SEMMELWEIS UNIVERSITY
**FACULTY OF PHYSICAL EDUCATION AND SPORT SCIENCES**

# THE 21ST INTERNATIONAL CONGRESS ON SPORT SCIENCE FOR STUDENTS

INTERNATIONAL CONGRESS XXI ON SPORTS SCIENCES FOR STUDENTS
Budapest Hungary

Hungary, Budapest
April 10-12 2014

Dear Colleagues, Students and Friends!

Our Conference is the hallmark of young sports scientist coming from many countries, and a hopeful investment in the future of sport science. If you have never attended or presented at our Congress, you can hardly imagine the international spirit and vitality of the sessions.

The Program Committee has prepared a very exciting program, and secured excellent speakers from three continents to make this Congress unique. The volume of information that will be presented over three days will be tremendous.

Come to the Congress, and take home an exceptional amount of scientific information to utilize with your associates. Become a part of the international experience that is this Congress.

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*Vice Dean for Science*

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Dr. Gyöngyi Szabó Földesiné professor *(Semmelweis University, Faculty of Physical Education and Sport Sciences)*
Dr. Bert Taylor professor *(University of Western Ontario, Canada)*
Dr. József Tihanyi professor *(Semmelweis University, Faculty of Physical Education and Sport Sciences)*

# Program

## Thursday, 10 April 2014

- 12:00
  - » Registration *(Main Building, Room 39)*
  - » Welcome reception for Professors *(Main Building, Room 37)*
- 13:30 Opening ceremony *(Main Building, Room 40)*. The official opening of the Congress by Prof. Zsolt Radák, dean and Prof. István Berkes vice-dean for Science. The cultural program is provided by TF Arts & Culture Group
- 14:00 Professors' day
- 19:00 Budapest at night by bike

## Friday, 11 April 2014

- 8:00 Rooms are open for participants. Registration *(Main Building, Room 39)*
- 9:00 Human Kinesiology & Physical Exercise Therapy Section *(Main Building, Room 40)*
- 10:30 Exercise Physiology Section *(Main Building, Room 40)*
- 12:30 Lunch at the Student Hotel
- 14:00 Rooms are open for participants
- 14:30 Sections for undergraduate students
  - » Social Sciences and Sport Management Section *(Main Building, Room 40)*
  - » Physical Activity in School and during Recreational Time Section *(Main Building, Room 37)*
- *Coffee break*
- 16:00 Motor Learning Section *(Main Building, Room 40)*
- 19:00 Reception Dinner at Fotex House, 1st floor, auditorium *(Budapest, XII., Nagy J. street 12.)*. The cultural program is provided by TF Arts & Culture Group.

## Saturday, 12 April 2014

- 8:00 Rooms are open for participants
- 9:00 Human Kinesiology & Exercise Physiology Section for PhD Students *(Main Building, Room 40)*
- 11:30 Closing ceremony *(Main Building, Room 40)*
- 12:30 Banquet *(Main Building, Room 42)*
- 14:00 Cultural program, sight-seeing in the Castle district (facultative)

# Sections and presentations

## Thursday, 10 April 2014

**14:00 Professors' day** *(Main Building, Room 40)*

1. Dr. Catherine E. Casey (Canada): Physical Education systems in Canada and the United States
2. Dr. Karsten Forberg (Denmark): New knowledge of fitness and its relations to health and learning outcomes
3. Dr. Csaba Nyakas (Hungary): Life-long exercise and the functional cognitive capacity of the brain
4. 10 minutes break
5. Dr. Dong-Ho Han (USA): Exercise induced adaptation of skeletal muscle
6. Dr. Kazuhiko Higashida (Japan): Effect of exercise training on lipid droplet-associated proteins in skeletal muscle
7. 10 minutes break
8. Dr. Bert Taylor (Canada): The effects of exercise on the major diseases of aging
9. Dr. Mitsuru Higuchi (Japan): Effects of polygenic risk and aerobic fitness level on metabolic profile in Japanese men

Friday, 11 April 2014

**9.00 Human Kinesiology & Physical Exercise Therapy Section** (Chair: Dr. Karsten Froberg | Members: Dr. Rudolf Mihalik, Dr. Anikó Pósa) *(Main Building, Room 40)*

Opening presentation | Zoltán Heckel: Muscle damage and recovery following two weeks of eccentric-concentric knee extensor training in young versus old humans (PhD Student)

1. Bartha Kincső: Influence of muscle activation level and stored elastic energy on positive mechanical work
2. Mariann Mravcsik: Co-activation of flexor-extensor muscle pairs during cycling arm movements
3. Gábor Montvai, Péter Kőrösi: The effect of homologous muscle stretching on the regulation of contralateral muscle contraction
4. Tamás Dobronyi, Julianna Király: The Evaluation of Familiarization for Bicycle Ergometer in Anaerobic Tests

## Friday, 11 April 2014

**10.30 Exercise Physiology** (Chair: Dr. Dong-Ho Han | Members: Dr. Higuchi Mitsuru, Dr. Andor Molnár) *(Main Building, Room 40)*

1. Lise Søndergård Thomsen: Effect of whey protein hydrolysate on adaptation to endurance training in well-trained runners
2. Anne Kær Thorsen: Acute effects of aerobic exercise on inhibitory control and brain-derived neurotrophic factor in young adults aged 16-19 years: preliminary results
3. Szabó E, Szénási N.: Comparsion of blood and saliva lactate concentration and its modifications by physiological parameters
4. Ágnes Takács, Zsófia Réka Nagy: Carbohydrate sensing in the human mouth: effects on exercise performance and brain activity
5. Laura Bas: Physiological Adaptation of the Heart in Hungarian National Single Canoe and Kayak Athletes
6. Anna Tüske: Age dependence aerobic capacity among young and middle age male
7. Hirokazu Taniguchi: Is irisin really an exercise-induced myokine?

Friday, 11 April 2014

**14.30 Social Sciences and Sport Management** (Chair: Dr. Gyöngyi Szabó Földesiné | Members: Dr. Gábor Géczi, Dr. Melinda Bíró) *(Main Building, Room 40)*

Opening presentation | Bálint Dolnego: The Football Referee Academy's Team's Longitudinal Study of Physical Preparedness (PhD student)

1. Veronika Vojtkó: Change of African American Participation in Modern Summer Olympic Games
2. Lilla Németh, Bence Bagó: Traditional but unpopular - The social representation of fencing and its impact on choosing among sports
3. Brigitta Fanni Hegyi: Motivational background of professional athletes' tattoos
4. Vivien Váczi, Bence Bagó: "Why did you give up?" - Narrative approach of fencers' dropout
5. László Mohácsi, Norbert Gura: Organizational culture and leadership behaviour among professional and amateur basketball and football organizations
6. Zsombor Zilinyi: The impact of the youth European Championships on basketball players sports career
7. Dóra Almási: Leadership efficiency research on Southern Plains teams
8. Krisztina Tóth, Kornél Boros, Erika Boros: Presence of eating disorders among female handball players and aesthetic sport competitors
9. Zsolt Ákos Jozefiák: Resting alpha brain-wave activity in male athletes: comparison with HRV values and cognitive performance

Friday, 11 April 2014

**14.30 Physical Activity in School and during Recreational Time** (Chair: Dr. Caterina Casey | Members: Dr. László Balogh, Dr. Zsolt Murlasits) *(Main Building, Room 37)*

Opening presentation | Nikoletta Nagy, Péter Szájer: Study of motivation of the leasure time swimmers

1. Tamás Csörgő: Effects Of Massage Therapies On Women Over Sixty Years
2. Marcell Mikolai: Friluftsliv forever / Develop Koppány Valley areas by Frilftsliv parks
3. Ágnes Badár: Sauna as a way of effective leisuretime activity
4. Gergő Gabnai, Aaron Fischer: Research on Young People's Leisure around the World
5. Anna Szabó: Role and movement quality imagery as a facilitator of flow for dancers
6. Bence Török: Comparsion of the Physical Education and Interscholastic Sport System in the USA and in Hungary
7. Gábor Horváth: The acknowledgement of Physical Education teachers, peer support and healthy lifestyle
8. Jakob Tarp: Associations between objectively measured physical activity levels and executive functions in Danish 12-14 year old adolescents – baseline findings from the Learning, Cognition and Motion (LCoMotion) cluster-randomized controlled trial
9. Fanni Sipos, Dóra Vilhelm: Relationship between the objectively measured physical activity in school and FMS scores

Friday, 11 April 2014

**16.00 Motor Learning** (Chair: Dr. József Tihanyi | Members: Dr. Miklós Bánhidi, Zoltán Marczinka) *(Main Building, Room 40)*

1. Gergely, Kiss: New distance, new perspective in education of the canoe technique
2. Zsolt Kisszékelyi: Developing karate techniques through gymnastics skills
3. Motoki Inoue: The study of Shooting play of pivot players in Handball
4. Maiko Nakahara, Hiroshi Aida: Characteristics of the center back player's attacking-play in Handball
5. Yuki Ito, Hajime Fujimoto, Eiko Yamada: World top-level men center back players scoring ability in handball - Focusing on two players, Nikola Karabatic and Dalibor Doder
6. Márton Bognár: Exemination of a Hungarian Elite Football Academy Players' Conditional Abilities
7. Arnold Nagy: The exercise intensity of Hungarian A-level motocross athletes

Saturday, 12 April 2014

**9:00 Human Kinesiology & Exercise Physiology for PhD students** (Chair: Dr. Bert Taylor | Members: Dr. Higashida Higuchi, Dr. István Berkes) *(Main Building, Room 40)*

1. Renáta Szabó: The effect of recreational exercise, caloric restriction, and high triglyceride diet in experimental menopause
2. Éva Boros: The expression profile of TAM and NLR receptors upon physical activity in TNBS-induced colitis in rats
3. Gergő Pintér: Enzyme activity, lipid peroxidation and amino acid level in smokers and non-smokers after a 6-week long β-alanine rich diet
4. Alexandra Cselkó: Performance Changes of Prepubertal female handball players after 8 weeks of aerobic training
5. Melitta Pajk: Training-Induced Differences In Mitochondrial Biogenesis In Rat Testicular Tissue
6. Takamasa Tsuzuki: Changes in stress protein expression in skeletal muscle before the onset of metabolic abnormalities in type 2 diabetic rats
7. Ryoko Kawakami, Susumu S. Sawada, Munehiro Matsushita, Takashi Okamoto, Koji Tsukamoto: Dynapenic Abdominal Obesity and the Prevalence of Type 2 Diabetes: A Cross-Sectional Study among Japanese Men (poster)
8. Elisa Grazioli: Physical Activity And Cancer Survivors: A Combined Training Protocol (poster)

# Details

# Professors' day (keynote lectures)

**Dr. Csaba Nyakas** (Research Institute of Sport Sciences, Semmelweis University, Budapest, Hungary)

**Life-long exercise and the functional cognitive capacity of the brain**

Exercise physiology and exercise medicine by nature serve prevention, rehabilitation, and also healthy aging which is becoming a rapidly demanding need. To increase functional capacity of the brain in aged individuals long-term exercise and sport of moderate intensity merit consideration. Using animal model, the life-long (L-L) moderate intensity exercise training was introduced from young adult age and kept regularly up to 24 months of age (the human equivalent of that age is around 70 years). At the old age of 24 months cognitive functions like attention and spatial learning were studied. As the background brain functional reserve the cholinergic brain, neurotrophic factors (BDNF), neurogenesis and the markers of neuronal bioenergy capacity (glucose transporter 1, MAPK and Akt phosphorylation) were followed. The results showed that the L-L exercise improved attention and spatial learning, attenuated the decline of hippocampal cholinergic capability and also that of neurogenesis. The concentration of brain derived neurotrophic factor (BDNF) increased, and the expression of capillary glucose transporter 1 did the same in the hippocampus. MAPK and Akt phosphorylation markedly enhanced. Thus, the most support of L-L exercise could be obtained in the energetic cellular reserve of neurons of aged rats compared to the sedentary controls. The concept is supported that continuous exercise preferably throughout the entire lifespan is preventive and supportive on the healthy brain aging condition.

**Dr. Dong-Ho Han** (Division of Geriatrics and Nutritional Sciences, Department of Medicine, Washington University School of Medicine in St. Louis, USA)

**Endurance Exercise Induces Rapid Decreases in Glycogenolytic / Glycolytic Enzymes in Skeletal Muscle**

Background: Endurance exercise activates PGC-1α and results in increases in mitochondria and endurance.
Results: One exercise bout induced a PGC-1α-mediated downregulation of glycogenolytic-glycolytic enzymes with a slowing of muscle glycogenolysis.
Conclusion: Exercise downregulates muscle glycogenolysis prior to an increase in mitochondria or change in fiber type.
Significance: Rapid downregulation of the glycogenolytic-glycolytic pathway resulting in glycogen sparing is a previously unknown function of exercise and PGC-1α
Abstract Endurance exercise training can induce large increases in the ability to perform prolonged strenuous exercise. The major adaptation responsible for this increase in endurance is an increase in muscle mitochondria. This adaptation occurs too slowly to provide a survival advantage when there is a sudden change in the environment that necessitates vigorous, prolonged exercise. In the present study, we discovered another, more rapid adaptation, a downregulation of expression of the glycogenolytic and glycolytic enzymes in muscle that mediates a slowing of muscle glycogen depletion and lactic acid accumulation. This adaptation, which appears to be induced by PGC-1α, occurs in response to a single exercise bout and is further enhanced by two additional daily exercise bouts. It is biologically significant, because glycogen depletion and lactic acid accumulation are two of the major causes of muscle fatigue and exhaustion.

**Dr. Kazuhiko Higashida[1], Dr. Mitsuru Higuchi[1, 2]** ([1]Faculty of Sport Sciences, Waseda University, Japan, [2] Institute of Advanced Active Aging Research, Japan)

**Effect of exercise training on lipid droplet-associated proteins in skeletal muscle**

Fat is one of the main fuel for producing ATP in skeletal muscle during endurance exercise. Although most of fat in the body is stored in subcutaneous and abdominal adipose tissue, small amount of fat is also stored in skeletal muscle as lipid droplet. Endurance exercise training increases lipolytic capacity and fat utilization in skeletal muscles. This adaptation results from upregulation of proteins involved in lipolysis, such as adipose triglycerol lipase (ATGL), hormone sensitive lipase (HSL) and perilipin 5. However, the molecular mechanisms of how exercise modulates lipid-associated proteins are unclear. Therefore, the purpose of this study was to elucidate the mechanisms underlying endurance exercise-induced lipid-associated proteins in rat skeletal muscles. A bout of 3-h swimming exercise increased lipid-associated proteins (ATGL, HSL and perilipin 5) in rat epitrochlearis muscle. However, there was no significant increase in these proteins in soleus muscle. Phospho-AMPK protein content in epitrochlearis muscle significantly increased immediately after swimming exercise, but not in soleus muscle. These results led us to hypothesize that AMPK is involved in exercise-induced increases in lipid droplet-associated proteins in skeletal muscle. Incubation with 0.5 mM 5-aminoimidazole-4-carboxamide ribonucleoside, an AMPK activator, for 6 h significantly increased the mRNA expression levels of lipid droplet-associated proteins in epitrochlearis muscle. Finally, we examined the effect of very high intensity exercise training on lipid droplet-associated proteins in skeletal muscle, since high intensity exercise has a greater effect on AMPK activation than endurance exercise. Consequently, we found that short (only 280 s),

extremely high intensity exercise training induces expressions of ATGL, HSL and perilipin 5 protein in skeletal muscle to a level comparable to that attained after 3-h endurance training. These results suggest that activation of AMPK is involved in exercise-induced increases in lipid droplet-associated proteins in skeletal muscle.

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**Dr. Mitsuru Higuchi[1, 2] Dr. Kumpei Tanisawa[3]** ([1]Faculty of Sport Sciences, Waseda University, [2]Institute of Advanced Active Aging Research, Waseda University, [3]Graduate School of Sport Sciences, Waseda University)

**Effects of polygenic risk and aerobic fitness level on metabolic profile in Japanese men**

Adverse metabolic profiles such as blood lipid abnormality, impaired glucose tolerance, and abdominal obesity increases the risk for cardiovascular diseases and type 2 diabetes. Individual variability of the metabolic profiles are determined by a combination of several genetic factors, while high cardiorespiratory fitness (CRF) is associated with favorable metabolic profiles and reduced risk for various metabolic diseases. However, it remains unknown whether physically active individuals can reduce their genetic risk for adverse metabolic profiles. Furthermore, it has been suggested that the relationship between genetic factors and the metabolic profiles differ by age. We therefore performed a cross-sectional study to determine whether CRF and aging modify the relationships between polygenic risk and the metabolic profiles. CRF was assessed by measuring maximal oxygen uptake (VO2max) in 181 Japanese men (age, 20–79 years), and subjects were divided into low and high CRF groups according to the measured VO2max values. We genotyped the single nucleotide polymorphisms (SNPs) previously

identified to be associated with blood lipid levels, glucose tolerance and body mass index (BMI) in the recent genome-wide association studies. Based on these SNPs, genetic risk scores (GRSs) for each trait were calculated by adding the number of risk alleles, and subjects were divided into the low, middle and high GRS groups. Two-way analysis of covariance (GRS × CRF or age) revealed that serum triglyceride levels of low CRF individuals were higher in the high and middle GRS groups than in the low GRS group, whereas no differences were detected in the triglyceride levels of high CRF individuals among the GRS groups. In contrast to blood lipid levels, there was no significant interaction effect between GRS and CRF on glucose metabolism; individuals with higher GRS had higher HbA1c and lower β-cell function than the individuals with lower GRS regardless of the CRF levels. Furthermore, several indicators of body fatness such as BMI, total abdominal fat area and visceral fat area were higher in the high GRS group than in the low GRS group only in the middle-aged individuals, whereas these indicators were not different between the GRS groups in the elderly. These results suggest that the relationship between polygenic risk and the metabolic profiles can be modified by CRF and age.

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**Dr. Catherine E. Casey** (Department of Curriculum, Teaching and Learning, Faculty of Education University of Manitoba, Canada)

**Physical Education systems in Canada and the United States**

The focus of the presentation is to highlight important aspects of University/College PE programs in both Canada and the United States. Although this is not intended to be a comparison of the two systems, there are places of intersect that will be explored. What is of note and certainly a point of disconnect between the two countries is the defini-

tion of a "qualified" PE teacher. In Canada, one must attain an undergraduate degree prior to application for a Teacher Education program. One must have successfully attended a Teacher Education Program prior to receiving a teaching certificate. One is not permitted to teach without this certification. This is not always the case in the United States and this will be further explored during the presentation. The evolution of university Physical Education, Kinesiology and Teacher Education programs in both Canada and the United States has been circuitous. Over the past thirty years, we have seen these programs grow and develop into, although narrow in scope, highly specialized and in some cases, prescriptive programs. Kinesiology is an important part of this evolution as it represents a splinter group from the original stand-alone Physical Education program. Today it stands very much on its own and has taken much of the spotlight away from Physical Education. This is especially true at the graduate level in Canadian PE Faculties where enrolment numbers continue to decrease.

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**Dr. Bert Taylor** (University of Western Ontario, Canada)

**The effects of exercise on the major diseases of aging**

Until recently the concept of reaching old age referred to relatively few individuals. As early as 100 years ago the average life span was about 50 years in most industrialized countries, whereas today it approximates 80 years. Medical science and, in particular, exercise scientists utilizing specific training programs for older adults, have made attaining even 100 years of age, no longer a rarity. In fact, in North America and western Europe, the fastest growing population cohort is the group over 85 years of age. Exercise has been found, generally, to ameliorate the debilitating effects of the aging process. All of the major diseases of

aging appear to be positively and beneficially affected by exercise. Exercise alleviates many of the symptoms of cardiovascular disease, Type II diabetes, osteoporosis, osteoarthritis, Alzheimer's Disease, and even certain types of cancer. In most countries, few physicians have any formal training in exercise prescription. The formulation of exercise programs for the aging population can be a complex task, due to the nature of the aging process, and should be left to Kinesiologists and Physical Educators. In North America seniors are being cared for by health care teams, which include these highly trained exercise specialists. Exercise may not be the panacea of all the problems of the aging population but it has been scientifically shown to be a great beneficial aid for healthy aging and improved quality of life for seniors. Exercise, importantly, is also a means to alleviate the ever increasing costs of the health care systems.

# Abstracts

## Human Kinesiology & Physical Exercise Therapy Section

**Zoltán Heckel** (University of Pécs, Faculty of Health Sciences, Doctoral School of Health Sciences, Pécs, Hungary)
Supervisor: Mark Váczi

### Muscle damage and recovery following two weeks of eccentric-concentric knee extensor training in young versus old humans

**Keywords:** ageing, muscle damage, strength training

In the present study we investigated how ageing muscle responds and regenerates in the process of short-term strength training.
**Methods:** Nine physically active elderly (age: 64,5±5,5 years, height: 176,2±8,8 cm, weight: 80,3±10 kg) and nine young males (age: 25,1±4,9 years, height: 17±69 cm, weight: 72,4±17,6 kg) who served as controls participated in the study. The participants performed six training bouts in two weeks. The training bouts consisted of 4 sets of 15 repetitions of eccentric - concentric knee extensions performed on Multicont II computer-controlled dynamometer, of which all had to be done with maximum effort. There were two minutes rest between the sets. Each participant trained the right limb only.
Muscle damage indicators such as maximal isometric voluntary torque (MVC) at 70° of knee angle and rate of torque development (RTD) in the knee extensor muscles were measured before 24h, 48 h, and 1 and 2 weeks after the first exercise bout. In addition, we examined the average torque exerted during the exercise sets. Simultaneously with the muscle strength tests we measured the serum creatine kinase (CK) and myoglobin (Mb) concentrations and evaluated the subjective muscle soreness in the quadriceps.

**Results:** MVC decreased significantly in both groups 24 hours after the first training. The average torque has also significantly decreased at the second training (48h) compared to the first in both groups. Most of the participants reported muscle soreness 24 and 48 hours after the first workout. The CK elevated 24 hours the first training bout in both groups. The current data (the knee extensor force deficit, the muscle soreness, and the elevated CK) in both groups suggests the acute development of muscle damage. The regeneration in the elderly group was slower than that of the young group, however, in contrast with the young, we noticed significant strength gain among the elderly participants at the end of the program.

**Kincső Bartha** (Semmelweis University Faculty of Physical Education and Sport Sciences, (TF), Budapest, Hungary)
Supervisor: Dr. József Tihanyi, Consultant: András Hegyi, Annamária Péter

**Influence of muscle activation level and stored elastic energy on positive mechanical work**

**Keywords:** knee extensors, patellar tendon, EMG activity, ultrasound
**Introduction:** The muscle can produce the highest power during concentric contraction when the activation is the highest at the beginning of the contraction. In addition to the muscular activity the work during concentric contraction is significantly affected by the reuse of the elastic energy stored in the passive elastic components. Our previous studies suggest that the muscle activation level and the elastic energy stored during isometric contraction prior to muscle shortening. collectively influence the positive mechanical work. In the present study we aimed to determine how much is the contribution of the two factors to the mechanical work.
**Hypothesis:** We assumed that the elastic energy stored in the muscle tendon at maximum activation significantly increases the amount of positive work.
**Methods:** 19 young (21.0±1.4 yrs) subjects volunteered in this study. Maximal voluntary isometric contraction (MVC) of the knee extensor muscles was measured at the optimal joint angle for each subject with Muticont II dynamometer. After that they executed concentric contractions with different pre-tension levels from an individually optimized angle to full extension. The pre-tension levels were set at 20, 40, 60, 80 and 100% of MVC and had to be reached those in two different ways: as quickly as possible (F) and with no time constraint (S). EMG activity was also recorded from the vastus lateralis and vastus medialis muscles in each task. Using Hitachi ultrasound device the

patellar tendon length was measured and length change was calculated to determine the amount of elastic energy stored in the patellar tendon (PT). The amount of the positive work was calculated with integration of the torque and angle change (Wp). Mean and standard deviation were calculated. Mann-Whitney's U test was used to compare the means. The relationship between variables was examined with Pearson product correlation analysis (Statistica 11.0). The level of significance was established at ($p < 0.05$

**Results:** When the muscle was fully activated with no pretension Wp (103.5± J) was 31.1% less than Wp (150.3± J) calculated at maximum pretension ($p < 0.01$). Elastic energy stored in PT linearly increased in a function of the increasing pretension level ($R^2$=0,94). The maximum energy stored in PT was 33.2±3.8 J). There was significant linear relationship between pretension level and work done by the muscle during knee extension ($R^2$=0.98). EMGrms was almost identical at each pretension level when muscles were maximally activated.

**Conclusion:** Our results demonstrate that although the level of the muscle activation significantly affects the positive work of the muscle, 30% of the total energy used during concentric contraction can be account to the elastic energy stored in PT. When the tendon's elongation is small (low pretension level) the maximum activation of the muscle can compensate the low elastic energy usage.

**Mariann Mravcsik** (Semmelweis University Faculty of Physical Education and Sport Sciences (TF), Budapest, Hungary)
Supervisor**:** Dr. József Laczkó

**Co-activation of flexor-extensor muscle pairs during cycling arm movements**

**Keywords:** co-activations, arm cycling
**Background:** For people with movement dysfunctions, special rehabilitation methods might be used to restore lost motor functions. Arm cycling on an ergometer is an important medical rehabilitation procedure for many individuals who have suffered a stroke or a spinal cord injury. If crank resistance increases in the ergometer than greater total muscle work is required from the cycler. This might be ensured by changing the co-activation of flexor-extensor muscles and/or by increasing individual muscle forces. We hypothesized that if crank resistance is increased, then the size of the range of angular crank positions where flexor and extensor muscles co-activate does not change and the sizes of these ranges do not differ comparing the two arms. I checked these hypotheses for able bodied individuals.
**Methods:** Kinematic data and electromyograms (EMG) were recorded from 17 right-handed able-bodied participants who performed cycling arm movements on a stationary ergometer (MEYRA). Ten cycles were recorded for each participant in several cycling conditions: cycling with two and one arm against low, medium and high resistance conditions(RC) and with 2 grasping modes(horizontal and vertical). Surface EMGs of Biceps(BI), Triceps (TR), Delta Anterior(DA) and Delta Posterior(DP) muscle groups were recorded with a ZEBRIS (Isny, Germany) movement analyzer system (sampling frequency 1000Hz). ZEBRIS recorded the positions of the markers placed on the arm and on the crank of the ergometer (100Hz). Own developed MATLAB and EXCEL programs processed data. A muscle was considered active

when its EMG amplitude exceeded 35% of its average obtained in a given cycling condition(Ozgunen et al. 2010). Crank direction(crank angle respect to the vertical direction) was computed from coordinates of markers placed on the crank of the ergometer and on the hand of the participant. Muscle co-activation was quantified by the range of crank angles in which a flexor-extensor muscle pair(BI-TR or DA-DP) was simultaneously active. Student's t-tests($p<0,05$)were conducted to compare the size of co-activation ranges (SCR) under different cycling conditions.

**Results:** 1)SCR did not differ significantly between different resistance conditions (low-medium),(medium-high). 2)There was no significant differences in SCRs assessed from the two arms. 3)The mean EMG amplitudes for BI, TR and DP were significantly larger in high compared to medium RC for the dominant arm in bimanual and for both arms in unimanual cycling, and it was larger in medium than in low RC except in unimanual cycling by the dominant arm.

**Discussion:** In bimanual tasks, the neural control of the dominant arm is expected to be responsible for controlling the movements and adapt to external resistances by adjusting the size of the ranges where flexor-extensor muscles co-activate. However, our results suggest that arm cycling on an ergometer requires muscle work that is raised against increased crank resistance by increased individual muscle activities(EMG amplitudes) without reducing the size of co-activation range. Thus, arm cycling offers an ideal rehabilitation strategy when strengthening is the aim of the training.

**Gábor Montvai, Péter Kőrösi** (Semmelweis University, Faculty of Physical Education and Sport Sciences (TF), Budapest, Hungary)
Supervisor: János Négyesi,
Consultant: prof. Dr. József Tihanyi

## The effect of homologous muscle stretching on the regulation of contralateral muscle contraction

**Keywords:** quadriceps femoris, neural and spinal drive
**Abstract:** During maximal isometric contractions, the sum of forces exerted by homonymous muscles unilaterally is notably larger than the sum of forces exerted by the same muscles bilaterally. This phenomenon is known as the bilateral strength deficit and it is suggested that this deficit was due to neural inhibition. According to the assumptions the reason of this difference can be mediated by supraspinal mechanisms or by reflex pathways at the level of spinal cord. Our research aims to study if one side of homologous muscle stretching in different speed have a significant effect on the contraction's torque-time and electrical activity (EMG) variables of homologous contralateral muscle.
**Hypothesis:** We assumed that if the stretching of the homologous muscle on one side effected the tension of the contralateral muscle, it is mediated at the level of the spinal cord, especially when the muscle stretch occurs with high speed.
**Methods** We examined 18 (6men, 12women) regularly trained university student on Multicont II dynamometer during maximal isometric ($M_{IC}$) contraction at the angle of 60° and during eccentric contractions between 60° and 90° ($M_{EC}$). Both settings were carried out unilaterally (UL) and bilaterally (BL) by the knee extensor muscles. Afterwards, our subjects performed isometric contractions with their left leg at 60° followed by the isometric contraction of the right leg then the eccentric contraction at a constant speed of 30 and 300°/s. In our third experimental setting the simultaneous isometric contractions of the left

and the right knee extensors was followed by the eccentric contraction of the right muscle. From the torque-time curve several torque and time variables were selected for comparison. The electrical activity of the vastus medialis, vastus lateralis and biceps femoris were recorded by a telemetric EMG divice (Noraxon). We established the differences between averages with Student T-test and the relationship with correlation matrices. We have set the p-value at 5% ($p \leq 0,05$).

**Results:** UL Mic was significantly ($p=0,049$) higher (455.4±121,8 Nm) than the BL $M_{IC}$ (388.8±113.7 Nm). $M_{EC}$ at UL and BL conditions (554.7±161.0 Nm and 519.6±122.6 Nm) did not show significant difference. UL/BL ratio in IC (1.18) was significantly higher ($p=0.029$) than at EC (1.07). The isometric torque of the left leg decreased significantly during the subsequent isometric contraction of the right leg (30°/s: 201.1±59.2 vs 146.3±48.1; 300°/s: 200.1±67.3 vs. 149.0±12.0). The stretch of the right leg did not effect on torque of the left leg. The maintained isometric contraction of the left leg increased the eccentric torque of knee extensors on the right foot. The greatest enhancement (92%, $p<0,001$) was measured at the speed of 300°/s.

**Conclusion**: Our research suggests that the stretch of the contralateral muscle does not cause inhibition on the homologous muscle neither on cortical nor on the spinal level. At the same time unlike our expectation the isometric contraction of the homologous muscle stimulates the eccentrically contracting contralateral muscle, which can be affected by both cortical and spinal mechanism.

**Tamás Dobronyi, Julianna Király** (Semmelweis University, Faculty of Physical Education and Sports Science (TF), Budapest, Hungary)
Supervisor: Zsolt Radák
Consultant: Masaki Takeda

## The Evaluation of Familiarization for Bicycle Ergometer in Anaerobic Tests

**Keywords:** familiarization, ergometer, anaerobe

**Introduction:** It is extremely common to perform a sport movement which is intensive and anaerobic, whether it is a short-term event, or a team sport where aerobic and anaerobic phases alternate. In sport science there is a natural need to enhance performance, while observing the physiology of anaerobic muscle work, which can be easily analyzed by anaerobic tests. Most test results of exercise physiology depend on several factors, such as motivation or the level of experience of the subjects in the particular test. During research the number of distractions should be reduced or eliminated altogether. In case of a longitudinal study, the possibility of familiarization increases, which is the habituation of the subjects to the test conditions. With its help, habitual performance improvement can be isolated. The present study was part of a research, which investigates the effects of a zeolite product on lactate level and/or anaerobic performance, thus it was important to be able to differentiate between the effect of the drug and the performance improvement resulting from practice.

**Hypothesis:** We assumed that during familiarization it is sufficient to perform the test four times to exclude the performance improvement resulting from familiarization.

**Materials and Methods**: In our study, 10 young adults (n = 10 , m = 22.6 ± 3.5 years), who are not practicing competitive cycling, were tested. The test sample is not based on probability but on persons who were easily accessible. The participants carried out the anaerobic cycling

test four times on a Kettler E3 ergometer. After a specified warm up period, the task was to maintain a maximal voluntary release of 400 Watt power, with verbal encouragement. Accordingly, performance improvement means that the task was carried out for a longer time period. For statistical analysis of the data Statistica 11 for Windows (Stat-Soft Inc., 2013) was used. To differentiate between the consecutive tests Repeated ANOVA test was used at a 5% level of significance.

**Results**: Our hypothesis has been confirmed. During testing the results improved. There was no significant difference found between the third and fourth measurement. However, between the first and third measurement a significant difference was detected.

**Discussion:** It follows from the above mentioned data that in our case it is sufficient to perform the test three times to get familiarized with the task. This research will allow the examination of the previously mentioned preparation, performance improvement resulting from habituation to test conditions is excluded by familiarization. However, it is advisable to monitor interference such the elimination of the effects of training. The present study relates to specific conditions, a comprehensive study involving more familiarization or similar research could be helpful in carrying out other test series, however, in such cases monitoring the familiarization process is suggested.

## Exercise Physiology Section

**Lise Søndergård Thomsen** (University of Southern Denmark, Odense, Denmark)
Supervisors: Mette Hansen, Niels Ørtenblad

### Effect of whey protein hydrolysate on adaptation to endurance training in well-trained runners

**Keywords:** Endurance training, sports nutrition, enzyme activity
**Background:** There is limited knowledge about the effect of protein on adaptation to endurance training.
**Purpose:** We aimed to examine effect of carbohydrate plus whey hydrolysate intake vs. isocaloric carbohydrate before and after each exercise session on endurance performance and mitochondrial adaptation in athletes during six weeks of endurance training.
**Method:** 30 well-trained endurance runners (aged 30,15y +/-8,65; maximum oxygen uptake 60,75 ml $O_2$ $kg^{-1}$/$min^1$ +/- 3,73) participated in a block-randomized controlled intervention trial including six weeks of endurance training. Half of the runners ingested a protein beverage before (0.3 g $kg^{-1}$) and protein-carbohydrate beverage (0.3 g protein $kg^{-1}$ and 1 g carbohydrate $kg^{-1}$) after each exercise session (PRO+CHO). The other half of the group ingested energy matched carbohydrate beverages (CHO). The groups were matched two and two for age, training and performance status and maximal oxygen uptake ($VO_2$max).
Before and after the intervention period a muscle biopsy and blood samples were obtained and the runners performed a $VO_2$max test, a 6 K performance test and had body compositions determined. Each participant kept diary 24 hours before each test to ensure nutritional status was identical before each tests. Food registration diary was obtained for four days in the beginning and end of the intervention period.
**Results:** Performance in 6 K-run test improved from baseline (p=0.001).

No difference in improvement was detected between CHO+PRO and CHO at any time (midway: p=0.68, n=9 matched pairs; after the intervention: p=0.98, n=8 matched pairs). No overall change in $VO_2$max (ml $O_2$/kg$^{1}$/min$^{1}$) was detected during the intervention period (p=0.47) or between the groups (p=0.46). Similarly was observed for $Vo_2$max (L/min) during the intervention period (p=0.30) and between the groups (p=0.48, n=9 matched pairs).

Muscle biopsies will be analyzed for enzyme activity (HAD, CS), gene expression of proteins related to endurance training adaptation (PGC-1-*a* etc.)

**Conclusions:** No difference was observed in $VO_2$max, but an overall improvement in performance was observed in 6 K-run test after six weeks of endurance training. Ingested PRO+CHO beverages before and after each training session did not have any additive effect compared to isocaloric CHO.

More comprehensive conclusions follow when muscle biopsies and blood samples are analyzed.

**Anne Kær Thorsen** (University of Southern Denmark, Institute of Sports Science and Clinical Biomechanics, Centre of Research in Childhood Health, Odense, Denmark)
Supervisor: Lars Bo Andersen, Karsten Froberg

**Acute effects of aerobic exercise on inhibitory control and brain-derived neurotrophic factor in young adults aged 16-19 years: preliminary results**

**Background**: Physical fitness and cognitive function are positively related [1] and Brain-derived neurotrophic factor (BDNF) is thought to play an important role in this regard. Furthermore, studies have demonstrated that executive functions (EF) and plasma concentrations of BDNF can be improved by a single bout of exercise [2, 3]. However, the roles of exercise intensity and duration on the acute effects of exercise on EF and BDNF remain unclear [2].
**Purpose:** The purpose of the present study is to investigate the influence of exercise intensity and duration on the effects of a single bout of exercise on EF and BDNF.
**Method:** The study included 52 young adults (aged 16-19 yr, 23 males, 29 females) and was conducted as a crossover study incorporating one control condition and 5 cycling exercise conditions manipulating exercise intensity (low, moderate and high intensity) and duration (5 and 30 minutes). The control condition consisted of 30 minutes of seated rest. All conditions were randomized and subsequently counterbalanced between subjects. Conditions were conducted with 4 days intervals at the same time of the day. Following each condition blood samples were collected and inhibitory control was evaluated by a modified Flanker Task. Plasma BDNF concentrations will be analyzed in duplicates by AlphaLISA.
**Results:** The results from the Flanker Task and analysis of plasma BDNF concentrations will be available and analyzed prior to the congress.

It is predicted that relative to the control condition, subjects will exhibit greater inhibitory control following each exercise condition. Previous research suggest an inverted U-shaped behavior regarding the influence of exercise intensity on cognitive processing and thus, our hypothesis is that participants show less inhibitory control following low and high intensity exercise compared to moderate intensity exercise. Furthermore, we expect to see dose-response differences in plasma BDNF concentrations both regarding exercise intensity and duration. We expect exercise intensity to be of greater importance compared to exercise duration regarding exercise induced changes in plasma BDNF concentrations.

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**Edina Szabó, Nikolett Szénási** (Institute of Sport Sciences and Physical Education, University of Pécs, Hungary)
Supervisor: Márta Wilhelm
Consultant: Tékus É.

**Comparsion of blood and saliva lactate concentration and its modifications by physiological parameters**

Recently saliva is a popular biochemichal material in sportphysiologycal studies.
The aim of our studies were to investigate how salvia and blood lactate concentrations are retated after a maximal intensity treadmill exercise and to identify the physiological and biochemical factors influencing lactate levels.
In this study the participants were healthy students (n=16, mean age: 22,83±3,09 y). We allocated them into two groups by training hours (athletes and non-athletes). Anthropometric characteristics, body composition and physiological parameters (heart rate, RR-variability) were measured in both groups. Blood and saliva samples were collected before and 1., 4., 8., 12., 15., and 20 mins after the treadmill test. The lactate concentration of the saliva was analyzed in a spectrophotometer, and a lactate analyzer was used with the blood samples.
The studied groups were similar in anhtropometic parameters. In the blood samples we registered the lactate peak at 1. minute in the athlete and non-athletes groups also, after 1. min lactate concentrations decreased. Lactate level changes of saliva were monitored and two lactate peaks were registered in athletes. These peaks didn't appear in non-athletes. Lactate parameters of athletes were always lower compared to non-athletes in both fluids. We found significant differences between blood lactate concentrations ($p_{8min}$= 0,015, $p_{12min}$= 0,018, $p_{15min}$= 0,025, $p_{20min}$= 0,032) in both groups. We found a significant correlation of saliva and blood lactate concentrations after exercise. Furthermore we

found parameters influencing lactate concentrations (spirometric parameters, body fat percentage, fat mass, weight and height).
Stronger correlation was noted between salivary lactate and blood lactate in athletes, than in controls (athletes: r= 0,514, p= 0,000; non-athletes: r= 0,384, p= 0,004).
Finally we can state that the research of the saliva lactate concentration is an effective method to asses fitness level.

**Ágnes Takács, Zsófia Réka Nagy** (Semmelweis University Faculty of Physical Education and Sport Sciences (TF), Budapest, Hungary)
Supervisor: Zsolt Radák

**Carbohydrate sensing in the human mouth: effects on exercise performance and brain activity**

**Key worlds:** rinsing, carbohydrate, brain activity
**Background:** We examined 7 female subjects in our research, who are all students at Semmelweis University. The study was based on an article published in 2009 in the „The Journal of Physiology", where 8 male endurance-trained cyclist were rinsing their mouth with solutions containing glucose or artificial sweetener, and their performance improved, perhaps activating the reward region of brain, as measured with MRI. We were curious, if we could reproduce these previous results, with athletes below the professional level, and if we could find differences in several cognitive and mental tests. At the beginning of the study we performed anthropometric measurements and determined the maximum aerobic capacity (VO2max). After that the subjects had to complete a one-hour exercise, where they had to pedal at 50% of their maximum performance for an hour on the cycle ergometer. The subjects appeared in the lab two more times for quarter component mental test, that included the measurement of attention and concentration (COG test), short term working memory (CORSI test), continuous visual recognition (FVW test), and attitude towards work (AHA test). The next step was the EEG test, where we looked at brain functions, than during the one hour exercise they were rinsing with 25 ml, 6,4% glucose or placebo solution in every 7,5 minutes [GLU (glucose); PLA (placebo: sweet water with no glucose] for 10 seconds in a blinded fashion, so it did not affect their performance. To estimate the changes, they repeated the EEG and the mental test after the exercise. Results: We didn't find significant differences between the trial and the placebo group during the

cycle ergometer neither in blood glucose, nor in the parameters which are related to performance, for example resting, average and maximal pulse, lactic acid, or the estimated performance during the one hour exercise. Similarly to the physiological parameters neither the COG test nor the FVW there were significantly different between the trial and the placebo group but there were changes between the sedentary and the exercise values in case of COG and FVW tests.

Finally, in our study we couldn't confirm, that rinsing the mouth with solution containing glucose improves cycle ergometer performance or the measured cognitive functions.

**Laura Bas** (Semmelweis University, Faculty of Physical Education and Sport Sciences, Budapest, Hungary)
Supervisor: Zsuzsanna Major

## Physiological Adaptation of the Heart in Hungarian National Single Canoe and Kayak Athletes

**Keywords:** canoeing and kayaking, left and right heart adaptation, echocardiography.

**Introduction:** Since 1936 the Hungarian Kayak and Canoe Team won 71 medals in the Olympics Games, including 19 gold medals. Both canoeing and kayaking are very complete sports. While performing the motion in a boat, the athletes work both aerobic, as is a repetitive movement using the whole body, and anaerobic exercise, as the resistance of the water makes to work the muscles harder. The most important difference of exercise between single canoeing (C1) and kayaking is body position on the boat.

Different type of endurance sports are often associated with left ventricular (LV) hypertrophy and larger apico-basal distance, and these have been hypothesized that training mode and type of exercise modulates long-term cardiac adaptation. It is easy to find extended literature about the athlete's heart, mostly about the LV hypertrophy, but we can't say the same about the RV. This is due to the difficulty of measuring its complex and crescent shape, which defies simple geometrical description, caused by irregular trabeculations on its wall and separate infundibulum.

The purpose of the study was to compare cardiac structure and function of the right and left ventricle among national team athletes of single canoe (C1), kayaking (K1) and sedentary controls.

**Methods:** Standard transthoracic two-dimensional M-mode, conventional and tissue Doppler echocardiography was performed at rest in Caucasian male single canoe (C1) (N=31), kayak paddlers (K1) (N=

77) and in healthy non-athletes (N=37). We measured long and short end-diastolic and end-systolic inner diameter both in left and right ventricles, the transmitral and transtricuspid inflow and myocardial diastolic and systolic wall motion. Statistical analyses were carried out using Statistica 11.0 by Statsoft Inc. statistical software package.

**Results:** We found significant differences between canoeing and controls in the following parameters: heart rate (HR), LV inner diameter both end-systole and end-diastole, some TDI parameters and the diastolic function of the LV (E/A). We also investigated the differences between kayak paddlers and healthy non-athletes and we observed significant differences in HR, E/A and morphologic parameters of the LV and RV. The most important part of our investigation was to find out the difference between kayak and canoe athletes. We found significant differences between these groups, only in the morphologic parameters such as left and right ventricle cavity size (LVLAXd: 94.28±5.65 vs. 89.01±7.97; RVLAXd: 93.24±7.73 vs. 103.37±6.26, the 1. group is the K1 and the 2. is the C1).

**Conclusion**: Kayak and canoeing are very similar sports, however, we could found few differences between them. For example, the body position in the boat and the type of exercise. For that reason, the adaptation of the heart to these sports is different. While kayak represents large LV long axis diameter, we found increased RV long axis diameter in canoeing. The most important role in these two parameters is the afterload which in some studies were found greater in kayak than in canoeing. In the future, our investigation will be compared with other parameters to understand the different adaptations to these two sports.

**Anna Tüske** (University of West Hungary Faculty of Apáczai Csere János, Győr, Hungary)
Supervisor: Ferenc Ihász

**Age dependence aerobic capacity among young and middle age male**

**Keywords:** aging process, muscle mass and muscle strength decline, aerobic capacity, off-balance

**Introduction:** Aging is a multifactorial process. Its intensity is determined by both genetic and environmental factors, as well as individual lifestyle. Numbers of theories exist to define the aging phenomena. One of these theories describes the reduction in reaction, poor quality homeostasis, and more prevalent pathologic events as a result of different stressors.

The purpose of this study is to analyze the reduction in oxygen uptake during exercise at steady state, anaerobic threshold, and maximal intensity zones among young adult, middle-aged and older adult males.

**Participants and Research Procedures:** This study demonstrates the anthropometric, nutritional, and exercise physiological data of n=312, (20-50 age) male subjects who volunteered to participate. Participants were assigned to three age groups. Participants in ages (20-30) were assigned to Group 1, (30-40) to Group 2, and (40-50) to Group 3 respectively.

**Results:** The difference of mean height between age groups was significant. Significant reduction (5cm) in height was observed in Group 3 (age: 40-50). Means of weight clearly supported one of the adverse effects of aging, which in this case was reflected in approximately (10kg) weight gain. A decline in oxygen uptake was observed in each intensity zone in the older groups when compared to the younger group. The decline in aerobic capacity (VO2) at maximal intensity was 10,6% (4,48 ml× $kg^{-1}$ ×$perc^{-1}$) between Group 1 and 2, and 13,8% (5,7 ml× $kg^{-1}$

×perc$^{-1}$) between Group 2 and 3 respectively. The decline was 22.8% at steady state, 20% at anaerobic threshold (AT), and 22.4% at maximal intensity respectively. The difference between anaerobic threshold (AT) and maximal intensity were 15.06% in Group 1, (15.06%) in Group 2, and (12.1%) in Group 3, respectively. Moderate mean oxygen pulse (O2P) results were defined, that is supported by the physical activity levels of participants. No significant difference was observed between mean oxygen pulse (O2P) results among groups in none of the intensity zones. Relative minute ventilation (RVE) was remarkable declined at each intensity zone as a matter of age. Significant difference was observed between the mean data of Group 1 and 2 at steady state and at maximal intensity, and between Group 1 and 3 at anaerobic threshold (AT).

**Discussion:** Findings of this study are supported by the similar findings of previous literature although in some cases the numerical differences are higher in the present study. Physiological function declines consistently with advancing aging, however, the intensity of reduction in function of different systems may vary. Results of this study represents that both the cardio-pulmonary and metabolic processes play a role at each observed intensity zones in approximately equal rate.

**Hirokazu Taniguchi** (Graduate School of Sport Sciences, Waseda University, Saitama, Japan)
Supervisor: Mitsuru Higuchi

**Is irisin really an exercise-induced myokine?**

**Keywords:** irisin, FNDC5, cardiorespiratory fitness, MVPA
**Background:** A novel myokine, irisin, which has been proposed to be secreted by skeletal muscle, and associated with improvement of glucose tolerance and obesity. Since previous studies reported that cardiorespiratory fitness (CRF) and physical activity (PA) are independent predictors of type 2 diabetes incidence, it is plausible that the extensive effects of CRF and PA on glucose metabolism are mediated by an increase in the blood irisin level. However, the relationships of CRF and PA with circulating irisin levels are unknown. In addition, although irisin has been suggested to be exercise-induced myokine, the time course of blood irisin levels after acute exercise training has also not been well described.
**Purpose:** The purpose of this study was to determine the association of serum irisin concentration with CRF level and moderate-to-vigorous physical activity (MVPA), and to examine effects on serum irisin levels after acute exercise.
**Methods:** In cross-sectional study, CRF was assessed by measuring peak oxygen uptake ($VO_2$ peak), PA by uniaxial accelerometer and serum irisin level by ELISA in 163 Japanese men (age, 21–79 years). Glucose metabolism was evaluated by measuring HbA1c, fasting plasma glucose, insulin, and HOMA-IR. In addition, 29 subjects (10 young males, 10 young females, and 9 older males) performed a cycling exercise for 30 min at 70 %$VO_2$ max, and blood samples were collected at immediately after, 30 min, 1 h, and 3 h after an acute bout of exercise.
**Results:** Serum irisin levels were negatively correlated with age ($p < 0.001$) and not associated with $VO_2$ peak, MVPA, HbA1c or HOMA-

IR in the cross-sectional study. On the other hand, although circulating irisin concentrations increased approximately 1.2 fold from baseline levels immediately after the acute aerobic exercise in all of the groups ($p < 0.05$). However, serum irisin levels were no longer elevated 30 min after exercise. There were no differences in serum irisin levels between baseline, 30 min, 1 h, 3 h, and 24 h regardless of age, sex and other physiological characteristics.

**Conclusions:** Serum irisin levels did not associate with glucose metabolism index. In addition, since neither the CRF level nor MVPA are associated with circulating irisin levels, it is suggested that CRF and PA do not influence basal serum irisin level. Moreover, exercise-induced increase in serum irisin levels return to pre-exercise levels soon after cessation of exercise. Therefore, it is likely that responsiveness of irisin to exercise is very limited.

## Social Sciences and Sport Management Section

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Supervisor: Dr. Csaba Bartha

### The Football Referee Academy's Team's Longitudinal Study of Physical Preparedness

**Keywords:** referee, physical test, preparedness

The football referees' physical preparedness is crucial factor in their performance during a game. The rapidly improving game, creates harder problems to solve. During the selection of the elite referees, physical preparedness is an essential factor. The Hungarian Football Association created an academic team for those young referees and assistants, who are talented enough to form the elite team in the future. For measuring the physical preparedness, we use the tests acknowledged by the Union of European Football Association (UEFA).

In our research we used the so called Yo-Yo test, which is official, mini interval test acknowledged by the UEFA, and which is, according to Castagna and D'Ottavio (2005), the best way for selecting the talented by measuring their lactic acid level, and their post-game heart rate. According to Weston et al. (2012), an elite referee moves 11534±748 meter/match. This number consists of 41% running, 44% walking and 15% other forms of movement or standing (Tessitore et al., 2007). The referees' average heart rate during a game is 163±5 beat/minute, this is the 89,1% of the estimated maximum heart rate (Bangsbo et al., 1991). According to Bartha (2006), the higher ranking referees perform significantly better than their lower ranking colleagues.

Our goal with research was, to determine, the changing of the fitness metrics of the referees of the academical team during a semester. We

came up with the following question: Would the referees' performance improve on the mini-interval tests, if they concentrate on short-interval kind of tests on the trainings.

We observed the male referees of the Referee Academy (N = 7). The referees did the tests given field conditions, at the exact same place, 2 times, the test was repeated after a semester , which consisted of 20+20 meters running. They had to complete the distance in gradually shortening time. The resting time between the runnings was constantly 10 seconds. We measured the referees starting and maximum heart rate, the linear coefficient of the increase in the heart rate, the resting time, with a 10 second sampling frequency post-test in the first 10 to 120 seconds, and the distance completed. To record their heart rate, we used the Polar RS 400 watch. We did the statistical analysis with Statistica for Windows v. 10 (Stat-Soft Inc. 2012). To calculate the difference between the measured performances we used paired T-test, also we determined the level of significance at $p \leq 0,05$.

The referees completed an average of 38±7,8 lengths, which means 1520 meters in distance and 17km/h running speed. We didn't notice significant difference in comparing the cardio variants. We only noticed significant difference between the distance done.

However, the different variants did not show significant difference, the distance done can be observed as a metric of fitness. As the law of transfer says, two separate training techniques, improve the fitness in a positive way. For a student to become part of the elite team, he has to show continuous improvement on the physical tests, so it's worth to do longitudinal studies both on the short- and mini-interval tests.

**Veronika Vojtkó** (Eszterházy Károly Collage, Faculty of Sport Sciences, Eger, Hungary)
Supervisors: Melinda Bíró, Judit Szathmári

## Change of African American Participation in Modern Summer Olympic Games

**Keywords:** African American athletes, Olympic Games, discrimination
**Background:** The evaluation of African American athletes in the Olympic Games has changed a lot since 1896. First their participation, later their media representation was investigated by scholars. As being minorities in American society, they have struggled to be appreciated; and sport is one of the areas where their ambitions could succeed. As a method I used text analysis; the Olympic Charter served as a basis of my research. In my study I focused on particular cases. I intend to show the change of how differently African American athletes are treated nowadays compared to the 20$^{th}$ century; and how differently African American athletes are treated compared to white Americans. I also enumerate several cases of breaking the regulation on discrimination written in the Olympic Charter. I personally believe that the Olympic Games - and sport in general - have a unique influence which helps to break down racial barriers; and have contributed to the acceptance of African Americans in the USA. My aim is to prove, that although some stereotypes remained about African American athletes, their presence in the U.S. Olympic team is no longer debated.

**Lilla Németh, Bence Bagó** (Eötvös Loránd University, Faculty of Pedagogy and Psychology, Budapest, Hungary , Eötvös Loránd University, Faculty of Science, Budapest, Hungary)
Supervisor: Csilla Ágoston

## Traditional but unpopular - The social representation of fencing and its impact on choosing among sports

**Keywords**: social representations, fencing, popularity of sport

The basic problem our research was built on is the decreasing popularity of fencing in Hungary. Fencing is one of the most traditional and most succesful sports in Hungary, but these days less and less people choose to participate in fencing trainings or become a competitor. Previous researches have confirmed that the social representations of objects, topics and phenomenon influence people's decisions and behavior, connected with these concepts. This is the reason why we chose the concept of social representations to examine the influencing factors of sport-choosing behavior.
Study 1: The first step of the study was to create a tool which is able to measure the particular elements of social representation of fencing, such as attitudes toward fencing, stereotypes and previous knowledge. In this pilot study 95 participants took part, who filled out the test online or with paper-pencil form. The selection criteria among stereotype and attitude items were the reliability measures, the values of inter-item correlation matrix, and the aim to reduce redundancy. To compile the questionnaire of previous knowledge about fencing, such as the knowledge about rules, Olympic medalists, etc., we aimed to choose the properly discriminating items by virtue of the results of the pilot study. As a result of this study, we were able to create a tool which includes 23 attitude items, 21 stereotype items, and 7 items which measure the previous knowledge about fencing of the given person.

Study 2: The main aim of our research was to create a model which will help us to explore the influence of stereotypes, attitudes and knowledge on sport-choosing behavior. In the second part of the study 517 participants were taken part. The tool we created in Study 1 was used but it was supplemented with questions measuring demographic issues, sport habits and questions related to sport event media following habits. We used multiple regression models to explore the best predictors of sport-choosing behavior. We believe that this research is able to shed light on the psychological reasons behind the decreasing popularity of fencing and could give ideas to professionals how to solve this serious problem.

**Brigitta Fanni Hegyi** (University of Szeged Juhász Gyula Teacher Training Faculty Physical Education and Sport Sciences Institute, Szeged, Hungary)
Supervisor: Noémi Tari-Keresztes

**Motivational background of professional athletes' tattoos**

**Keywords:** professional athletes, tattoos, motivation
**Introduction:** During the London 2012 Olympic Games lots of newspaper and online articles could be read about the participants' tattoos. After I read them, I started to wonder what motivated them to draw illustrations, captions into their skin. The Hungarian water polo team members' Olympic-themed tattoos have been discussed in the media but an overall picture nowhere can be found about other athletes' tattoos, and their motivational background of making them. From there came the idea that I would like to examine the motivational background of professional athletes' tattoos and compare them with the leisure sportsmen's ones.
**Hypotheses:** The motivational background of professional athletes' tattoos is the sport
The motivational background of leisure sportsmen' tattoos is not the sport
**Research methods:** My research unit of analysis is individual. I used interview method and snowball sampling (Babbie E. (1995): The Practice of Social Research. Balassi Publisher, Budapest). I examined 15 professional athletes -8 men and 7 women- and 15 leisure sportsmen -7 men and 8 women-. From the 30 interviewed athlete 17 people are playing team sports -9 professional athletes, 8 leisure sportsmen-, 13 people are playing individual sports -6 professional athletes, 7 leisure sportsmen-. The interviewees are ranged in age from 18 to 32 years. My research has sectional time dimension. During my examination I used the motivational list from Kaldenekker and Pikó's study from 2005

titled The world of the piercing and the tattoo - deviance or fashion? and I supplemented it with 'sport': 1.To express myself ; 2.To make me unique; 3.To be a rebel; 4.To feel independent; 5.To feel mature; 6.To be different; 7.To have a beauty mark; 8.To remember life event; 9.To be like a friend; 10.Show commitment to group; 11.To show control of my body; 12.Just kiked the loks of it; 13.I really don't know; 14.Other. Kaldenekker and Pikó used Gordon B. Forbes's motivational list from his study. (Forbes, G. B. (2001): College students with tattoos and piercings: Motives, family experiences, personality factors, and perceptions by others. Psychological Reports, 89: 774–786.) An interviewee was allowed to choose more options. My study is not representative.

**Results:** The professional athletes' two main motivations were "Sport" (53,3 %) and "To remember life event" (53,3 %), while leisure sportsmen principal motivating factors were "To make me unique" (73,3 %) and "To express myself " (60 %). The motivation of the team's athletes were "To make me unique" (53,3 %) and "To remember life event" (53,3 %), while people who are playing individual sports are motivated by "To make me unique" (60 %) and "To express myself " (53,3 %). From the 30 interviewed sportsmen 8 professional athletes (26,7 %) and 3 leisure sportsmen (10 %) have tattoos related to the sport.

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Supervisor: Krisztina Hevesi

## "Why did you give up?" – Narrative approach of fencers'dropout

**Keywords:** dropout, narrative psychology, probabilistic modelling
**Introduction and research question**: In this study our aim was to examine the reasons behind dropout in sport. We chose a traditional and successful sport in Hungary, where dropout has an intensified importance: fencing. If we knew the main reasons and predictors of fencers' dropout, we would have the chance to do something about it and keep our talented fencers in sport life. Narrative psychological approach was used to explore why certain competitors give up racing. In that way, we can emphasize what concrete reasons led the individual to choose to give up competiting.
**Method**: The total sample included 18 participants ($M$=21,5; $SD$=3,03), 8 males and 10 females. The sample was divided into two groups: current competitive fencers and former competitive fencers, all of them were over 18 years. The participants were reqiured to complete some questionnaries (Ryff Psychological Well-Being, Rosenberg Self-Esteem Scale, ACSI-28, STAI) and participate in a narrative interview.
**Results**: Owing to our previous study, individual reasons to dropout was examined, and eight narrative dropout moduls were identified: absence of sportmates, absence of coach' support, lack of expected results, too high expectations towards the competitor, decreasing motivation, high costs, problems with the Hungarian Fencing Federation and other, not classifiable reasons. Along the narrative interview analysis these dropout moduls were explored in individual stories to take an individual prediction. According to our prior expectations there was a significant difference between the two groups: former competitive fenc-

ers mentioned more narrative dropout moduls in their interviews ($M$ = 0,212; $SD$ = 0,08) than current competitive fencers ($M$ = 0,108; $SD$ = 0,03), $t$ (13) =2,925, $p < .05$.

**Conclusion**: Using the interview results we aimed to build a probabilistic model, which is able to predict fencers' dropout in an individual level. The data distributed normally, thus we were able to count the probability density function for each individual and tell the probability of sport dropout of a given fencer. Our research shed light on the reasons behind adult fencers' dropout, and we believe the results could help professional trainers to prevent as many fencers as possible from dropping out.

**László Mohácsi, Norbert Gura** (University of Szeged Faculty of Physical Education and Sport Sciences, Szeged, Hungary)
Supervisor: Dr. László Balogh PhD

## Organizational culture and leadership behaviour among professional and amateur sport teams

**Keywords:** organizational culture (OC), leadership behaviour (LB)
**Background:** The purpose of this study was to examine the phenomena of OC and how it is affected by LB in professional and amateur sport. Every organization has its norms, dynamics which define its members' behaviour and attitude (Balogh, 2009). Schein (1990) defined OC as a "pattern of shared basic assumptions that the group learned as it solved its problems of external and internal integration". We hypothesize that amateur organizations have more familiar and less competitive inner environment than professional teams have. We suppose coaches of amateur teams are more supportive and rewarding while leaders of professional teams are more autocratic. On the other hand, the amateur teams are more satisfied about their efficiency as a team because of lower expectations and less competitive environment.
**Methods:** Two amateur and two professional basketball and football teams were examined. Cross-sectional analysis was conducted with questionnaires about leadership behaviour and organizational culture among athletes and their coaches (N=60). LB of coaches was measured with Chelladurai MML (1980). Organizational-diagnostic multidimensional questionnaire was used to investigate the attitudes of organizations (Cameron, Quinn, 1999). Furthermore, Participants were asked of personal and organizational effectiveness. All data were collected in the mid-season and were analysed by GraphPad Prism 5 program.
**Results:** Significant correspondences appear ($p > 0,05$) of LB in four categories between the teams. Highest average scores in all the four teams are in Rewarding Behaviour (3,9) dimension, while the lowest numbers

appeared in Democratic (2,6) Behaviour. Clan culture dominates generally in the teams. All teams rated their organizations a friendly, familiar place to work. Leaders of both professional teams were regarded by the players rather hierarchical, organizer- and coordinator-type leaders than mentors or parent figures. The feeling of effectiveness is just as low in the amateur football team as in the professional teams. Only the amateur basketball team rated their efficiency with a higher number (7,8 of 10).
**Conclusion:** We started this study to reveal if there was correspondence between OC, LB, personal and organizational effectiveness. To have a strong OC, teams should create familiar environment that they can build upon later, and this can happen with a rewarding, supportive leader. Participant teams and their coaches received feedback, which they could make use of in the future.
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**The impact of the youth European Championships on basketball players sports career**

**Keywords:** youth basketball**,** career building, FIBA Europe

Our research is based on the specialties of the youth competitions of the european basketball federation (FIBA Europe). We focused on tracking the players' achievement, who have participated in the FIBA European Championships in 2013. During their career, players climb up steps progressively, these steps are: U16, U18 and U20 youth European Championships. The research's aim is to find out that present senior national team players had played in these competitions or not, what kind of selection rules have the successful teams followed, and is it possible to be a senior national team player without being selected in the youth categories?
We had the following hypothesises: We assumed that there is a correlation between the youth team and the senior team achievement. Competitive youth appereances will generate competitive senior appereances. We also supposed that the good youth individual appearances will predestinate competitive senior achievement. Our last hypothesis was that the national teams are highly built on former or current youth national players.
During the research we investigated the basketball players in both categories who participated in the FIBA European Championship 2013. (The sample's size is N=480). We used Microsoft Office Excel 2007 to categorize the basketball players. We examined correlation based on sequence of the youth categories, we used the official site and yearbooks

(2005-2010) of FIBA Europe.
Based on our results we got in the FIBA Europe U16, U18 and U20 Championships, there is an upward trend in participation, 50,34 %, 70,57% and 71,87% of the senior players had played in the competitions. We found a problematic category between women championships, in the women U20 category, there is a reduction in the participation. It means that we can't see the best players in this competition. There is a moderate, significant correaltion between the youth and senior teams results. The most dominant correlation is between the woman U16 and the senior women competition results. From 480 players there were 409 players, who played in youth european championships.(86%) In total the youth european championships are important steps in a basketball player's career. With reforming the competition systems the decision-makers can make these events more exciting, more entertaining. It is an open question whether we need more or less categories, but our research showed that there are areas which have to be developed. As the basketball federation's main aim is to educate champions, it is also important to increase the the size of the basketball society.

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**Leadership efficiency research on Southern Plains teams**

**Keywords**: leadership, handball

**Introduction**: Performance is defined by several factors in sports. I examined the relationship between the coach and the players among male(m.) and female(f.) handball teams(t.) as one of the key elements of success. I based my research on a quastionnaire(qu.) by Chelladurai(Ch.) (1.). My first hypothesis was that there is a difference between the two sexes regarding the ideal coach. A similar study was conducted by Balogh and Rétsági.(2.) My second assumption was that the effectiveness of t.s is in accordance with the results of the qu. by Ch.

**Methods**: I studied six Southern Plains handball t.s (N = 81, 40 m.s and 41 f.s). The qu. by Ch. and Saleh was used to examine the t.s. It consists of five dimensions (d.): 1, practice and instruction 2, democratic behavior 3, autocratic behavior 4, social support 5, positive feedback. 40 questions were examined in three ways (the player's opinion of the present and ideal coach, and the coach's self-perception). In case of t.s where there was no significance (sign.) at the examination of the present and ideal coaches, successful co-operation led to good results. In another survey coaches - on a scale of ten - evaluated their t.s in the lights of the expected and actual results of the fall season.

**Results**: At the coach assessments 8 points(p.) were given for two t.s, 9p. for other two t.s, and 10p. to the last two t.s. The results of Ch.'s qu. confirmed these high p. The analization of the six t.s has shown tendential and sign. results, however, the rating of the t.s in the aspect of the present and ideal coach differs only to a small extent. The result could contribute to the outstanding performance and high scores of the t.s. In case of m. teams the d.-s appear in order of impor-

tance as follows: 5,1,4,2,3. As for f. t.s, this order is slightly different: 1,5,4,3,2. Futher details will be presented in the oral presentation.

**Conclusion**: My first hypothesis concerning the ideal coach was only partly confirmed. Sign. appears only in case of 3 d.s, with just a slight difference, so the view, mentioned often in the media, that different type of coach is suitable for m. and f. teams, was not absolutely confirmed. After setting up the order it is shown that in case of both sexes the 4th d. stands in the third place (social support) ($p \leq 0.0009$), the 5th ($p > 0.1643$) and 1st ($p > 0.6672$) in the first two, while the 3rd ($p \leq 0.0038$) and 2nd d.-s ($p \leq 0.0001$) in the last two places.We intend to continue this research with a survey in which coaches will be asked, how the suitable coach differs on the basis of sexes and why m. coaches are usually the head of larger or adult teams and why women remain trapped in junior handball. My second hypothesis, supported by the results of the qu. and the scores given by coaches, proved that the questionnaire would be a great help in a more successful teamwork between the team and coach.

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## Presence of eating disorders among female handball players and aesthetic sport competitors

**Keywords:** eating disorder, handball, aesthetic sport

**Background:** Nowadays the several types of eating disorders (ED) provoke frequent problems all over the world. Many publications suggest the connection between ED and sport (Sundgot-Borgen, 1994). Beside the classic EDs such as anorexia nervosa and bulimia nervosa, anorexia athletica can also occur in the period of active sport activities. As far as the connection of ED and sport is concerned, we should mention the female athlete triad. It means the combined occurrence of disordered eating, secondary amenorrhea and bone mineral disorders (Torstveit, 2005). In the present study the occurrence of ED was examined among female handball players and aesthetic sport (AS) competitors (n=154).
**Methods:** Female handball (HB) players (n=72) and aesthetic sport competitors (gymnasts and fitness competitors, n=82) participated in the examination. Physically inactive women (n=96) also attended in the study as control group (C). The possible occurrence of ED was investigated by EDI (Garner, 1983) and SCOFF (Morgat, 1999) questionnaires. Statistical analysis: Mann-Whitney U-test and Bonferroni's multiple comparison test.
**Results:** The first three subscales of EDI are capable to detect ED. The 'Drive for Thinness' (C: 2.615±0.39 S.E.M.; TS: 3.375±0.5; AS: 4.43±0.35***) and the scores of 'Bulimia' were significantly higher among AS competitors (C: 0.44±0.13; HB: 0.82±0.29; AS: 4.49±0.37***). There was no significant difference between the 'Body Dissatisfaction' of any participants (C: 6.31±0.64; HB: 6.54±0.72; AS: 5.6±0.44). Although there were a few participants in every group

whose scores reached the critical limit, but none of them passed it in all the previously mentioned three subscales. Consequently, we could not detect ED among the participants by EDI. The next five subscales of EDI measure psychopathology commonly associated with, but not unique to, ED. 'Ineffectiveness', 'Interpersonal Distrust' and 'Interoceptive Awareness' were significantly higher among AS competitors. We could not observe any significant difference between the 'Perfectionism' or 'Maturity Fears' of any participants. The SCOFF test reveals that significantly more AS competitors (40.24%***) show the signs of ED than HB players (8.33%) or the members of group C (9.375%).

**Discussion:** According to the EDI results, despite the fact that we did not detect ED, the higher subscales' scores of AS competitors suggest that they are more disposed to have ED. The SCOFF results seem to prove this statement. The shortness and simplicity of SCOFF test can explain the contradiction between EDI and SCOFF results.

Our results are parallel to the relevant literature (Sundgot-Borgen, 1994), aesthetic sports carry higher risk of ED than others.

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Consultant: Dr. Máté Petrekanits

## Resting alpha brain-wave activity in male athletes: comparison with HRV values and cognitive performance

**Keywords:** resting alpha brain-waves, HRV, cognitive performance
**Introduction:** Electroencephalography (EEG) studies' results suggest that resting alpha (8-12 Hz) brain-wave activity represents the sportsmen's cognitive and sensorimotor performance (processing of visuo-spatial information, stimulus selection, task and problem-solving strategy), (Babiloni et al., 2009). Researchers with different methods (transcranial magnetic stimulation – rTMS, neuro/biofeedback training) were able to optimize the alpha waves' values (increased amplitude which means the synchronized operation of the neurons). After these methods the patients' had better performance during functional cognitive tests (Klimesch et al., 2003; Hanslmayr et al., 2005). Our resent study's aim is to find out how much does the resting heart rate variability (HRV) effect the resting alpha brain-wave functions. The study's second goal is to repeat and ascertain the theory that resting alpha is associated with cognitive performance.
**Hypothesis:** The 17 years old soccer players (n=76) and university students (n=12) with better resting HRV values have more preferable resting alpha brain-wave functions. The participants with 'good' resting alpha brain-wave values also have better functional cognitive performance.
**Methods:** The first part of our research is based on a study conducted at the spiroergometry labor at TF in 2012. 17 years old male (n=76) soccer players' (16,8 ± 1,6 years) EEG data were recorded in all subjects posed at resting state (eyes closed, early in the morning). The EEG

recordings were performed (ElmeFitnesz) from 4 electrodes positioned on the forehead and ears. EEG signals were recorded for 2x3 minutes. The software calculated the MQ (mental quotient), alpha brain-wave stability and hemispheric domination. During this test we recorded different HRV values (average, minimal and maximum heartbeat, two Poincare values and the pNN50) with a wireless Polar chest belt (Polar Precision Performance). In the second part of our study we measured twelve physically active male volunteers (23,54 ± 1,5 years), with no history of neurological disorder, no current use of medications or drugs. We followed the same EEG and HRV protocol as in the first study. After that the participants performed the 40 minutes long cognitive test. We recorded and calculated the participants' reaction time (COG), visual short-term memory capacity (CORSI) and the impairment of the reading speed or color recognition due to interfering information (STROOP). We used Vienna Test System, version 37.0.

**Results:** For the statistical analysis SPSS 21.0 software was used. The factor analysis method didn't show any significant correlation between resting heart rate variability and alpha brain-wave activity parameters. According to the results there was significant relationship between STROOP-task results and the first three minutes' MQ. Those subjects who had more synchronized brain waves they showed more quickly task absolving during COG-test (r=-0, 656; p< 0, 014). Results indicate that better frontal cognitive performance (STROOP-task) came together with better parietal lobe cognitive performance (CORSI-cube task), (r=-0, 571; p< 0,033).

## Motor Learning Section

**Gergely Kiss** (SZTE JGYPK-TSTI, Szeged, Hungary)
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### New distance, new perspective in education of the canoe technique

**Keywords:** canoeing technique, special competence development
**Introduction:** The national and the international researches discuss the performance enhancement and its potential, the mapping of the top athletes psychological abilities, the components of efficiency, the psychic abilities and environmental factors effect on each other, and possibilities of its improvements. There are not enough reliable data about the components of the applied methods, at the same time these data are essentials of a development a new program.
**Methods:** During the processing phase of the literature we observed that there are no useful methodological staff in the theme. With using the traceable information we sketched a methodological recommendation for the establishment of technique of two Olympic distances, and for the specializations of land and water basing.
**Results:** In this study we put together such a gap-filling material which differ from the appeared ones and reflect a new approach of the work of trainers.
**Summary:** The tasks of our investigation are to collect methodological literatures in the theme of how to develop canoe racers especially for 200m race. Later on we plan measurements basing on this study. Beside the technique smoothing, the special strength training and the methodology base of the trainer have to be in harmony. "By the side of many conditions the most important thing the creation of performance based training system, which is suitable to integrate the athlete him/herself into it." (Szabó, 2007) During water trainings the physique are exposed

to exterior effects. Therefore the canoeing mainly power exercise, which is helped with power-endurance and locomotorical speed. Beside of these it needed good rhythmical sense, economical muscle activity and of course good coordination. The unstable boats needed a good balance operation and sense. Therefore the canoeing needs high level of coordination and power skills. The trainings on water characterizes the contest, change of environment and maximal load.

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**Developing karate techniques through gymnastics skills**

**Keywords**: karate, training, technique, gymnastics skills, development
**Introduction:** In several top-level karate clubs in Hungary coaches teach some basic gymnastics skills as preparatory exercises to improve performance in karate. Knowing the positive effects of gymnastics, its usefulness is out of question.
**Goal setting:** Can karate techniques be improved when training time is limited only to teaching gymnastics skills instead of practicing karate in a club organizing courses of this sport? The primary goal of this research is to find the answer to this question.
**Hypotheses:** 1. I suppose that karate techniques of a beginner children group from Szigethalom (having attended 30-minute gymnastics training sessions twice a week for 11 months) have improved much better than those of a similar group from Kispest without such type of training. The following components were used: 1.1. Strength of the movements, 1.2. Speed of the movements, 1.3. Accuracy of the movements, 1.4. Stability of the stands, keeping balance, 1.5. Confidence of the movements
2. Furthermore, I suppose that the majority of the interviewed coaches of the Hungarian Karate National Team and the trainers of the national team members conceive that practising gymnastics skills has positive effects on improving karate techniques, so I suppose they use them.
**Methods:** To prove my hypotheses I used two different methods: Two beginner children groups were recorded by video when performing a well-known karate routine. Then one of the groups started doing 30-minute gymnastics exercises at the beginning of their karate training. The video recording was repeated and evaluated by an independent

committee of qualified karate officials. A questionnaire was filled in by outstanding and successful Hungarian coaches, with questions related to their applied methods.

**Results:** Hypothesis 1: The first two components (strength and speed) showed significant difference in group practicing gymnastics skills as part of their training. In the other three components (accuracy, stability and confidence) no significant difference could be proven between the groups. (Significance level was 90%) Hypothesis 2: The majority of the interviewed coaches firmly believe that gymnastics practice has positive effects on karate techniques and they use gymnastics exercises in their karate trainings.

**Conclusions:** The integration of gymnastics skills into karate trainings during the sensitive period of motor learning did not increase the speed of learning karate techniques of the examined children. However, the examined group had more benefits from the motor development program, compared to those participating only the traditional karate trainings, and at the same time they gained basic gymnastics knowledge, as well. In my opinion, we have to develop specific preparatory exercises to significantly increase the speed of learning karate techniques.

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## The study of Shooting play of pivot players in Handball

**Keywords:** defense system, team tactic, a movement of a pivot player

**Introduction** In recent years it was getting difficult to shot easily because of the changing of the defense system. Shooting lightly gives a clear chance of fast-break to the opponent so that it is a point of attack's team that shooting in high probability and effectively. The shot of the highest probability is a pivot shot in an attack.

**Methods:** The purpose of this study was to clarify the characteristics of shooting of pivot players to score in high probability by comparing Men's World Championships (n=100), Japan League (n=100) with Japan College League in Kanto (n=204). The sample was comprised 404 shootings from 33 matches in 2009-2011. A shooting play of pivot was observed by 8 items which contains (1)a defense system, (2)a team tactic, (3)a moving of a pivot player, (4)a place pivot player got a ball, (5)a position pivot player got a ball, (6)a fake before shooting, (7)a contact before shooting and (8)a result of shooting. The data were analyzed using a chi-square-test and residual analysis.

**Results:** Results revealed the following: The world level has a high percentage of a pivot play for the closed-defense and the Japan top and the Japan college levels have a high percentage of a pivot play for open-defense. In all levels a pivot play was often caused after a transition of team tactics. In all levels a pivot player frequently got a ball in the middle area. The world level player usually got a ball between 6-7 meter, but the Japan college level player occasionally got a ball over 9 meter. The Japan college level has a high percentage of a fake before shooting. The world level has a high percentage of a contact from the defenders when shooting. In all levels a percentage of scored shooting

was the highest. In world level a percentage of getting 7 meter throw was also higher.

**Conclusions:** Results revealed that it is important for a pivot player to score in high probability that catching a ball closer to 6 meter, reaching a shot even if he was caught by the defenders and not making any fakes in the team tactics depends on the defense systems of the opponent. The implication was suggested that it is significant that a pivot player shot simply to score in high probability. Therefore a pivot player has to find a correct way there is not a defender. The pivot player needs to keep his position closer to 6 meter and between the defenders. He needs the physical power to reach a shot between the defenders.

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## Characteristics of the center back player's attacking-play in Handball

**Keywords:** shot-play, assist-pass-play, center back player

The objectives of this study were to provide useful data for coaching by revealing the characteristics of an attack-play that combined with a shot-play and an assist-pass-play of center back player. Subjects were 24 female players (8 center players, 8 left-back players and 8 right-back players) of 8 teams belonging to the Kanto inter-college Handball Association. By comparing a degree of contribution to team-attack, and the attack-plays with center back players, left-back players and right-back players, characteristics of the center players were revealed. The findings reached in this study can be summarized in the following two points: Although the contribution of a center back player is in a tendency higher than left-back players and right-back players, there is no significant difference in a success rate. The center back player is performing the different shot-play and assist-pass-play from left-back and right-back.
These results suggested that appropriate position specific shot-trainings and assist-pass-trainings could be required for each backcourt position.

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**World top-level men center back players scoring ability in handball – Focusing on two players, Nikola Karabatic and Dalibor Doder**

**Keywords:** center back player,shot-play
**Purpose:** Finding some major characteristics of two world-class center back players shooting that could explain the scoring skills, by analyzing the last dependence and success rate.
**Method:** The target players were Karabatic (French representative) and Doder (Swedish representative). I analyzed extracted pictures from seven games of the 2011 Men's World Championship and five games of the 2010 European Championship. The shooting play was classified into four elements - approach run before ball maintenance, moment of catching the ball, approach run during ball maintenance, and the shot - and the occurrence rate was compared between every element. The results showed a 43% average in success rate and 15% in the last dependence rate.
**Results and consideration:** Characteristic of Karabatic: Distance shots were mostly jump shots and the probability was 66% high. The shots were carried out overhand, and without leaning the upper body. The last dependence rate was 17.9% and the last success rate was 44.5%. Keeping a posture that allows him to constantly observe the defenders, and find the proper distance in order to avoid contacts was found important in his play. However, he was able to successfully carry out the shot even when the defender reacted or came into contact, because of his exceptional technical skills. Most of the shots were carried out after dribbling in regard with the situation, and moving to the direction of the goal or his shooting hand. Characteristic of Doder: Mostly scored from jump shot or step shot, using two kinds of step patterns. Data showed high tendency moving to the non-handedness side, but shoot-

ing with a straight upper body. The last dependence rate (15.4%) is high, and the last success rate (41.2%) is low. Obtaining the ball mostly happened in the long distance shot area without having body contact with the defender and the upper body was facing forward. Most shots were carried out without coming into body contact with the defenders. He did not use dribbling often before scoring, and he was mostly moving forward to the direction of the goal.

**Conclusion:** The following characteristics of were found common in the two players' scoring skills. Ball catching moment usually happens in the long distance shot area. They both received the ball in a position where the defenders did not come into body contact with them. Feinting was rarely found during ball maintenance. Three steps were often used before shooting. Shots were mainly executed from the long distance and the middle distance area. The mostly used pattern was the jump shot. Shots were often carried out with a straight upper body.

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Supervisor: Dr. Csaba Bartha,
Consultant: Bálint Dolnegó

**Exemination of a Hungarian Elite Football Academy Players' Conditional Abilities**

**Keywords:** football, youth, conditional ability

In football, such as in any other sport, one of the most important task is nurturing a new generation players at the right quantity and quality, as well as raising the professional players to a higher level. The permanent development of young and adult athletes must be monitored with periodically carried out surveys. These surveys highlights the incidental training gaps or can offer positive confirmation about the quality of performed training.
Our research topic is based on resaerches made by Bill Tancred (1995), Bob Davis (2000).
In our study we were curious to know, that what results footballers achieve on the surveys by using the hungarian training methods and is there correlation beetween them.
Before our research we supposed that there is a correlation between the conditional abilities within the different age groups (under 14-19). The test sample made up of a hungarian elite academy's youth players of different age groups (N=94). The test sampling occured by not probability – arbitrary – sampling. For the statistical analysis of the results we utilized Statistica for Windows 10. version (Stat-Soft Inc., 2012).
In our research, we studied all three conditional abilities of players according to the following tests: 30 m sprint, push-up, sit-up, shuttle run. We used Pearson's correlation to determine the correlation between conditional abilities measured at different age groups.

During the test, we found correlation between speed and endurance trials only at age group under 17. The hypotesis's section for force trials confirmed at age group under 16.

Based on the obtained results, we accepted the hypothesis,because at most tests, moderate or strong correlation was found, but for footballers it is worth to study more sport specific trials to determine more accurate correlation.

The workmanlike youth footballer training is the basis of subsequent successful adult football. In different match situations the conditional abilities of athletes play enormous importance. For this reason it is important to measure continuously the preparedness of young and adult footballers, thus pointing to areas that need further development. Our goal for the future is to enrich the test series with more functional elements, which are closer to the material movement of football, and thus continue our investigation. We also want to extend this test series to the whole hungarian football – both adult an youth players – thereby it could become easier to compare the conditional abilities and development of the hungarian footballers with international surveys.

**Arnold Nagy** (University of Szeged Juhász Gyula Faculty of Education Institute of Physical Education and Sports Sciences, Szeged, Hungary)
Supervisor: Beáta Vári

**The exercise intensity of Hungarian A-level motocross athletes**

**Keywords:** Motocross, exercise intensity

**Introduction:** Motocross (MX) is an off-road motorsport, which sport's physiological effects are not slightly investigated and discovered by sport science. This type of racing needs high technical skills, mental and physical fitness as well. The MX athletes have nearly full cardiovascular load during a 30 minutes race. There are numerous Hungarian A-level MX athletes who spend great amount of money and time, training for national and international races. But do they have the same exercise intensity as the World's greatest MX athletes?

**Methods:** Twelve A-level MX athletes agreed to partake in our study, who were 16-28 year old males, racing in MX2 (250ccm 4T) or MX1 (450ccm 4T). The data collection took place on two events of the Hungarian National Motocross Championship in Hódmezővásárhely, Hungary 2011 and '12 by Polar Team System. Every race has a free practice, a qualifying and two runs. Each runs were 25 minutes +2 laps (about 30 minutes). Only the athlete's complete runs were analyzed by Polar Pro Trainer 5 (software). In lack of laboratory test we used a formula for calculating the HRmax: $205 - \frac{age}{2} + x + y$. The results were compared to international study results.

**Results:** After the data collection we got 9 complete diagram which we were able to analyze. We found out the HRrest is 51±4 and the mean HRavg of Hungarian MX athletes during a run is 184. Their mean HRmax was 191±5 and their calculated mean HRmax was 200 ± 2. They averaged 97±0,01% of their calculated HRmax and 92%±0,02% of their HRavg. They burnt 343±17.7 kcal in each run. American (Augustine, 2011) and a Finnish (Konttinen, 2007) studies in the same

subject reported their HRavg results 94-, 95- and 96% of the HRmax which equals the mean of our results as the competitors completed the whole run in the maximal heart rate zone, so as the foreign ones.

**Conclusion:** In conclusion, our study shows no significant differences to other international studies. We can state, therefore, Hungarian MX athletes exercise intensity is the same as the world greatest MX athletes', so Hungarians should be able to beat them judged by the cardiovascular load and exercise intensity. The results represent the physical demand of a race day as well by the kcal loss. This could be 1400 kcal or even more. Furthermore we would like to prove MX athletes' aerobic endurance by a $VO_{2max}$ treadmill test in the laboratory.

## Physical Activity in School and during Recreational Time Section

**Nikoletta Nagy, Péter Szájer** (Semmelweis University, Faculty of Physical Education and Sport Sciences (TF), Budapest, Hungary)
Supervisor: Dr. Csaba Ökrös
Consultant: Dr. Csaba Sós

### Study of motivation of the leasure time swimmers

**Keywords:** leasure time, swimming, motivation

**Introduction**: The leasure time is one of the most important part of our life. If you want to spent it usefully then you could choose from uncountable possibilities. So, we suppose to something power in the background, which motivate us to choose any sport activity.
The motivation, which determs of activity we can influence in the early life period. So it is really important to explore the motivation orientation of the children in the early-school-age period. The swimming in Hungary is not only competition sport, but also a recreation activity is truly popular. The youth's leasure time swimming is one of the leader topic in the Improving Program by the Hungarian Swimming Federation (MÚSZ) as well.
**Methods:** Our investigation has been made in those clubs (N=8), whose are joint to the MÚSZ and have got leasure time swimmers in their clubs. (N=110) The investigated people were age goup swimmers and their avarage age was 13,84 year old. The collection of datas was made by Hungarian version of the Sport Motivation Scale. To the analysis we used desprictive statistic processes, 2 samples T-test, Anova and Post Hoc tests as well.
**Results**: We experienced during the processing that the extrinsic and intrinsic motivation values were above the avarage in both sexes in all subscales. The intrinsic motivation had higher values. The value of

amotivation was under the avarage in both sexes. There was not significant difference between woman and the men. In case of the intrinsic motivation the value of the introjected subscale was the highest and the valeu of experience stimulation subscale by the extrinsic motivation was the highest. During the investigation in the point of age there was significant difference at the 14 years old swimmers, whom vary in from 11,12,17 and 18 year old children. There was significant difference at amovitation the 15 between and 17 years old swimmers and between the 11 and 17 years-old once too. Although the external regulation at the swimmers in the capital was more higher than in the countryside. We didn't find significant difference in any scale.

**Conclusion**: The value of the intrinsic motivation in the age goup is good, because if somebody wants to do leasure time sport in a long time period it is necessary. The low level of the amotivation is a positive result which is although a good news. Though the external motivation reflected more than the avarage, but the internal motivation base of the leasure time swimmers were higher. The value of external stimulation subscale show us that the individual mindset comes from the entertainment and excitement. But it is more than typical to do sports grounded to sense of guilt and distress. Regarding the age the 14 year-old children are the most critical. In this period is the highest of the value of the extrinsic and intrinsic motivation. By result of the identification subscale in this case the activities comes from external causes, but it is self-regulated internally. The values, which from age of 15 are reducing warning us to the wantingness of this period.

**Tamás Csörgő** (Eszterházy Károly University, Eger, Hungary)
Supervisor: Dr. Melinda Bíró

**Effects of massage therapies on women over sixty years**

**Keywords:** massage therapy, complementary and alternative medicine, range of motion,

**Background:** Ideas about health, preventing diseases and types of cures are changed dramatically in last decades all over the world. The special attention or positive effect of complementary, and alternative therapies were suggested by WHO and EU regarding the global health care system. Massage is one of the most popular area in alternative medicine and rehabilitation. Several experts prove positive effects of massage on the human body, so a multi-massage therapy was examined in our study. Women over 60 years (N =12) were randomly assigned into two groups „Massage" (N=6); „Control" (N=6). The joint range of motion, subjective level of pain, or physical and mental health status were measured by SPSS 18.1 for windows with paired samples t-test (≤,05). The main range of motion difference was assessed in lumbar spine flexibility (t=-8,174; p=,000) between pre- and post- measurement. There were positive improvements in Visual Analog Scale (t=5,085; p=,004); and in health status questionnaire also. „Role Physical" (t=-2,712; p=,042); „General health" (t=-3,024; p=,029); „Body pain" (t=-3,507; p=0,17). Our **results** show, that the massage had positive effect on all the three measured tests.

**Marcell Mikolai** (Semmelweis University Facultiy of Physical Education and Sport Sciences (TF), Budapest, Hungary)
Supervisor: Dr. Ágoston Dosek

**Friluftsliv forever / Develop Koppány Valley areas by Frilftsliv parks**

**Keywords:** recreation, Naturparks, rural developments
**Introduction:** I live in the countryside, west part of Hungary. My area is located 20km south of Balaton. The nature is nice and opened there, and the tourism is not too advanced. The area has some problems with employing and population growing and lifestyle level.
The nature is there and the area is very peaceful and includes some unique places. The Balaton is one of the biggest tourist attraction in Hungary, but it is a bit crowded at summer time. With rural recreation and active sport tourism, we can give alternative for tourists and develop the local economy.
**Hypothesis:** Does this area have unique and values, programs which can be good tourist attraction despite Lake Balaton area.
The Koppány Valley area has good properties to develop sport tourism, like cities at south beach of Balaton has. That Koppány Valley area with alternative spot tourism, next to the crowded Balaton style can be sustainable business, with öko and green tourism and protect and develop the nature area. The Naturpark project can be give extra income and safe the local traditions.
**Plan:** To observe economic, tourist, and nature possibilities in the area against the Balaton.
Make a Develop Idea to create project a Naturpark idea for the area developing.
**Test Methods:** I will analyse the Hungarian tourist association's year statements at last 3 years to find action way, which zone can be strong in sport tourism in Koppány Valley, with secondary analytical. I will analyse the economic environment in Koppány Valley, to realize, how is

it possible to start this business, with fieldwork and purposeful surveys. I will interview some Hungarian naturpark owners, how much success they have to develop the rural area.

**Ágnes Badár** (Institute of Applied Health Sicence and Health Promotion, Juhász Gyula Faculty of Education, University of Szeged; Hungary)
Supervisor: Margit Borkovits

**Sauna as a way of effective leisuretime activity**

**Keywords**: sauna, recreation, health
**Background:** This area of recreation and leisuretime is not that popular among students, researchers or professors, so that is why I decided to make a survey about it. in my paper I mention the ways of spending leisure time effectively and the awareness of social health in the communities of university students from Turku and from Szeged.
First of all I mentioned the modern interpretations of health, then how recreation and leisure time are connected, and in this whole concept where sauna is located. I presumed it is important to talk about bathing cultures and how sauna appeared in them. As a symbol of Finnish culture I wrote about the origins, traditions and legends of the sauna, and how it became a part of in other European countries' culture. Finally I wrote about the main theme of my research, the benefits of sauna in recreation and health promotion.
In my paper I researched the popularity of Finnish sauna as a way of recreation and health promotion, and the level of sauna culture between Hungarian and Finnish university students. This research assessed the frequency, the quantity of time spent in the sauna, and the amount of people that choose the use of sauna in the mindset of recreation and social health. The study utilized random sampling technique and an anonymous and self-reported online survey questionnaire. The participants were 50 Hungarian and 50 Finnish students. In the evaluation I used diagrams to show the results.
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**Gergő Gabnai, Aaron Fischer** (West Hungary University Faculty of Apaczai, Győr, Hungary)
Supervisor: Dr. Miklos Banhidi

## Research on Young People's Leisure around the World

**Keywords:** leisure, young people, international
**Introduction:** In order to gain a broader understanding of young people's leisure habits on an international level, the students created a survey to be distributed to other young people.
**Goals:** Find how young people think about leisure. Find what the significant differences between nations are. Find if there are any good models that can help Young People to increase their quality of life.
**Method:** The students first completed the survey themselves to make sure it was understood by all. While visiting Vienna and Budapest the students approached young people and asked whether or not they would be willing to answer a few questions. After the camp, the participants administered the questionnaires in their own countries and sent back the data. The data was analyzed and evaluated with statistical methods. At this time, we have gathered approximately 1,000 questionnaires representing 26 different countries.
**Results:** The first results show that the favorite locations for students around the world are outdoor areas such as parks, mountains, forests, beach, and lake sides. At those places, 43% of respondents stated that active sports or exercise were the activities they enjoyed participating in the most. When asked what type of benefits they gained from these activities 33% of respondents said they chose the activity as a way to relax or decrease stress. In comparing responses from different countries, we concluded that there are differences dependent on their social economic and cultural background. For example, richer countries have more choices and easier access to leisure activities, and countries with lower average income are offered a limited amount of opportunities.

**Anna Szabó** (Eötvös Loránd University Faculty of Pedagogy and Psychology, Budapest, Hungary)
Supervisor: Dr. Attila Oláh

## Role and movement quality imagery as a facilitator of flow for dancers

**Keywords:** imagery types, dance, flow
**Background:** Dance is considered to be one of the activities which can increase the likelihood of emergence of flow state, but it takes years of training to reach a level where the execution of particular movements is rather automatic and the dancers can concentrate on expressions and performance.
In previous studies four types of imagery have been distinguished that are used by dancers during the movement learning process and performances: technique, goal related, mastery based, role and movement quality imagery.
**Research aims:** The role and movement quality imagery as a flow state facilitator during dance classes was studied in this research. Flow motivates people to participate in a specific activity more often it could mean that the use of imagery in dance education could prevent people giving up dancing by helping them experience the flow from the beginning of their training. I examined whether age, dance level or the compatibility of the preferred imagery type with the actually used one affected the emergence of the flow as well.
Short term goals, challenge-skill balance and instant feedback are also required to reach the flow state; the second aim was to verify whether imagery fulfills these requirements during dancing.
Based on previous studies, the confidence in self and skills are flow facilitators as well, and the use of different imagery types is a positive predictor of dispositional self confidence. The third aim was to examine whether those dancers who use imagery more often reach the flow state

more easily because they are more confident in themselves and in their skills.

**Methods and analysis:** An online questionnaire was used that began with general demographic and dance experience related questions. It was followed by the Dance Imagery Questionnaire to explore which type(s) of imagery techniques are used by dancers more often. The Trait Robustness of Sports-Confidence Inventory was also applied to measure the confidence in self and sport skills. Then half of the participants (all dancers from different dance types, age, and experience levels) described in detail a dance experience where they were asked to use role and movement quality imagery. The other half described an experience that didn't contain imagery use. The next step consisted of two questionnaires: the Flow State Scale and the Pekala's Phenomenology of Consciousness Inventory to measure to what extent the conscious state altered during the experience and whether it was really caused by the flow.

Multiple regression model was used to examine the best predictors of flow in dance situation. At the end, the models were compared and as a result the best fitting model was chosen as the best predictor of the emergence of the flow state.

**Bence Török** (Semmelweis University Faculty of Physical Education and Sport Sciences (TF), Budapest, Hungary)
Supervisor: Dr. Katalin Szikora

## Comparsion of the Physical Education and Interscholastic Sport System in the USA and in Hungary

**Keywords:** USA, physical education, sport

Today, one of the biggest leader in sports is the USA, the olimpic medals prove that. Although Hungary has far less population, it still stands between the leaders in the world of sports. This big achievement is based on the sport of the rising generation, and the interscholastic sports and physical education belongs to that.
In view of this, the main question is what sort of differences are there between the physical education and interscholastic sport system of the USA and Hungary. The sport is really based on physical education, or this is not true? Is there in the USA a sport system between schools, like the school sport system in Hungary, and if there is, how successful it is?
By monitoring the american side of the question, an american national survey, the Shape of Nation Report from 2012 was an excellent source, because it was made for estimate the status of the physical education in the USA. In addition, the datas from the National Federation of State High School Associations were very useful as well. We have to mention the works in this theme of Patrick M. O'Malley, and Jordan A. Carlson.
The main source for review the hungarian system was the CXC. law from 2011, about the national education. We used the work of Gyula Gergely and Gábor Elbert as well.
The research was made by qualitative research method. The main method of qualitative research is document analysis, and it can be used for analise documents made by others. Because of the nature of this method, we used secondary data collection. This means we studied, and

confronted information which was collected by someone else.
The results of the comparsion suggest that the hungarian physical education system is in many cases more modern and far-gone than the system of the USA. It stands with stabil rules, and obvious phrasings against the unregulated system of the USA, which has no federal law for the physical education. Despite this, the interscholastic sports, and the value and popularity of them is on a much higher level in the USA, we can say that it is one of the reasons why they are so successful in sports. It is obvious, that with the intense study of the american system we can make a better school sport system in Hungary. A better school sport system, in my opinion, will bring better, higher performace, thus taking positive effect on the professional sports.

**Gábor Horváth** (University of Szeged Faculty of Physical Education and Sport Sciences, Szeged, Hungary)
Supervisor: Dr. Noémi Tari-Keresztes

**The acknowledgement of Physical Education teachers, peer support and healthy lifestyle**

**Keywords:** social support, P.E. teacher
**Introduction**: This paper investigates the acknowledgement of physical education (P.E.) teachers, the effect of peer support and their relations to healthy lifestyle. The choice of my topic has been influenced by the current changes in the field of sport in Hungary. Among others are the outstanding results in the Olympic Games by Hungarian athletes, which might set a good example for young people and the introduction of the daily sport education in schools, which is hoped to bring significant improvements in public health. Among adolescents peer pressure is a crucial factor. These aspects considered, I want to focus on the possibilities of P.E. teachers in establishing a healthy lifestyle.
**Methods**: A survey was conducted in two secondary schools (Katona József Grammar School and Gáspár András Vocational and Technical School, Kecskemét), with subjects (aged 14-19) from randomly selected classes (grades 9-12). From the total amount of subjects (n=216), the percentage of provided answers was 100 %. The average age of the students was 16.19 years (S.D.: 1.27 years). The rate of males was 67.7 %, whereas of females 34.3 %. The focal points of the questionnaire were not only socio-demographic, but also looked into the students' educational results, sporting habits, motivating factors for their choice of sport, eating habits, addictive tendencies, peer influences and the competences of their sport instructors. The questionnaire took about 30 minutes to complete.
**Results**: The results altogether show that P.E. teachers have a great responsibility, and 22.1 % of the subjects stated that they would even

change their lifestyle if their teacher drew attention to it. About the question whether their teacher's encouragement is helpful or hindering in accomplishing a task, 97.6 % claimed it beneficial. Furthermore, 77.7 % considered their teacher having knowledgeable expertise, yet 61.4 % said they do not discuss healthy lifestyle with their sports instructor. Thus, knowledge should be paired with the suitable communicative competences. Regarding peer influence, their pressure is considerable – 70 % of subjects prefer doing tasks with peers to without them. I examined the age of PE teachers and PE teachers' willingness to promote healthy lifestyle with cross tabulation analysis which showed a significant result. The younger the PE teacher is, the more often they promote healthy lifestyle. The result of the examination which revealed that teachers who set good examples to their students are more trusted was also significant. Another significant finding was that students who are praised during the PE lessons are more pleased to perform the exercises. Consequently, they are more likely to experience success and less likely to demonstrate failure avoidance.

**Conclusion**: The research shows that for students getting positive reinforcement and praise has a great emphasis. They need motivation for accomplishing the tasks in the appropriate as well as enjoyable manner so that in the future they can benefit from this love of sports.

**Jakob Tarp** (University of Southern Denmark, Institute of Sports Science and Clinical Biomechanics, Centre of Research In Childhood Health (RICH), Odense, Denmark)
Supervisors: Anna Bugge, Karsten Froberg

**Associations between objectively measured physical activity levels and executive functions in Danish 12-14 year old adolescents – baseline findings from the Learning, Cognition and Motion (LCoMotion) cluster-randomized controlled trial**

**Keywords:** Academic performance, school-based, accelerometry
**Background:** The school setting has long been recognized as an apt opportunity to influence youth health-related parameters (i.e. cardiorespiratory fitness, physical activity levels and adiposity). Recent findings support the notion that these parameters may also be linked to performance in school (i.e. academic achievement). These findings may be explained by the concurrent reportings that particular brain functions, known as the executive functions, which are involved in planning, maintaining and initiation of goal-directed actions, are more developed in youth exhibiting higher levels of fitness and lower levels of adiposity. These later findings, however, have primarily been reported in laboratory settings and the relationship between health-related parameters and executive functions among youth in a public school setting is thus unknown.
**Methods:** The LCoMotion study is a cluster-randomized controlled trial with the purpose of investigating changes in academic performance and executive functions as a result of a more physical activity-based school-day. Participants are students attending the 6$^{th}$ and 7$^{th}$ grade of the normal Danish public school system. Baseline assessments were performed during November/December 2013 with follow-up assessments scheduled for May/June 2014. Physical activity was assessed using accelerometry while executive functions were assessed using the

Flanker Task which is a measure of an individual's ability to inhibit a pre-potent response during a stimulus trial.

**Results:** Baseline associations between physical activity assessments at 14 schools including more than 700 consenting adolescents and performance on the Flanker Task will be presented. These associations will be adjusted for potential confounders (i.e. socio-economic status) and a potential mediating effect of weight status (BMI) will be explored. Results from both reaction time and accuracy during the Flanker Task will be presented, as datasets are available, including an objective measure of physical activity and of executive functions in a large school-based population. It is hypothesized that students who, are more physically active (counts/min), will perform better on the Flanker Task. Similarly, that minutes spent in moderate and/or vigorous activity/per day will be associated with better performance. Finally, it is hypothesized that the associations will only be pronounced during the incongruent condition on the task as this requires the greatest amount of cognitive control.

**Conclusions:** The relationship between health-related parameters and learning is difficult to completely entangle, but any association between health-related parameters and specific brain functions required for learning will be an important step in the promotion of physical activity in public schools.

**Fanni Sipos, Dóra Vilhelm** (Semmelweis University Faculty of Physical Education and Sport Sciences (TF), Budapest, Hungary)
Supervisor: Dr. Martina Uvacsek

## Relationship between the objectively measured physical activity in school and FMS scores

**Keywords:** physical activity, FMS, actigraph
**Introduction:** Little objective data has examined the effectiveness of physical education lessons however we believe that PE is one of the most important method to increase physical activity in school time. Most studies have shown that students spend less than 50% of physical education class time in MVPA (Fairclough and Stratton 2006). According to the international recommendations the Hungarian government decided to enhance physical activity in children with the introduced everyday PE in schools (WHO 2008, CDC 2011). This study aimed to examine the physical activity levels of children during school days, on PE lessons and examine the relationship between FMS results and measured PA.
**Hypothesis:** We hypothesized that the boys' school activity is higher than girls', however their Functional Movement Screen scores are similar.
**Methods:** Thirty-seven 9-13 yrs. old children participated in the study, after statistical data clearing 32 children data were analyzed (19 boys and 13 girls). The body dimensions were taken following the ACSM' recommendations, the activity were measured using GT3X ActiGraph equipments. The PA was detected on 5 weekdays using 5sec. epoch length. Descriptive statistics were calculated using the STATISTICA software version 11.0, the gender differences were analyzed with t-tests.
**Results:** Boys were heavier and produced significantly more MVPA/day (91.53±18.21 min.) than girls (73.46±7.84 min.) and higher MET average score (1.98±0.19 vs. 1.81±0.11) too. Boys spent significantly

more time (23.46%) of their school time with MVPA compared with girls (17.87%). Despite of the measured activity girls reached higher points in Functional Movement Screen (FMS) than boys (12.68±1.88 vs. 14.46±1.61), therefore we found week opposite relationship (r=-0.34) between the measured PA and FMS.

**Conclusion:** The everyday PE is significantly contribute to the daily MVPA, thus most of the children reached the 60 min. daily recommendation in school time. The boys' activity was higher however the girls' functional movement ability was better. We can conclude based on in this study the higher PA does not necessarily related to better functional movement.

## Human Kinesiology & Exercise Physiology Section for PhD Students

**Renáta Szabó** (Department of Physiology, Anatomy and Neuroscience, Faculty of Science and Informatics, University of Szeged, Szeged, Hungary)
Supervisor: Anikó Pósa
Consultant: Csaba Varga

### The effect of recreational exercise, caloric restriction, and high triglyceride diet in experimental menopause

**Keywords:** recreational exercise, experimental menopause
**Background:** The incidence of cardiovascular diseases are significantly higher after occurrence of estrogen deficiency in menopausal age. Augmented level of pro-inflammatory cytokines (tumor necrosis factor alpha; TNF-α) and activity of myeloperoxidase (MPO) enzymes and decreased activity and expression of heme-oxygenase (HO) are accompanying factors of heart and coronary diseases.
**Aims:** We investigated the effects of hormone deficiency after surgical menopause as well as the recreational physical exercise (RPE) and nutrition on levels of TNF-α and HO-1 and activity of MPO and HO enzyme systems from blood plasma and tissue (heart left ventricle -LV) homogenates.
**Methods:** Female Wistar rats were divided into 12 groups. The two main groups were the ovariectomized (OVX) and sham-operated (SO) groups. Both of the OVX and SO groups were divided into trained and control (without exercise) groups. We separated high trigliceride (HT), caloric restriction (CR) and normal (CTRL) diet groups within running and control groups. The feeding and training period were monitored over 12 weeks. TNF-α and HO-1 level were measured by ELISA while the activity of HO and MPO enzymes were detected by spectrophotometric assays.

**Results:** We found that the HO activity and HO-1 expression were significantly decreased in OVX CTRL LV comparing with SO CTRL rats, which could be normalized via CR and running. The HT diet reduced significantly the level of HO-1 in case of SO animals and this changes might be prevented by RPE.
The concentration of plasma TNF-αand MPO activity of heart were significantly higher in OVX females as compared to the SO groups. The level of TNF-α and MPO were reduced by CR diet while the activity of MPO was significantly decreased via RPE. The HT diet caused significant increase in TNF-α and MPO of SO animals and this rising could be improved by RPE.
**Conclusion:** The OVX and HT diet are responsible for cardiovascular risk which might be associated with inflammatory processes and the decreased function of antioxidant systems, which could be improved by RPE.
**Grant support:** This research was supported by the European Union and the State of Hungary, co-financed by the European Social Fund in the framework of TÁMOP-4.2.4.A/ 2-11/1-2012-0001 "National Excellence Program" (to Renáta Szabó, Anikó, Pósa, Krisztina Kedvesné Kupai and Csaba Varga) and by the Bolyai scholarship (Anikó Pósa).

**Éva Boros** (University of Szeged, Hungarian Academy of Sciences, Biological Research Centre, Szeged, Hungary)
Supervisor: István Nagy,
Consultant: András Szász

**The expression profile of TAM and NLR receptors upon physical activity in TNBS-induced colitis in rats**

**Keywords:** chronic inflammation, recreational physical activity, next generation sequencing

**Background:** To the various harmful impacts that effect our body, our immune system responds with an inflammatory counteraction. This process is strictly regulated, since advancing from an acute to chronic phase of inflammation may cause serious complications. The inflammatory bowel diseases of the whole tract, such as Crohn's disease or colitis ulcerosa, shows an ascending trend in the population. Despite the fact that several inflammatory effector molecule's expression level rises in the course of the disease, the expression patterns of the molecules controlling the course of the inflammation are completely unknown. Numerous molecules, such as the members of TAM receptor family and the NLR gene family, are involved in the negative regulation of the inflammatory immune processes: these molecules are controlling the inflammatory activity. Although it is well known that NOD2 polymorphisms are in direct correlation with Crohn-disease, the expression of TAM and NLR family members in inflammatory bowel diseases are unknown. Moreover, while recreational physical activity efficiently helps resolving other chronic autoimmune diseases such as rheumatoid arthritis, little is known about the role physical activity plays on the IBD patient's status and the gene expression changes at the site of inflammation.
**Methods and Results:** Utilizing the power of next generation sequencing, we have performed transcriptome analysis in a 2,4,6- trinitroben-

zenesulfonic acid induced rat IBD model with the aim to identify genes showing differential gene expression. In addition, the model and experimental approach proved useful for testing the role of recreational type of physical activity on the gene expression. Our data show that recreational physical activity itself reduces the expression of inflammatory effectors in mononuclear cells isolated from blood, a phenotype not observed in inflamed rats. When monitoring the gene expression pattern of intestines, we identified that most of proinflammatory effector molecules show significantly increased expression in the inflamed regions, in contrast, the expression of negative regulator molecules show heterogeneous pattern.

**Conclusion:** Our data, showing decreased expression of most of negative regulators, may explain the constant and high expression of proinflammatory effector molecules at the site of inflammation.

**Gergő Pintér** (University of Pécs, Doctoral School of Health Scienses, Pécs, Hungary)
Supervisors: Jr. Ferenc Gallyas
Consultant: Dr. Marta Wilhelm

**Enzyme activity, lipid peroxidation and amino acid level in smokers and non-smokers after a 6-week long β-alanine rich diet**

**Keywords:** smoking, creatine kinanse, TBARS, carnosine
**Background:** It is well known that intensive physical activity can raise the blood lactate level supremely. The purpose of our study was to characterize the biochemical effects of a β-alanine rich legal trade sport food supplement. β-alanine is the decomposition and constructive product of the dipeptide carnosin (beta-alanyl-L-histidine). Its main physiological role is to neutralize hydrogen ions, avoiding acidification therefore maintaining the optimal pH level of muscle cells. There is little information about the antioxidant effect of carnosine.
**Materials and Methods:** Participants were volunteers (n=43) 58% male, 42% female. Since we did not find any significant differences between data of men and women, our final groups are: smoker users (SU, n=9), smoker non-users (SNU, n=7), non-smoker users (NSU, n=14), non-smoker non-users (NSNU, n=13). The food supplement was supplied by Scitec Nutrition. Half of each group got pills containing β-alanine, taking them consistently (50mg/bwkg) on an everyday basis, while the other half of the groups took placebos (microcrystalline cellulose). Before and after the 6-week long training and supplementing protocol, we had measured some anthropological, biomechanical and fitness parameters. Besides these measurements we had collected blood samples of our volunteers, and measured the creatine kinase enzyme activity(CK), lipid peroxidation(TBARS), and some important amino acid concentrations(histidine, beta-alanine, carnosine) (HPLC) of blood serum.

**Results:** The CK activity has showed significant reduction ($p<0,017$) in smokers, before (228,3U/ml) and after (112,9U/ml). While in the nonsmoker group the normal physiological range of the enzyme activity was detected after the training program, before(112,1U/ml) and after(130U/ml). Interestingly the TBARS levels had shown the same trend as the CK. The smokers had much higher initial TBARS level which reduced after the training period, while the non smokers TBARS levels has shown the opposite, it started from a much lower level than the smoker group's and after the 6-week training it increased.
**Conclusion:** We have all the data of the amino acid levels in the blood plasma, but further analysis is needed. We hope that we will find some relations between amino acid levels and our previous results.

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## Performance changes of prepubertal female handball players after 8 weeks of aerobic training

**Keywords:** handball, morphological age, training

**Background:** The sensitive period of aerobic capacity development is between prepubertal and pubertal ages (9-13 ages). Therefore the main training goal is to improve stamina in this age group for all young athletes including handball players. The appropriate level of aerobic capacity is an important factor of good performance on the field. The aim of our study was to examine the changes of anthropometric and physiological parameters and the muscle force of young female handball players caused by a well constructed training period (8 weeks) in the preparatory season and to correlate these changes with the morphological age of players.

**Materials and methods:** Eighteen young female handball players (average age: 11.50±0.56 yrs) participated in our study. Before and after the training period the body mass, height, body fat percentage and specific anthropometric parameters were measured, followed by a hand grip strength test and maximal concentric quadriceps and hamstring torque were conducted. All players took part in a spiroergometric treadmill exercise test (Bruce protocol). Changes in physiological parameters were monitored (e.g. maximal heart rate, $VO_2$max, RR variability, Respiratory Exchange Ratio/RER) during the test. Lactate levels were also measured before and after the treadmill test. The same young athletes performed besides handball training in an additional program (20-25 min, continuous running, three times per week). Paired sample t-test was used to analyze the changes in physiological parameters and bivariate correlation to analyze the correlation between parameters. Significance level was set at $p \leq 0.05$.

**Results:** We found statistically significant differences in anthropometric parameters after 8 weeks of aerobic training. The mean morphological age (12.52±0.80 years) of handball players significantly differed from their decimal ages (11.50±0.56 years). Although no significant differences were found in mean relative $VO_2$max, improvement can be seen (before: 43.32±5.68 ml/kg/min, after: 44.05±5.09 ml/kg/min). RER was significantly higher (p=0.001) after 8 weeks (1.08±0.45) than before (1.02±0.36). Better results were registered in force parameters. Among others the mean maximal concentric quadriceps torque is significantly (p=0.022) higher (84.39±15.35 Nm) then before (76.38±15.93 Nm). The morphological age of handball players correlates with the concentric quadriceps torque (r=0.67, p=0.003).

**Conclusion:** As previously reported there was no significantly higher $VO_2$max measured after 8 weeks of strong aerobic training. However young handball players reached the ventilatory breakpoint later, while minute ventilation did not change, suggesting that the quality of respiration is improved. Furthermore the anaerobic capacity of handball players improved, probably caused by the specific demands of handball training. The recorded improvement in force parameters in prepubertal ages are the consequences of neuromuscular adaptation. It is important to monitor and correlate the biological age/maturity and the changes in physiological and anthropometric parameters of young athletes for good performance and efficient training programs.

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**Training-Induced Differences In Mitochondrial Biogenesis In Rat Testicular Tissue**

**Introduction:** The increasing incidence of civilization diseases cause greater problems worldwide,with inactive lifestyle and the low VO2max in the background. These diseases can be prevented by regular physical activity. We know that VO2max is largely dependent on genetics,but it is also determined by the number of mitochondries. So, mitochondriogenesis plays an important role in the body's adaptation. According to our hypothesis,animal groups with low running capacity can reach the high running capacity level of control animals. In addition,we assumed that due to physical activity or resveratrol affect the different between animals of different genetic decreases in mitochondriogenesis.
**Methods:** In our study,we worked with 22nd generation male rats,which were selected by their ability of running-low (LRC) and high (HRC) running capacity. The animals were divided into 8 groups: control LRC (Clow), LRC coach (Tlow), resveratrol treated (RSVlow),coach and resveratrol treated (T+RSVlow),control HRC (Chigh),coach HRC (Thigh),resveratrol treated (RSVhigh),coach and resveratrol treated (T+RSVhigh). 5 times a week for 12 weeks endurance training treadmill was used with 60% of VO2max. During the training, the duration was fix,while the speed was constantly raised by VO2max. The quantitative analysis of proteins were carried out by Western blotting of testicle tissue of rats. The data were analyzed by ANOVA, at 5% significance level.
**Results:** Training increased VO2max values in the RSVlow group significantly,while resveratrol did it moderatly,compared to the control animals. The levels of SIRT1 increased significantly in the RSV-

low group while it is increased moderatly in the case of T+RSVlow compared to the control group. The PGC-1α increased in groups of T.low and RSVhigh compared to the control group. In the case of the NRF-1,we can observed an increas in the RSVhigh animals compared to Chigh. In the TFAM there is a significant difference between trained animals and those receiving resveratrol and combination therapy.

**Discussion:** We can conclude that we had the chance to examine a new area because in the literature we can find researches with other tissues (heart,muscle,liver). We could only assume that in spite of the tissue differenc of testicular tissue we will experience similar changes as found in previous studies,and we can conclude that doses of resveratrol have a good effects on process of strengthening on mitochondriogenesis. This research provides a good basis for further investigation.

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## Changes in stress protein expression in skeletal muscle before the onset of metabolic abnormalities in type 2 diabetic rats

**Keywords:** type 2 diabetes, heat shock protein 72, aging
**Background:** Physical inactivity affects metabolic diseases including type 2 diabetes, by attenuating the metabolic function of the skeletal muscle, which is an important tissue for maintenance of energetic homeostasis. Recently, stress proteins are considered the novel molecular target for preventing and improving of metabolic diseases and they are induced in the skeletal muscle to protect cells against many stressful conditions such as oxidative stress. However, it is unclear how the expression of stress proteins in the skeletal muscle changes with progression of metabolic abnormalities toward type 2 diabetes. We hypothesized that the stress protein in the skeletal muscle, especially the inducible form of 70-kDa heat shock protein (HSP72), is induced to protect cells against various stressors with progression of metabolic abnormalities.
**Purpose**: To examine changes in the expression of HSP72 in the skeletal muscle that occur before the onset of metabolic abnormalities in type 2 diabetic rats.
**Methods**: The study used 24 male Otsuka Long-Evans Tokushima Fatty (OLETF) rats, as the models of type 2 diabetes, and 24 Long-Evans Tokushima Otsuka (LETO) rats as non-diabetic controls. The experiences were conducted at the age of 5, 15 and 25 weeks (n = 8 each). At

each age, an intraperitoneal glucose tolerance test (IPGTT) was performed. Five days after the IPGTT, the animals were anesthetized with pentobarbital sodium and sacrificed. Blood samples were obtained to assess the triglyceride (TG) and non-esterified fatty acid (NEFA) concentrations, and then the soleus and plantaris muscles were removed and frozen immediately in liquid nitrogen. The expression of HSP72 in both muscles was analyzed using Western blotting.

**Results**: The OLETF rats weighed more than the LETO rat at all ages ($p < 0.05$). In the OLETF rats, the glucose tolerance determined by the IPGTT became significantly worse with age ($p < 0.05$) and type 2 diabetes developed by the age of 25 weeks. The serum TG concentration in the OLETF rats increased significantly with age ($p < 0.05$), whereas there were no significant differences in the LETO rats with age. The serum NEFA concentration in OLETF rats was higher than in the LETO rats at each age ($p < 0.05$). In the soleus muscle, HSP72 expression increased significantly with age in both animals ($p < 0.05$), but there were no significant differences between animals. HSP72 expressions in plantaris muscle also increased significantly with age in both animals ($p < 0.05$), but those in 25-week-old OLETF rats were higher than in the age-matched LETO rats ($p < 0.05$).

**Conclusions**: Our results suggest that the expression of HSP72 in the skeletal muscle increased with progression of metabolic abnormalities in type 2 diabetic rats, suggesting that HSP72 might be modified by metabolic abnormalities with type 2 diabetes.

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**Physical Activity And Cancer Survivors: A Combined Training Protocol**

**Background:** Breast cancer is one of the most common cancers worldwide and the leading cause of cancer death in women. About 8.500 deaths, 37.000 new diagnoses and 416.000 prevalent cases of breast cancer are estimated among Italian women in 2005. As several studies show surgery and all related treatments (chemotherapy, radiotherapy, hormonal therapy etc.) can produce many negative side effects in the physiological and psychological area, that could be reduced with specific program of exercise.
**Aim:** Evaluate the effects of a composed aerobic-resistance training protocol in breast cancer survivors.
**Design and method:** 20 patients, 32 to 68 years old (49,3±10,1) surgically treated for breast cancer with therapeutic treatment concluded at least six month previously, eligible for non competitive sports were randomly assigned to either Training Group (TG) or to Control Group (CG). TG began exercise programs consisting of 2 training sessions per week lasting 60 min for 6 months. Each training session was structured as follows: 5-10 minutes of warm-up performed on a stationary bike or ergometer; a central phase of 20-25 minutes of aerobic training using elliptic equipment or treadmill. Each patient started from 50% of their Vo2max and was monitored by an heart rate monitor. And 20-25 minutes of resistance training exercises that included shoulder press, vertical traction, leg extensions, leg curls, leg press, running between

40 and 80% of 1RM. For the first four weeks, training was carried out at 40% of 1RM, then the workload was progressively increased. Final phase with stretching: specific exercises of flexibility for upper arm, especially for the shoulder. In order to evaluate the exercise effect on cardiopulmonary function and body composition, all patients were tested for $VO_2$max, FVC, $FEV_1$ and Body Impedance Analyse and had the strength of their principal muscular groups measured too. Additionally, the psychological screening consists of FACIT-F. Data are collected twice, at the beginning and at the end of the training program.
**Results:** After intervention, TG group showed significant improvement in: VO2Max, Strength in both upper and lower limbs, BMI and FAT; FACIT-F total score showed significant increase too. Data from CG were unchanged, except BMI that was significantly increased. These preliminary results suggest that combined training has positive effects on all of the physiological and psychological parameters measured.
**Conclusions:** The results of this study underline the importance of the early inclusion of structured physical activity in the rehabilitation protocol of breast cancer survivors.

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## Dynapenic Abdominal Obesity and the Prevalence of Type 2 Diabetes: A Cross-Sectional Study among Japanese Men

**Keywords:** muscle strength, hyperglycemia, waist circumference
**Background:** Muscle strength decreases with aging, known as dynapenia (1), while the body fat mass increases. Abdominal obesity is a well-known major risk factor for type 2 diabetes (2). In addition, a previous study has reported that people with diabetes have weaker muscle strength than those without (3). These findings suggest that the coexistence of dynapenia and obesity may synergistically induce the development of type 2 diabetes. However, a limited number of epidemiologic studies have examined the interactions between dynapenia, abdominal obesity, and the prevalence of type 2 diabetes.
**Purpose:** This study aimed to examine the cross-sectional relationship between dynapenic abdominal obesity and the prevalence of type 2 diabetes among Japanese men.
**Methods:** We evaluated hand-grip strength in 2,517 male workers aged 40 years or older (median age 53 years) in order to assess muscle strength. The participants were divided into quartiles on the basis of their muscle strength. Abdominal obesity was defined as a waist circumference ≥85 cm. The prevalence of type 2 diabetes was estimated using data from annual health checkup and questionnaire. Odds ratios and 95% confidence intervals (95% CI) for the prevalence of type 2 diabetes were obtained using a logistic regression model.
**Results:** In total, 258 participants had type 2 diabetes. The prevalence of abdominal obesity was 44.4%. After adjusting for age, cigarette

smoking, alcohol intake, family history of diabetes, and waist circumference, and by using the highest muscle strength group as the reference, the odds ratios (95% CI) for the second to the fourth (lowest) quartiles groups were 1.21 (0.80–1.83), 1.26 (0.83–1.91), and 1.46 (0.97–2.20), respectively (*P* for trend = 0.076). When the analyses were stratified by the status of abdominal obesity, the multivariate odds ratios (95% CI) for the second to the fourth (lowest) quartiles of muscle strength in the abdominal obesity group were 1.11 (0.64–1.91), 1.30 (0.77–2.22), and 1.56 (0.93–2.61), respectively (*P* for trend = 0.067), but we did not observe a relationship in the group without abdominal obesity (*P* for trend = 0.333). The interaction between muscle strength and abdominal obesity was not statistically significant (*P* = 0.304).

**Conclusion:** These results suggest that dynapenia with abdominal obesity is associated with the prevalence of type 2 diabetes among Japanese men; however, this trend was not observed in men without abdominal obesity. A cause-effect relationship could not be established in this study; therefore, we plan to investigate this issue using a longitudinal design in future studies.

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