of injuries were the inappropriate sports facilities and tatami as well as the low level of flexibility and the false technique.

**CONCLUSION:** It should be noted that injuries in judo athletes can be found not only in the lower part of the body but also in the upper part. Also, injuries during training may not be as frequent as during

competition but they are very common. Finally, female athletes suffer significantly less injuries compared to male athletes. To conclude, most studies should be conducted concerning the causes of injuries in judo athletes, in order to help judo trainers improve the strength, the flexibility and technique of their athletes reducing the rate of their injuries.

**PP-12-185**

## **SPORTS INJURIES AT THE OLYMPICS: A REVIEW OF INCIDENCE RELATED DATA FROM PAST GAMES AND THE IMPLICATIONS FOR FUTURE MULTI-SPORT EVENTS**

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**BACKGROUND:** The Summer and Winter Olympic and Paralympic Games are major international multi-sport events held every four years. They are the pinnacle of many athletes' careers and unique sporting and cultural occasions. Few games have been fully reported on regarding injury occurrence.<sup>1</sup>

**OBJECTIVE:** Our aim was to collate the evidence on sports injuries at Olympic and Paralympic Games into a complete review to inform medical provision planning, injury prevention strategies and data collection at future multi-sport events.

**METHODS:** Eight electronic databases were systematically searched for articles that fulfilled the following criteria: (i) title regarding any Olympic or Paralympic Games competition or training period, (ii) abstract documenting the frequency, characteristics or causes of any sports related injuries that (iii) occurred in participating Olympic or Paralympic athletes [Figure 1].

**RESULTS:** Twelve articles met the inclusion criteria. Four included all athletes and injuries at the event they investigated. In the 2008 Summer Olympics, 1055 injuries were reported from 9572 athletes, highest injury proportions being in football and the commonest injury location the knee. In the 2010 Winter Olympics, 287 injuries were reported from 2567 athletes, highest injury proportions were in snowboard cross and the commonest injury location was the knee. In the 2010 and 2002 Winter Paralympics, injuries were reported from 120 of 505 and 39 of 416 athletes respectively, highest injury proportions being in sledge hockey.

**CONCLUSION:** Current evidence suggests a similar proportion of injured athletes in Summer and Winter Olympics, an inconclusive injury proportion in Winter Paralympics, and a lack of research on Summer Paralympics. This review highlighted consistencies and differences in injury frequencies, types, mechanisms and distributions between training and competition in the four-yearly snapshots of data from Olympic and Paralympic Games. For example, football consistently had the highest proportion of injuries out of team sports at the Summer Olympics, whereas there was opposing evidence for whether the highest proportion of injuries treated at future Winter Games will be from ice hockey or alpine skiing. Preventative strategies should be sport specific as injury causalities vary.<sup>2</sup> There is evidence that severe injuries occur in training and competition, so adequate medical coverage should be provided during both.<sup>3</sup> More longitudinal and



sport specific data is needed to better understand these findings. International Federations could consider collaboration to establish an injury surveillance system, including the use of electronic data entry, that will produce longitudinal evidence from all future sporting events.<sup>3</sup> This is important to define the athletes at highest risk of injury, sports with highest demand for medical resources, and areas where improvements in injury prevention strategies are most urgently needed for future Olympics and other multi-sport events. None of the data collection methods reviewed were without limitations, and all had missing data. Forms could be extended to include information on treatments, investigations and referrals provided. This would give more evidence for what medical resources will be in demand at future events.

## REFERENCES:

1. Athanasopoulos Spyridon et al. 2007. Br J Sports Med. 41:603.
2. Engelbrechtsen Lars et al. 2010. Br J Sports Med. 44:772.
3. Webborn Nick et al. 2012. Clin J Sport Med. 22:3.

**PP-12-186****CONCUSSION IN SPORTS AND EXPERIENCE WITH THE NFL**D. BARON<sup>1</sup><sup>1</sup>*University of South California, USA, California, USA*

According to the CDC, 1.6 to 3.8 million sports related traumatic brain injuries occur every year. They recommend the symptoms be evaluated in 4 primary domains; 1) physical, 2) cognitive, 3) emotional, and 4) sleep. Despite the dramatic increase in public awareness of TBI/concussion in sports (largely related to the media coverage of this issue in pro football) little research has been conducted into the emotional and sleep related problems. The NFL has recently taken important steps to address this problem, including informational material in every locker room, requiring independent medical clearance before an injured player may return to compete, standardized neurocognitive screening measures, and increased vigilance by referees to penalize helmet to helmet blows to the head. All well intended, these efforts do not seem to have substantially addressed the ever growing problem. One positive outcome has been the increased awareness of the importance of head and neck trauma in all sports, particularly youth sports. Despite 3 international consensus conferences on TBI in Sports, many more questions exist than answers. This presentation will review the extant knowledge of TBI in sports and highlight the critical areas yet to be addressed, with a special emphasis on the psychiatric issues related to TBI, concussion, and subclinical multiple head and neck trauma.

**PP-12-187****PSYCHOLOGY OF SPORT INJURY**J. HEIL<sup>1</sup><sup>1</sup>*Lewis Gale Clinic, Roroake, USA*

The ability to remain relatively injury free and to rehabilitate well when injury occurs is essential to longevity in sport and to the full realization of athletic potential. Because injury is a psychologically disruptive experience, recovery is not complete until the athlete is mentally ready for return to play. The goal is to present an applied guide to the psychology of sport injury that is practical, comprehensive, and systematic. Interest in the Psychology of Sport Injury has continued since its initial publication in 1993. The continued utility of this work rests heavily on its applied clinical focus and to the comprehensiveness of its scope. The strategic conceptualization of a psychology of sport injury, blending behavioral medicine and sport psychology, while novel when first published has taken hold in mainstream thinking about injury management. Over the decade that has followed, research has supported the value of psychology in sport injury, and the ecological and theoretical validity of the methods presented in this and other works in sport injury. More details presented in early published book *Psychology of Sport Injury* (1993, 2010).

**SPORT AND CONCUSSION**D. BARON<sup>1</sup>, LI JING ZHU<sup>2</sup>, TH. WENZEL<sup>3</sup>, J. HEIL<sup>4</sup><sup>1</sup>University of South California, USA, California, USA<sup>2</sup>Beijing Normal University Hong Kong Baptist University UIC, Zhu Hai, CHINA<sup>3</sup>Vienna Medical University, Vienna, AUSTRIA<sup>4</sup>USA Olympic Fening Team, sport medicine committee, Virginia, USA

The role of sports psychology in dealing with concussion in sport continues to grow in importance. As data on the impact of repetitive mild concussions in athletes continues to demonstrate the mental status changes reported by concussed athletes, the need for sports psychologists to be familiar with the most common psychological symptoms grows. Until recently, brain injured athletes were seen primarily by neurologists and neurosurgeons. The extant literature on the consequences of mild concussion is highlighting the important role psychologists can play in helping to diagnose, treat, and monitor these athletes. This symposium will review the most recent literature on concussion in athletes, and focus on the important role of sports psychologists in caring for these athletes. Another key component in addressing this growing problem is changing the current culture in sports that mild concussion is not a serious injury, and can be played through. The role of the sports psychologist in providing accurate education to members of the sports world will also be addressed. A review of psychometric instruments, and their appropriate use will be discussed. Finally, new research on altered brain changes resulting from mild concussion will be reviewed.

**LA LUXATION POST-TRAUMATIQUE DE LA ROTULE CHEZ DES SPORTIFS AMATEURS DE L'INJS PROPOS DE 126 CAS : BILAN DES SÉQUELLES ET PROTOCOLE DE PRISE EN CHARGE EN URGENCE**J. BISSOU MAHOP<sup>1</sup>, A. MONROCHE<sup>2</sup>, M.G. ONANA<sup>3</sup>, NGOA NGUELE<sup>4</sup>, NGOWE NGOWE<sup>5</sup>, SIMO MOYO<sup>6</sup>, MA. SOSSO<sup>7</sup><sup>1</sup>Chirurgien traumatologue du sport, assistant vacataire (FMSB)<sup>2</sup>Médecin rhumatologue du sport Université d'Angers (FRANCE)<sup>3</sup>Kinésithérapeute-Ministère des Sports<sup>4</sup>Enseignant permanent Universitaire et Directeur de l'INJS<sup>5</sup>Professeur agrégé de chirurgie générale et Doyen de la faculté de médecine de Buea<sup>6</sup>Professeur émérite d'Université et Médecin Anesthésiste-réanimateur<sup>7</sup>Professeur agrégé de Chirurgie, Chef de département de chirurgie Faculté Médecine Yaoundé et Recteur Université de Yaoundé I

**BUT:** Faciliter une prise en charge thérapeutique d'appoint du sportif victime d'une rotule luxée à travers une démarche diagnostic bien définie et codifiée pour minimiser le risque de survenue des séquelles cartilagineuses assez dommageables et réputées de mauvais pronostics pour le pratiquant amateur, ou en compétition

**RESUME:** Réduire au quotidien et sur les stades une rotule luxée nous paraît anodin, cependant, ne se limiter qu'à ce geste constitue un facteur de risque, parfois préjudiciable pour le sportif eu égard aux nombreuses lésions séquellaires sous-jacentes souvent méconnues en urgence et réputées de mauvais pronostics. Parmi ces séquelles, on retiendra les fractures ostéochondrales (dans 30 à 46% selon le Pr. Patricia Thoreux), les hémarthroses post-traumatiques attribuées à une lésion de LCA, ou les douleurs mécaniques résiduelles parfois invalidantes.

Fort de ce constat, une étude rétrospective et perspective pluridisciplinaire colligée sur 126 cas des sportifs, d'une durée de trois ans, appliquée aux deux sexes a été menée à l'INJS de Yaoundé afin d'identifier ces séquelles dont le risque d'usure du cartilage du genou nous paraît assez préoccupant.

Une démarche diagnostic et thérapeutique codifiée est donc proposée face à une entorse du genou sur rotule luxée pour permettre au praticien de gérer au mieux ce tableau clinique.

De nombreuses questions se posent face à cette symptomatologie clinique :

1. Faut-il compléter nécessairement l'examen clinique du genou par des bilans d'imagerie de type Shuss ou en stress, une IRM ou un scanner en urgence ?
2. Quelle démarche diagnostic et thérapeutique faut-il adopter de façon efficace pour minimiser les lésions d'usure du cartilage à forte incidence et pourvoyeuse d'arthrose à long terme ?

Devant cette préoccupation d'actualité du médecin de terrain, nos résultats corroborent ceux retrouvés dans la littérature (travaux Pr. Saragaglia 1990-1997, Pr. Patricia Thoreux, Abstract Medsport Mai 2010, N°4) et ont permis de mener une profonde réflexion sur des pistes de solution et un protocole de prise en charge à adopter, les gestes d'urgence devant être bien définis.

Nos suggestions faites à terme, permettront de minimiser les risques d'usure du cartilage, du condyle fémoral interne du genou luxé afin de faciliter une reprise précoce d'activité tout en limitant le risque de survenue d'arthrose réputée invalidante à long terme.

**MOTS CLES:** luxation, rotule, entorse, genou, diagnostic, séquelle, urgence, sportif.

PP-13-190

**RÉSULTATS FONCTIONNELS À LONG TERME DES SUTURES MÉNISCALES « ALL-INSIDE » PAR FASTFIX. A PROPOS D'UNE SÉRIE CONTINUE DE 32 PATIENTS**

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**INTRODUCTION:** L'objectif de cette étude était d'évaluer les résultats fonctionnels d'une suture méniscale « all-inside » par FastFix avec un recul minimum de 5 ans.

**MATÉRIEL ET MÉTHODES:** La série initiale était composée de 32 patients opérés entre 2000 et 2007 par le même chirurgien (DS), 8 femmes et 24 hommes âgés en moyenne de 26 +/- 9 ans (16-54 ans) au moment de l'intervention. 22 ménisques internes et 10 ménisques externes ont été suturés par FastFix (Smith & Nephew, Andover, MA) avec une moyenne de 1,1 sutures par ménisque. Toutes les lésions méniscales étaient verticales et situées au niveau de la corne postérieure en zone rouge-rouge ou rouge-blanche. Une ligamentoplastie du LCA était associée à la suture méniscale dans 72% des cas (23 patients). Tous les patients ont été contactés par téléphone pour renseigner les scores de Lysholm-Tegner et KOOS.

**RÉSULTATS:** Le recul moyen était de 7,95 +/- 2,2 ans (5-11 ans). Nous n'avons pas retrouvé de complications per ou post-opératoires dans cette série. 7 patients (21,8%) ont nécessité une ré-intervention chirurgicale pour ménissectomie arthroscopique dans un délai moyen de 32 mois (8-72 mois). A la révision, pour le reste de la série (n=25 patients), le score moyen de Lysholm post-opératoire était de 94 +/- 14 points (36-100). Le niveau d'activité selon Tegner était de 7 (idem qu'en pré-opératoire). Le score KOOS moyen était de 91 +/- 14 (45-100). 6 patients (24%) présentaient des douleurs résiduelles isolées épisodiques du genou opéré sans conséquence sur la pratique sportive et 1 patient (4%) présentait des épisodes de blocage douloureux non documenté. Aucun n'avait d'instabilité résiduelle. Nous avons colligé 23 excellents résultats (score de 84 à 100 points), un résultat moyen (score de 65 à 83) et un mauvais résultat (score de 0 à 64 points).

**CONCLUSION:** La suture méniscale « all-inside » par FastFix donne un taux acceptable de résultats fonctionnels satisfaisants à un recul moyen de 8 ans. Il ne nous a pas paru utile de faire un contrôle de la qualité de la suture par une imagerie sophistiquée.

PP-13-191

## CHARACTERIZATION OF MOUTH-FORMED MOUTHGUARDS: THERMAL PERFORMANCE AND WEAR-ABILITY

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**INTRODUCTION:** European Council adopted a Directive for Personal Protective Equipment (PPE) which concerned both professional and private use [1]. As mouthguards (MGs), whatever type or method of fabrication, are considered as a PPE designed for sport or leisure activity, they are subject to essential health and safety requirements evaluated by a notified body of each Member State during an "EC type-examination". Several scopes are defined by the directive: for example, a good MG is defined as "the optimum level of protection in the foreseeable conditions of use" which is directly linked to the ability of energy absorption on impact.

And MGs must also "not cause movements which endanger the user..." and "remain in place for the foreseeable period of use", which suggests retention properties.

Therefore, impact tests as presented in literature [2] are insufficient to characterize MGs because covering, breathing space and retention are not taken into account.

The aim of the presented work is to study mouth-formed MGs behavior in order to propose several tests qualifying a mouth-formed MG.

**MATERIAL AND METHODS:** One thermoplastic custom-made MG (referred as prototype) and four commercially available EVA mouth-formed MGs were selected for this study. Five specimens were used for each selected MG.

First, a Differential Scanning Calorimetry (DSC) analysis has been carried out on MGs to determine the melting and crystallization temperatures. Indeed, there is a relationship between thermal performance and mechanical damping [3]. Second, MGs have been thermoformed according to manufacturer's recommendations and using a specific device designed to ensure repeatability of the process [4]. Two thermocouples have been used to measure and compare core and surface temperatures of the MG during the process. Third, after modeling, three criteria have been proposed to qualify the MG: retention, covering and oral breathing space.

**RESULTS:** SDITM and Gel nanoTM have a good retention on all the teeth whereas prototype has retention only on few teeth. For the two others, there is no retention after thermoforming. Any mouthguard have sufficient recovering regards to the minimum chosen covering protection. The ventilation criterion is only verified by the prototype. (Table 1)

**Table 1:** Results of DSC, retention, covering, ventilation tests

	Fusion temperature (°C) (n=1)	Crystallization temperature (°C) (n=1)	Retention (n=5)	Covering (n=5)	Ventilation (n=5)
SDI™	45.3	48.5	Yes	No	No
Gel nano™	49.2	51.6	Yes	No	No
Opro shield gold	48.1	49.1	No	No	No
Kipsta™	45.4	48.5	No	No	No
Prototype	53	50.1	Yes	No	Yes

**CONCLUSIONS:** The thermal and wear-ability proposed criteria can be used to classify MGs in accordance with the European Directive, but they do not concern the shock absorption capabilities, which remain the essential property to limit the load transmission up to teeth. The same MGs used for this study will then be tested for impact performances.

**REFERENCES:**

1. European Economic Community, OJ L 399, 30.12.1989; 1989. p18.
2. Takeda T., et al., Dental Traumatology 2004; 20: 12-20.
3. Gould TE, et al., Dent Mater 2009;25:771-80.
4. Barou J-L., et al., Applied Mechanics and Materials 2011; 83:78-84.

**PP-13-192**

**BILAN OSTÉO-ARTICULAIRE DE PRÉVENTION DES BLESSURES CHEZ LE JOUEUR DE TENNIS**

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**INTRODUCTION:** Les blessures chez le sportif de haut niveau entraînent une diminution de la performance, une indisponibilité de durée variable, pouvant aboutir à un arrêt définitif. La prévention des blessures a pour but d'optimiser la performance, de limiter le développement des pathologies, des indisponibilités, et d'éviter les interruptions précoces de carrière. Pour cela, nous proposons un bilan complet de l'appareil locomoteur, ainsi qu'un suivi 3 fois par an pour prévenir l'apparition des blessures.

L'objectif de l'étude réalisée auprès de jeunes joueurs de tennis, était de mettre en évidence des altérations minimales du fonctionnement des articulations, des muscles et des tendons afin de limiter les risques d'apparition de blessure, et de mettre en place un programme d'exercices individuels de prévention.

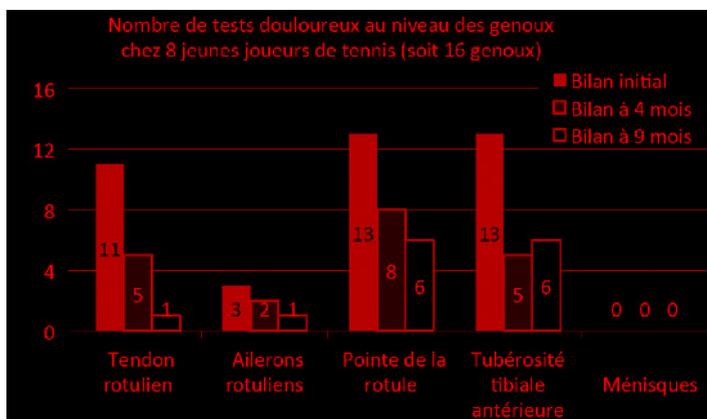
**MÉTHODES:** 8 joueurs de tennis âgés de 10 à 14 ans ont participé à l'étude (3 filles et 5 garçons ; 2 gauchers). Ils s'entraînaient 9 heures par semaine en moyenne (tennis et préparation physique) et pratiquaient régulièrement le tennis en compétition. Les bilans étaient réalisés lors des entraînements de la ligue du Languedoc-Roussillon.

Le bilan-diagnostic consistait en une série de tests manuels réalisés par 2 kinésithérapeutes spécialisés dans la prévention, afin de détecter des dysfonctionnements articulaires, des zones douloureuses, des déséquilibres de tension musculaire ou des mauvaises postures. Toutes les articulations étaient testées.

Le bilan comprenait des palpations, des mesures d'amplitudes articulaires, des tests de conflit et d'inflammation, des tests tendineux, des tests musculaires (souplesse). Un compte rendu individuel était transmis aux parents et aux entraîneurs. Les résultats ont permis de mettre en place un programme de prévention avec des exercices et des étirements spécifiques à chaque joueur (fiches et vidéos). Les joueurs étaient suivis 4 mois et 9 mois plus tard, en renouvelant ce bilan de prévention et en adaptant le programme d'exercices.

**RÉSULTATS:** Sur les 16 épaules testées au premier bilan, 8 épaules présentaient un dysfonctionnement mécanique (décentrage), 1 épaule présentait un signe de bursite (test de Hawkins douloureux), 4 épaules présentaient une douleur lors du test du tendon supra-épineux et 1 épaule lors du test du tendon infra-épineux. A 4 mois, 5 épaules étaient encore décentrées, puis 7 à 9 mois. Il subsistait 1 épaule avec bursite à 4 et 9 mois. Les tests tendineux douloureux avaient disparu aux 2 bilans suivants.

En ce qui concerne le membre inférieur, les résultats observés au niveau des genoux sont présentés dans la figure 1. Les tests ligamentaires et tendineux au niveau des chevilles indiquaient une nette diminution au fil des mois du nombre de ligament latéral interne douloureux (8 au bilan initial, 1 seul à 4 mois, puis aucun à 9 mois), du nombre de ligament latéral externe douloureux (8 ; 1 ; 0), et du nombre de tendon d'Achille



douloureux (12 ; 11 ; 8). Les hanches présentant un décentrage étaient au nombre de 2 au bilan initial, de 4 à 4 mois et de 3 à 9 mois.

**CONCLUSION:** L'action de prévention réalisée auprès des jeunes joueurs de tennis a permis de réduire une grande partie des zones douloureuses.

#### PP-13-194

### LA SURVEILLANCE MÉDICALE DES MANIFESTATIONS SPORTIVES DANS LE DÉPARTEMENT DE LA SARTHE EN 2012. EVALUATION DES PRATIQUES AU REGARD DE LA RÉGLEMENTATION

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**INTRODUCTION:** L'organisation d'une manifestation sportive répond à deux impératifs : le respect de la réglementation et la prise en compte du risque réel.

**MATÉRIEL ET MÉTHODE:** Centrée en Sarthe (72), l'étude a porté sur les clubs des fédérations sportives à activité considérée comme « à risque potentiellement vital », au cours de la saison sportive 2011-2012. Les critères d'inclusion adoptés sont :

- sportifs amateurs.
- activités dépendantes du Ministère de la Jeunesse et des Sports.
- espace limité (salle ou stade).
- clubs organisant des manifestations au cours de l'étude.

Une description du système actuel dans ses différentes composantes est réalisée et les modalités d'élaboration des réglementations fédérales identifiées.

L'objectif principal de l'étude est d'évaluer la conformité des pratiques au regard de la réglementation.

L'étude a été basée sur:

- une enquête épidémiologique quantitative, transversale, descriptive à partir d'un questionnaire.
- un recensement de la réglementation en vigueur.

**RÉSULTATS:** Tenant compte des critères d'inclusion et des réponses recueillies, la population incluse est constituée de trente six clubs appartenant à dix fédérations.

Le taux de manifestations conformes à la réglementation étant le critère de jugement principal, il a été constaté:

- une application perfectible de la réglementation existante.
- une corrélation de la présence du médecin aux risques constatés.

Parmi les trois fédérations imposant une présence médicale, huit clubs (61%) respectent cette obligation. Pour les sept fédérations n'imposant pas une présence médicale, dix-neuf clubs (82%) n'incluent pas de médecin dans leur organisation.

Les mécanismes identifiés dans l'étude, à l'origine du non-respect de la réglementation, sont :

- des difficultés d'évaluation du risque (notion subjective).
- la remise en cause de la pertinence de la réglementation.
- la lourdeur administrative.
- des contraintes économiques.
- la démographie médicale et présence de solutions alternatives.
- des difficultés logistiques et responsabilité de l'organisateur.

Une analyse croisée a corrélé la présence médicale à l'évaluation du risque (test du Khi2 valide pour un seuil de confiance à 95%)

**DISCUSSION:** A partir de ces constats, des propositions sont élaborées:

- gestion centralisée des médecins.
- prévoir une couverture assurantielle.
- harmoniser les rémunérations.
- sensibiliser les organisateurs et les médecins à leurs responsabilités.

Celles-ci pourraient s'organiser autour d'une organisation en réseau :

- individualiser un circuit de demande (document unifié), d'autorisation (commission de sécurité) et formalisation d'un guide référentiel.
- mise en œuvre logistique basée sur un arrêté préfectoral dont l'exécution serait faite, sous la responsabilité de l'organisateur, auprès des organismes habilités
- contrôle du respect de l'exécution par les forces de l'ordre et mise en œuvre d'un processus qualité par déclaration des dysfonctionnements.

**CONCLUSION:** Devant l'absence d'homogénéité des règlements fédéraux, et à partir des propositions élaborées, l'organisation proposée a pour finalité d'améliorer la concordance de la réponse au risque avec la réglementation, et, d'harmoniser les pratiques au profit d'une amélioration du niveau de sécurité.

## PP-13-194 – ENGLISH VERSION

### THE MEDICAL SURVEILLANCE OF SPORTING EVENTS IN THE DEPARTMENT OF SARTHE IN 2012. EVALUATION OF PRACTICES IN ORDER TO THE REGULATIONS

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**INTRODUCTION:** The organization of a sporting event meets two requirements : the compliance and taking into account the actual risk.

**MATERIAL and METHOD:** Centred in Sarthe (72), the study focused on the clubs sports federations activity considered «a risk potentially vital», during the 2011-2012 sports season. The criteria for inclusion were adopted:

- Amateur athletes.
- Dependent activities of the Ministry of Youth and Sports.
- Spaces limited (room or stage).

- Clubs organizing events during the study.

A description of the current system in its various components is made and terms of elaborations of federal regulations identified.

The main objective of the study is to assess the compliance procedures under the regulations.

The study was based on:

- A cross-quantitative epidemiological investigation, descriptive from a questionnaire.
- A census of the actual regulations.

**RESULTS:** Taking into account the inclusion criteria and responses collected, the population included consists of thirty-six clubs belonging to ten federations.

The rate of events in accordance with regulations being the primary endpoint, it was found:

- A perfectible application of existing regulations.
- A correlation between the presence of the doctor and the risks found.

Of the three federations requiring medical coverage, eight clubs (61%) comply. For the seven federations not requiring a medical presence, nineteen clubs (82%) didn't include a doctor in their organization.

Mechanisms identified in this study, at the origin of non-compliance of regulation, are:

- Difficulties in risk assessment (subjective concept).
- Calling into question of the relevance of the regulation.
- Administrative burden.
- Economic constraints.
- Medical demography and presence of alternative solutions.
- Logistical difficulties and responsibility of the organizer.

A cross analysis has correlated the medical presence at evaluation of the risk (test  $\chi^2$  valid for a confidence level of 95%).

**DISCUSSION:** From these findings, proposals are developed:

- Centralized management physicians.
- Provide insurance coverage.
- Harmonize remuneration.
- Sensitize organizers and doctors to their responsibilities.

These could be organized around a network organization :

- Individualize a demand circuit (unified document), authorization (Security Committee) and formalization of a reference guide.
- Logistical implementation based on a Prefectural Decree which execution would be done under the responsibility of the organizer to authorized agencies.
- Control of respect of the execution by the security forces and implementing a quality process for reporting malfunctions.

**CONCLUSION:** Given the lack of homogeneity of the federal regulations, based on proposals developed, the proposed organization is aimed at improving the consistency of the response to risk with the regulations, and harmonize practices in favour of an improvement in the security level.

### PP-13-195

## INTÉRÊT DES ONDES DE CHOC DANS LE TRAITEMENT DES FASCIITES PLANTAIRES

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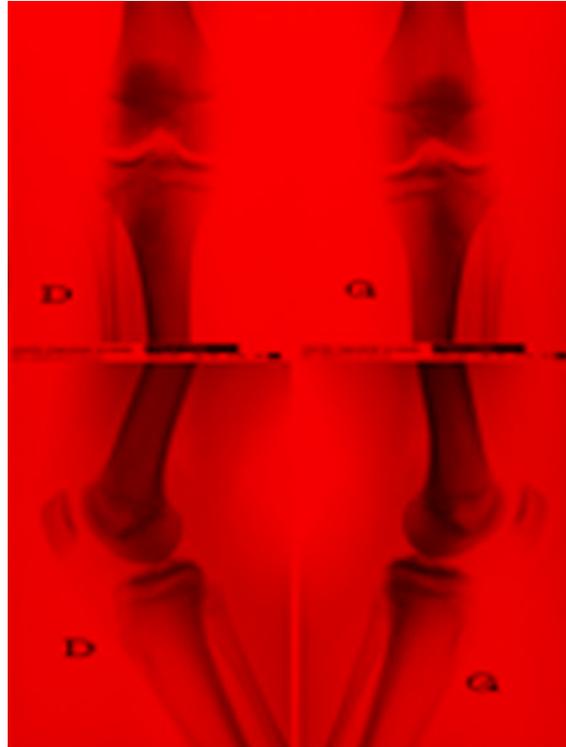
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**INTRODUCTION:** Au cours de cette dernière décennie, la thérapie par ondes de choc radiales a connu une

réelle expansion. Indiquée dans les tendinopathies superficielles, son efficacité réelle reste toutefois à être démontrée.

**MATÉRIEL ET MÉTHODE:** La population se compose de 30 patients atteints de fasciite plantaire chronique unilatérale (n=22) ou bilatérales (n=8). Elle comprend 11 hommes et 19 femmes avec une moyenne d'âge de 51,9 ans (29-73). Notre expérimentation est une étude longitudinale sur 12 semaines composée d'une phase contrôle (0 à 6 semaines) et d'une phase de traitement (6 à 11 semaines). Elle comprend 3 évaluations (T1, T2 et T3) respectivement à 0, 6 et 11 semaines. Une évaluation type regroupe une EVA de la douleur, un questionnaire de retentissement algo-fonctionnel de la cheville (FFI modifié), un test à l'algomètre et une analyse dynamique du pied sur plateforme de force. L'identification du point le plus algique à T1 a été effectuée à l'aide d'un quadrillage original. La thérapie par ondes de choc radiales a été réalisée à l'aide de l'appareil Swiss DolorClast dès la 6ème



semaine à raison d'une séance par semaine. Tous les patients ont reçu 2000 coups, à une fréquence de 10 Hertz et une pression de 0,4 MPa. Aucune utilisation d'analgésiques ni même de cryothérapie n'a été effectuée avant ou après le traitement. Aucune complication n'a été rapportée au cours de l'expérimentation. Dans un second temps, les individus portant ou non des semelles orthopédiques à T1, ont été identifiés dans deux groupes à part entière. Ils ont tout deux été soumis au même protocole.

**RÉSULTATS:** L'analyse statistique met en évidence que le traitement par ondes de choc radiales induit une amélioration hautement significative ( $p < 0,0001$ ) du score du retentissement algo-fonctionnel de la cheville (70,2%) et du seuil de la sensibilité douloureuse (61,2%). De plus elle révèle une tendance à une légère augmentation non significative du temps de contact pied-sol au cours du temps. L'observation de nos critères démographiques âge, le sexe, le BMI, la présence ou absence d'infiltrations, du port de semelles, en relation avec l'évolution du seuil de sensibilité obtenu entre T2 et T3 met en évidence une corrélation significative entre l'évolution du seuil et l'âge des patients ( $p = 0,04$ ).

L'étude de l'Influence des semelles orthopédiques dans le traitement de la fasciite plantaire par ondes de choc radiales, met en évidence que le groupe portant des semelles orthopédiques présente des améliorations non significatives, plus importante que ceux ne portant pas de semelles orthopédiques. Ces améliorations sont notables sur toute la durée de la prise en charge.

**CONCLUSION:** Notre étude confirme l'intérêt des ondes de choc dans le traitement de la fasciite plantaire. De plus, nous constatons que le port de semelles orthopédiques diminue la sensation douloureuse, celle-ci étant encore améliorée par la réalisation du traitement par ondes de choc radiales sur une période de 12 semaines.

**PP-13-195 – ENGLISH VERSION****SHOCK WAVE THERAPY FOR PLANTAR FASCIITIS**

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**INTRODUCTION:** Over the past ten years, radial shock wave therapy usage has grown tremendously. Prescribed for chronic tendinopathy, its real benefit has yet to be demonstrated.

**OBJECTIVE:** Demonstrate radial shock wave therapy benefits in plantar fasciitis treatment.

**MATERIALS AND METHODS:** Our experimentation is a study over twelve weeks divided in 2 periods: the control phase (week 0 to week 6) and treatment phase (week 6 to week 11). It includes 3 evaluations (T1, T2 and T3) respectively at 0, 6 and 11 weeks. A standard evaluation consists of one VAS pain, an algo-functional backwash survey about the ankle (modified FFI), algometer test and dynamic analysis of the foot on strength platform. The radial shock wave therapy has been performed thanks to Swiss DolorClast machine (Electro Medical Systems)

**RESULTS:** Statistical analysis show radial shock wave therapy induces a highly significant improvement ( $p < 0,0001$ ) on EVA results (50%), ankle algo-functional backwash (62.6%) and pain sensitivity threshold (49.6%). Therefore, a significant correlation can be observed during T2-T3 period between pain sensitivity threshold improvement and patients age ( $p = 0,012$ ). The statistical results show a time increase trend for foot-ground contact over time. It is not significant though.

**CONCLUSION:** The use of radial shock wave therapy in plantar fasciitis treatment helps decrease pain and improve step. However, additional studies performed on bigger samples have to be completed to confirm these results.

**PP-13-196****RÉACTION INFLAMMATOIRE EXUBÉRANTE SUITE À UNE INFILTRATION DE PRP**

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**INTRODUCTION:** Les infiltrations de plasma riche en plaquettes (PRP) représentent un nouveau traitement des tendinopathies. Le PRP, obtenu par la centrifugation de sang autologue, contient une concentration élevée de facteurs de croissance qui peut initier le processus cicatriciel tendineux. Actuellement, aucun effet secondaire n'a été rapporté dans cette indication.

**CAS CLINIQUE:** Un patient de 35 ans présentant une tendinopathie rotulienne supérieure, rebelle à tout traitement conservateur depuis plus de 6 mois, a bénéficié d'une infiltration intratendineuse de 6mL de PRP (8x10<sup>5</sup> plaquettes/mm<sup>3</sup>, sans globule rouge ni blanc), sans anesthésie locale. Il est diabétique de type 1. Immédiatement après l'infiltration, une cryothérapie locale a été réalisée durant 15 minutes. En cas de douleur, les anti-inflammatoires (AINS) étaient proscrits, mais les antalgiques de classe 1 ou 2 autorisés. Une rééducation excentrique sous-maximale aurait dû être débutée 1 semaine post-infiltration. Cependant, le patient a développé un épanchement local très douloureux associé à un érythème et une hyperthermie locale, localisée juste à la pointe de la rotule, sans syndrome inflammatoire biologique. Un important signal Doppler était observé au sein du tendon épaissi échographiquement. Cependant, aucun signe infectieux n'a été démontré au scanner ou à l'IRM. Malheureusement, la douleur et l'inflammation locales n'ont pas diminué après un traitement anti-inflammatoire progressif de 3 semaines: cryothérapie, AINS locaux puis per os et colchicine 1mg. Une infection insidieuse fut donc suspectée, même en l'absence de syndrome

inflammatoire biologique ou de foyer septique observé en imagerie. Une antibiothérapie (rifampicine 600 mg + minocycline 100 mg) a été initiée pour 3 mois. Finalement une scintigraphie osseuse 3 temps a suggéré la présence d'un syndrome douloureux régional complexe de type 1, traité par une prise en charge kinésithérapeutique et antalgique classique. L'évolution fut favorable en 6 mois, avec une diminution de la douleur telle que présente avant l'infiltration de PRP.

**DISCUSSION:** Ce cas clinique met en garde sur les effets secondaires potentiels liés aux nouvelles thérapeutiques, notamment suite à une infiltration de PRP pour traiter les tendinopathies. Donc la balance entre les bénéfices et les risques doivent être évalués précautionneusement avant d'employer ce traitement, en particulier chez les patients diabétiques de type 1.

## PP-13-196 – ENGLISH VERSION

### EXUBERANT INFLAMMATORY REACTION AFTER AN INFILTRATION OF PLATELET-RICH PLASMA TO TREAT TENDINOPATHY

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**BACKGROUND:** PRP, obtained from centrifuged autologous blood, contains a large quantity of growth factors, which may enhance the tissue healing processes. Local infiltration of PRP represents a relatively new treatment for tendinopathies. To date, no side effects have been reported after infiltration of PRP to treat tendinopathy.

**CASE REPORT:** A 35-year-old patient had a right upper patellar tendinopathy which was resistant to all conservative treatments for more than 6 months. The patient was a type 1 diabetic (well controlled). He had an intratendinous infiltration of 6 mL of PRP (8.105 platelets/mm<sup>3</sup>, almost no red or white blood cells) after disinfection but without local anaesthetic. Immediately following the infiltration, local cryotherapy was performed for 15 minutes. NSAIDs were avoided, but class-1 or -2 pain-killers were authorised if necessary. A standardised sub-maximal eccentric rehabilitation should have been started 1 week after. However, the patient experienced local swelling with erythema, increased heating and pain which appeared just underneath the patella, but without biological inflammatory syndrome. A great Doppler signal in a thicker patellar tendon was observed by US, but there was no sign of local infectious disease demonstrated by either CT or MRI. However, the local inflammation did not decrease after a progressive 3-week treatment of local cryotherapy, local and oral NSAIDs and colchicine 1 mg. Thus, an insidious infection was suspected, even though there was neither evidence of biological inflammatory syndrome nor sign of infectious lesion on imagery examination. An antibiotic therapy (rifampicine 600 mg + minocycline 100 mg) was initiated for 3 months. Finally, a 3-phase bone scintigraphy suggested the presence of a complex regional pain syndrome type 1 treated by a classical physical therapy and concomitant class-2 pain killers. The evolution was favourable after 6 months of symptomatic treatment, and the pain decreased to a level similar to that before the infiltration of PRP. Discussion/Conclusions: This case report draws attention to potential side effects that are linked to this new therapy by infiltration of platelet rich plasma in case of tendinopathy, in particular when used in patients with type 1 diabetes. Thus, the balance between benefits and risks must be carefully evaluated before using this treatment in patients with type 1 diabetes. Reference: Platelet-rich plasma application in the management of chronic tendinopathies.

**PP-13-197****LE SPORTIF BLESSE: QUEL ACCOMPAGNEMENT PSYCHOLOGIQUE POUR SA REPRISE SPORTIVE?**B. HAFSAOUI<sup>1</sup>, N. BOUDJELTHIA<sup>1</sup><sup>1</sup>Université Hassiba Ben Bouali, CHLEF, ALGERIA

La blessure se définit comme « un état ressenti qui garde l'athlète à l'écart des séances et des compétitions pendant au moins un jour après l'incident et qui implique une attention médicale ou des soins autres que la simple application de glace ou de strapping » (Noyes et al, 1988).

Par conséquent, elle peut être considérée par les athlètes comme une perte de temps pour s'entraîner et/ou engendrer diverses réactions plus ou moins néfastes selon le sportif blessé, tels qu'un sentiment de frustration, d'isolement, de peur de ne pas revenir à niveau, de mettre fin à une carrière sportive...

Dans la mesure où la blessure est quasiment incontournable dans la vie d'un sportif et donc, que la probabilité de se blesser pour un sportif est relativement élevée, il faut savoir l'anticiper et la surmonter (Boutineau, 2005).

Les activités physiques et sportives exposent les pratiquants à un risque élevé de blessures (Van Mechelen, 1997). Une étude menée aux Etats-Unis a montré que près d'une personne

sur six se blesse chaque année en pratiquant une activité physique (Ballard, 1996). Au delà des douleurs ressenties au moment et à la suite de leur occurrence, ces blessures entraînent des baisses d'estime de soi ou l'émergence de troubles dépressifs (Brewer et al. 1995).

Plusieurs auteurs ont ainsi démontré l'importance d'un accompagnement psychologique dans les cas de blessures lourdes (rupture des ligaments croisés, fractures) et ce quelque soit le niveau de pratique sportive (Hare et Evans, 2008). Un soutien psychologique donc est presque toujours nécessaire, même si la nécessité d'un suivi par un psychologue est plus exceptionnelle.

La blessure sportive si elle n'est pas bien prise en charge peut confronter l'athlète à un certain nombre de difficultés: à l'incapacité physique, et à l'affectation de l'image de soi qui lui est associée, peuvent effectivement s'ajouter certains troubles psychologiques d'ordre émotionnel ou motivationnel. L'entraîneur se trouve alors dans une position délicate et il n'a pas toujours les moyens de répondre efficacement aux besoins de l'athlète (Fournier et al. 2001).

L'objectif de notre étude est de montrer comment surviennent les blessures sportives?, quelles sont les réactions psychologiques de la blessure sportive ?, quelle prise en charge pour ces sportifs, et enfin quel rôle de la psychologie sportive dans la réadaptation et la récupération pour un sportif blessé surtout les blessures lourdes (rupture des ligaments croisés, fractures, lésions) ?

**MOTS CLÉS:** Blessure sportive, accompagnement psychologique, soutien psychologique

**PP-13-197 – ENGLISH VERSION****PSYCHOLOGICAL SUPPORT (CARE) USED FOR AN INJURED SPORT MAN TO RETAKE HIS SPORT CAREER?**B. HAFSAOUI<sup>1</sup>, N BOUDJELTHIA<sup>1</sup><sup>1</sup>Université Hassiba Ben Bouali, CHLEF, ALGERIA

The injury is defined as: «the state in which an athlete is kept far from his sport sessions and competitions for at least one day after the accident occurred, the athlete must be under medical supervision or must have simple body care using ice or strapping» (Noyes and al, 1988).

Consequently, it is considered as a waste of time to not train because of the sport injury, especially that the athlete has that feeling of frustration, isolation and fears if not have the first level or makes an end to his /her sport career.

In measuring the injury is nearly underground in the life of a sport man so the probability of the injury for a sportsman is relatively raised, we must know the event and how to overcome it (Boutineau, 2005).

The physical and sport activities which must be done by an athlete expose a high risk to raise the level of the injury (Van Mechelon, 1997). Studies occurred in the united state of America show that persons from 6 are injured each year when practising a physical activity (Ballard, 1996). Taking into consideration pains felt during and after the accident which reduce self confidence and brought psychological troubles (Brewer and al, 1995).

Lots of authors show the importance of the psychological side in cases of hard injury (...Breakdown). And whatever the level of sport practise (Hare & Evans, 2008) psychological support is needed always in cases of injury even if the psychologist care is more exceptional.

The injury if it is not well controlled it may cause difficulties for an athlete; sport incapability, the influence of the self image of an athlete, may effectively add certain psychological troubles of emotional and motivating order. The trainer so is found in a serious position; he has no means to respond to the needs of the athlete. (Fournier and all, 2001).

The objective of our studies is to show comments on the sport injury?

What are the psychological reactions of the sport injury? How do we take care of injured sportsman? And finally what is the role of psychological care in the readaptation and recovering for an injured athlete especially in hard cases (break down ...)

## PP-13-198

### LUTTE CONTRE LES TROUBLES MUSCULO SQUELETTIQUES (TMS) PAR L'ACTIVITE PHYSIQUE ET SPORTIVE

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Sur une proposition des salariés de RTE (Réseau Transport Electricité filiale de ERDF) il m'a été demandé d'instaurer des séances de kinésithérapie. Ces séances sont basées sur le volontariat et ont été ouvertes dans un premier temps à l'équipe ligne, c'est-à-dire aux personnels ayant en charge l'entretien et la mise en place des lignes haute tension. Ce service de 20 salariés déplore 4200 heures d'arrêts de travail par an pour TMS. 12 à 14 personnes sont présentes, une séance d'une heure une fois par semaine.

La séance type comprend:

- Echauffement 5 mn.
- Travail proprioceptif (équilibre) 10mn.
- Etirement 15 mn.
- Gainage musculaire du rachis 15 mn.
- Travail abdominal 10 mn.
- Retour au calme 5 mn.

Au début de l'étude puis après quelques mois d'activité, nous avons testé sur le plan masso-kinésithérapique la souplesse et la force des membres inférieurs et du rachis lombaire.

Les résultats sont très probants puisqu'ils laissent apparaître non seulement un gain de souplesse et de force mais également une diminution (voir disparition) des douleurs lombaires dans un grand nombre de cas ainsi qu'une sensation de « mieux vivre » son dos pour 90%.

D'autre part, depuis 2010 aucun arrêt de travail pour lombalgies n'a été à déplorer au sein du GET Poitou Charentes RTE. Devant de tels résultats nous avons ouvert cette prise en charge kinésithérapique à tout le

personnel (100 personnes), toujours sur la base du volontariat. Pour les personnels administratifs, l'attention se porte plus sur la ceinture scapulaire et les membres supérieurs de manière à protéger au mieux le rachis cervico-dorsal et à lutter contre le risque d'avoir « le regard prisonnier du secteur de travail » (ordinateur). A ce jour, 70% des salariés du GET Poitou Charente du RTE sont volontaires et désireux de poursuivre cette expérience.

L'aspect convivial, communautaire et régulier de cette activité individuelle pratiquée en groupe permet de donner du sens à un projet commun de prise en charge globale vis-à-vis de la sécurité au travail et des troubles musculo-squelettiques. Il apparaît également une meilleure communication au sein des différents services certainement dû au fait de pratiquer de façon collégiale une activité sportive.

Sur le plan budgétaire, l'entreprise doit prendre à son compte l'heure de travail pendant laquelle le salarié n'est pas à son poste ainsi que la prise en charge du formateur. En contrepartie, la diminution du nombre d'arrêts de travail, et surtout la diminution du montant de la cotisation Sécurité sociale concernant les risques liés aux accidents de travail permettent bien souvent à l'entreprise de réaliser à moyen terme la diminution des charges. (Notion d'utilité sociale de ce travail)

Devant l'efficacité et les résultats obtenus il est envisagé, au sein de RTE, d'étendre ce type de travail sur le plan national.

### PP-13-199

## BROCHAGE PERCUTANÉ DU POIGNET DANS LES ACCIDENTS DE SNOWBOARD

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Les auteurs présentent une étude rétrospective de 50 patients ayant bénéficié d'une ostéosynthèse du poignet par brochage percutané, de novembre 2012 à mars 2013.

Tous présentaient une fracture déplacée du radius distal et/ou de l'ulna distal lors d'un accident de snowboard.

La moyenne d'âge était de 31 ans (14 à 50 ans), il s'agissait de 32 femmes pour 28 hommes et le recul moyen à la révision était de 9 mois (2 à 18 mois).

Le bilan radiographique pré-opératoire comprenait uniquement des clichés du poignet de face et de profil. Un testing dynamique sous fluoroscope et sous anesthésie locorégionale complétait systématiquement ce bilan, à la recherche d'une instabilité scapho-lunaire, triquetro-lunaire, radio-carpienne et radio-ulnaire distale.

Selon la classification de Laulan, on dénombrait 28 fractures du radius métaphysaires, 9 épiphysaires, 3 ulnaires et 10 impliquant le radius et l'ulna.

4 patients ont bénéficié en plus d'un brochage scapho-lunaire et un patient d'un vissage percutané du scaphoïde. 3 patients ont eu les deux poignets fracturés, mais un seul côté opéré.

48 patients ont été opérés quelques heures après le traumatisme, 2 patients le lendemain, tous sous anesthésie loco-régionale. Le séjour a été en ambulatoire dans 46 cas.

La technique opératoire utilisait des broches de 1.4 à 1.8 mm de diamètre intra focales, associées à des broches épiphysio-métaphysaires et parfois épiphysaires.

39 patients ont été revus dans notre centre, 7 dans un centre différent, 4 ont été perdus de vue. A la révision, étaient notées les amplitudes articulaires, la force de serrage ainsi que le score DASH.

Les résultats ont montré un déficit moyen de flexion du poignet de 10 degrés (0 à 30), d'extension de 10

degrés (0 à 30), de supination de 5 degrés (0 à 20) et de pronation de 8 degrés (0 à 20). La force de serrage moyenne évaluée au Jamar était de 88% par rapport au côté non opéré. Le DASH moyen était de 3.

Les complications ont été : 3 dysesthésies de la branche sensitive du nerf radial spontanément résolues, 12 sepsis superficiels sur broche, 2 syndromes douloureux régionaux complexes, et une rupture du tendon de l'Extensor Pollicis Longus.

Les résultats de cette série nous encouragent, à l'époque où la place de l'ostéosynthèse par plaque vissée prend une importance croissante, à continuer de proposer ce type d'ostéosynthèse chez le sujet jeune victime d'une fracture déplacée du poignet en snowboard. Les fractures articulaires du radius à plus de 3 fragments ainsi que les fractures à déplacement antérieur n'entrent pas, pour nous, dans les indications du brochage percutané.

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