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## The Role of Pre-surgery Strength and Functional Training in Succesful Accelerated Physiotherapy after Anterior Cruciate Ligament Reconstruction: a Case Report

**Keywords:** accelerated physiotherapy, ACL reconstruction

**Purpose:** This case report describes the advanced pre-surgery rehabilitation protocol followed by the literature proved accelerated physiotherapy after ACL reconstruction using the double bounded ST/GR autograft.
**Introduction:** The anterior cruciate ligament become a leading injury of lower extremities both in case of profesional and amateour sport (1). Most of the ACL injuries occur in non-contact situation (2) and might be recognized as lack of biomechanical-neuromuscular function (2). The anterior cruciate ligament in crucial for both static and dynamic stability of the knee joint. Espacially the function during the maximal velocity, dynamic actions seems to be most important in case of returning to sport activity – that is being supported by specific ligament mechanoreceptors such as the Ruffini and Paccini corpules, the Golgi organs and free nerve endings (3). Therefore the main aim of post-surgery physiotherapy is to restore as fast as possible proprioception of the ligament. That is neccessary for succesfull return to sport as well as can protect the joint against re-injury or arthrofibrosis leadning to joint osteoarthritis (1).
A successful rehabilitation requires also physiotherapy prior to surgery. Based on literature knee joint should be „quiet" at the time of ACL reconstruction to minimize the risk of arthrofibrosis. Most surgeons and therapists suggests: minimal or no effusion, minimal muscle torques assymetry between the knee flexors and extensors, full knee extension and „normal" gait (4).
Therefore the aim of the study was to apply modern physiotherapy protocol including pre- and post-surgery treamtment leading to restore the full function of the knee joint after the ACL reconstruction.
**Methods:** The 33-year-old male basketball player who suffered his first knee injury. MRI scans showed rupture of ACL. Prior to surgery intensive physiotherapy program was introduce. Main aim was to restore the full range of the motion, and elevate the level of muscle strength. The patient had operated after seven years the first injury in july 2010. After reconstruction he immediatly started accelerated physiotheraphy. Surgery was done with Rigidfix technique. Measurements made with Multicont II (Tihanyi System) dynamometer.
**Results and discussion:** Maximal muscle torques and Rate of Tension Development (Rtd) of both knee extensors were measured during static and dynamic contraction. The experience was the injured leg's strength was higher in every measuring time and every angle than the unhurt leg's strength before the reconstruction due to the sternght and functional preparatory-training. Immediately after the operation strength of the injured leg decreased. Seven month after surgery the injured leg shown stronger than the unhurt thanks to the postoperative accelerated therapy. The same trend appears at dynamic contraction, at every angular velocity.
**Conclusion:** Pre-surgery physiotherapy program was found effective and helpful to reach

„quiet” stage of the knee before the reconstruction. Post-surgery accelerated rehabilitation supported fast and safety return to everyday and sport activity with significantly decreased risk of re-injury.

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**A Multidisciplinary Vocational Rehabilitation with Focus on Physical Activity Predicts Increases in Motivation, Perceived Competence, Physical Activity Behavior, Healthy Functioning, and Return to Work**

**Keywords:** Physical activity, self-determination theory, vocational rehabilitation

**Objective:** The aim of the study was to: 1) examine whether participants on sick-leave who received 4-6 weeks of vocational rehabilitation with focus on physical activity changed in the following variables compared to a control group: return-to-work (RTW), need satisfaction in physical activity (PA), perceived competence for PA, autonomous motivation for PA, well-being, vitality, subjective health, somatic symptoms and level of PA, and 2) explain possible changes in the intervention group by using a Self-Determination Theory (SDT; Deci & Ryan, 2000) framework.
**Method:** A prospective non-randomized controlled study was designed with 107 participants (n=91 in the intervention group [IG] and n=16 in the control group [CG]). CG participants were also on sick-leave, but not in need for rehabilitation (i.e., more healthy functioning). Participants responded to a questionnaire package which was administered three times to the intervention group (at intervention start, T1, and end, T2, and at six week follow-up, T3) and two times in the control group (at T1 and T3).
**Results:** The IG had a significant increase in perceived competence for PA, autonomous motivation for PA, well-being, vitality and subjective health from T1 to both T2 and T3. Additionally, the IG had a significant increase in RTW and PA at T3, need satisfaction in PA at T2 and decreases in somatic symptoms at both T2 and T3. Those of the participants with the shortest duration of sick-leave responded significantly better to rehabilitation than those with longer sick-leave (cut-off point at approximately nine months). The CG also had a significant increase in RTW. In addition, the only significant change in this CG was a decrease in autonomous motivation for PA. A MANOVA repeated measures including all study variables yielded a significant interaction effect [$F(17, 56) = 2.207$, $p=.014$] and it was the IG who had the most favorable development. According to the second objective, two different SDT process models with change scores from T1 to T2 and T1 to T3 was tested. Both process models were supported using linear multiple regression. In the first model, based on change scores from T1 to T2, need satisfaction in PA was the most important predictor of the outcome variables. In the second model, based on change scores from both T1 to T2 and from T1 to T3, perceived competence for PA was the most important predictor.
**Conclusion:** This study demonstrates that both groups have a significant increase in RTW. In addition the IG had significant increases in autonomous motivation for PA, perceived competence for PA, well-being, vitality, subjective health, PA level and a decrease in somatic symptoms. These changes persisted for at least six weeks after ended rehabilitation. Two SDT process models of changes in the rehabilitation outcomes were tested and supported.

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## The Effectiveness of Conservative Physiotherapy in Case of Isolated Anterior Cruciate Ligament

**Keywords**: ACL reconstruction, physiotherapy

**Background**: The anterior cruciate ligament rupture is one of the most common knee injuries in sports (Lam et al. 2009). ACL injuries usually do not heal with conservative treatment (Zhang et al. 2011) however many surgeons and therapists advise conservative treatment not including invasive intervention. Therefore the aim of this study was to optimize individual, advanced conservative rehabilitation protocol for the young male basketball player.
**Hypothesis**: In partial ACL tear, could be enough to restore the joint proprioception, strenght and force and settlement the asymmetry between the two lower limbs, for the total healing of the articulation and to return to sport activity. Thefore we stated following research questions:
Does the muscle function could support/replace lack of ligament function?
How much time is necessary after ACL reconstruction for the knee to reclaim the total dynamic stability?
**Methods**: The patient first injury was a partial tear of the ACL, and then he was underwent a 3 months duration conservative physiotherapy treatment. The outcome of the therapy was the restored muscle strenght, force and proprioception of the injured limb. One monht after ending of the physiotherapy protocol, the patient suffered second non-contact ACL tear during a basketball match. Following the injury the patient underwent primary anatomic double-bundle ACL reconstruction using hamstring autografts and EndoButton post-fixation technique. The patient after the surgical procedures, received a 10 months duration intensive physiotherapy treatment.
**Results**: All mesurements were done with dynamometer, using isometric and concentric contraction of the quadriceps muscle. After the first injury the quadriceps strenght of the injured leg was 30% lower than the healthy leg. After the conservative treatment 10-15% difference between the injured and healthy leg was registered. Following the intensive physioterapy treatment after surgery, the injured knee have been shown 20% better achievements than the healthy knee.
**Conclusion**: The restored muscle function of the knee do not substitute the ligament, which control by the neuromuscular system. What more, extremely fast internal/external rotation of the tibial bone during the intial contact phase (40 milisecond) requires perfectly restored ligament sensibility secured by Ruffini and Paccini corpules, the Goldi tendon organs and free nerve endings (Angoules et.al 2011, Webster and Feller 2012). In this case, the efficient therapy of the torn ACL, are the surgical reconstruction and the following physiotherapy treatment.The remodeling of the transplanted grafts and total recovery of the knee is about 18 months (Cassandra A. Lee et al. 2004).

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**The Effect of Life Long Physical Activity on Early Stage of Alzheimer's Disease**

**Keywords:** Alzheimer's Disease, Physical Activity

**Introduction:** Alzheimer's Disease (AD) is one of the most common neurodegenerative diseases with severe impact on health care and society. It results in gradual loss of mental abilities, morbid behavioral changes, and finally total decomposition of the personality. It is repeatedly assumed that proper amount of physical activity during lifespan can significantly increase the reserve capacity of cognitive abilities in old age. In our work we examined how the characteristics of physical activity in the entire previous lifespan of patient can affect the progression of AD in the initial phase following diagnosis.
**Hypotheses:** We had assumed that in patients being more active physically and mentally in their previous life periods the progress of symptoms is less serious than in patients with a relatively sedentary way of lifestyle.
**Research Methods:** 32 patients with slight and medium stage of AD were examined by applying questionnaires. A detailed anamnesis was carried out in relation to their mental and physical activities. The risk factors that could alter the extent of progression were examined. Subjective and objective tests were carried out regarding the assessments of symptoms. In order to express the progression of dementia we have applied the MMSE (Mini Mental State Examination) test provided by the neurologist. Data was separated into 4 groups: factors determining physical activity, mental activity, risk factors, and factors determining symptoms. Each data was scored with digital scales according to severity, and the scores were further processed. In order to express the progression of the disease the difference between MMSE values obtained at the diagnosis of the disease and at the completion of questionnaire was computed. The difference in MMSE values was corrected for time spent between the two events and expressed as change per one month. Final results were born out of the correlation of results received on the recent mental activity scores of the patients, as well as the figures calculated regarding the risk factors based on previous physical and mental activities.
**Results:** A strong correlation was found among previous physical andmental activities and the progression of AD MMSE symptoms. In case of people being more active physically the progression of the disease was significantly slower. Regarding previous mental activities a medium size correlation was found.The identified risk factors resulted in a relatively weak correlation to the MMSE performance.
**Conclusion:** From the results we may ascertain how important a proper amount of movement, i.e. spontaneous physical activity and exercise throughout the entire span of life to prevent fast progression of mental deterioration even in AD. A longer follow-up study is planned to carry out with AD patients in the near future.

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**The Protective Cardiovascular Effects of Six Weeks Recreational Physical Exercise**

**Keywords:** recreational exercise, cardiovascular protection

**Background:** The development of heart and cardiovascular diseases are decisively life style dependant. Physical inactivity, i.e. sedentary life style increases the development of the risk factors of circulatory disease such as: high blood pressure, diabetes, the lipid metabolism and obesity. Carbon monoxide and nitric oxide produced by the heme oxygenase (HO) and by the constitutive nitric oxide synthase (cNOS) protect circulation. In contrast, the enhanced level of the matrix metalloproteinase (MMP) augments cardiovascular risks. We examined the actions of recreational physical exercise on the expression of these enzyme systems in conjunction with cardiovascular protection.
**Design:** Male Wistar rats were placed into cages installed with running wheels allowing them the self administration of physical exercise over 6 weeks. We studied 1.the activity and expression of HO and NOSenzymes in the aorta and heart left ventricle (LV); 2.theserum level of MMP-2; 3.the angina susceptibility of the heart (assessed by lead II. surface ECG following adrenaline plus phentolamine challenge); 4.the infarct size was measured in isolated hearts from both groups (control, trained) and subjected to 30 min coronary occlusion followed by 120 min reperfusion.
**Results:** We found that physical exercise 1.increased LV and aortic HO activity (from 0.83±0.21 to 5.35±0.36 and from 0.73±0.15 to 1.60±1.13 nmol bilirubin/h/mg protein, respectively; n=12-15; $p<0.001$) and LV HO-1 isoenzyme expression (from 106.3 ±3.132 to 164.0±16.479%; n=6-7; $p<0.05$) and increased LV and aortic cNOS activity (from 16.32±3.71 to 59.11±7.94 and from 105.38±55.72 to 181.78±30.29 pmol/min/mg protein, respectively; n=9-15; $p<0.001$) and LV endothelial NOS isoenzyme expression (from 109.15±5.247 to 163.1±10.67%; n=3; $p<0.05$); and 2.decreased MMP-2 serum level (64 KDa; from 1002.71±37.50 to 679.73±34.35 intensity x $mm^2$;n=12-13;$p<0.001$); and 3.decreased heart ischaemia susceptibility (ST segment depression: from -0.14±0.018 to -0.019±0.019 mV; n=11; $p<0.001$); 4.reduced infarct size (from 51.2±6.86 to 30.17±3.66 %; n=5-6; $p<0.001$).
**Discussion:** Physical activity is known to prevent the development of coronary arteria disease and reduce symptoms in patients with established cardiovascular disease. Recreational physical exercise protects the heart against angina and decreases the infarct size, which might be associated with the up-regulation of the HO and NOS enzyme systems and the down-regulation of MMP-2 activation.

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## Choreographed Movements and Games to Prevent Plantar Deformities at the Age of Preschool

**Keywords:** plantardeformities, flat feet, pre-schoolage

**Introdution:** As the opinion of orthopeadists, the plantar deformities especially flat feet is nowdays civilization disease and its formation results earnest complaints (for example formation of bunion and hammer toe, ankle joint dysfunction, scoliosis and other strong pain in the joints). Treatment is recommended to avoid these symptoms as soon as possible.
By the conducted studies of school doctors in the 2008/2009 school year and the data of Central Statistic Office, the most common disease of the five-year-old children is flat feet.
In our study we examined the platar deformitiy of preschool-aged children. In the non-representative study we compared the children, who were from a kindergarden of Budapest and Eger.
For the selection of exercise which figured in my program we used Physical Therapy (by Gárdos Magda- Mónus András, 1991), Start exercise! (by Iványi Márta, 1987) and 1008 gymnastic games and exercises (by Ursula Häberling- Spohel, 2003) titled books.
**Hypothesis:** We assume poise-correcting and foot muscle-enhancing exercises will help the development of the corresponding foot conformation and depress the frequency of the plantar deformity at the age of preschool. There is a significant difference between the degree of plantar deformity of the two genders. A significantdifference can be shownbetween Budapestand Eger-kindergarten degree ofplantardeformity.
**Methods:** The test groups included 28 boys and 29 girls from Budapest and 31 boys and 36 girls from Eger. I recordedthe necessary data, medical history, body size, degree ofplantardeformity with questionnairesandmeasurements.
For thedeterminationoffootdeformities I evaluated the plantarimprintswith a 5-point scale. (5 means healthyfoot) The poise-correcting program was used for two month, in which basic and game exercise of aesthetic sports were contained.
**Results:** Our assumptionwas verified, because after two month the foot imprints improved 0.5 value according to the determined scale. We found 0.5 value difference between the two genders (theboysoccurredto a greater extent in theflat feetfrom the test groups). Slightdifferencesobservedbetweenthetwo kindergartens, the value was 0.2.
**Summary:** Determining thegender differences the average value of the foot imprint of the girls involvedin the study was betteratbothmeasurementsthanboys, but theprogresscameto a greater extentby the boys.
In point of plantar deformity we can assert that the state of children who tookpartin the experimenthas also improved. The higherdegree ofimprovementsuggeststhat the poise-correcting and foot exercisehelps tocorrectthehealthydevelopment of the foot and the treatment of the starting deformities.

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## Developing Reaction Speed and Hand-eye Coordination by Using Speed Stacks

**Keywords**: Sport Stacking, Speed Stacks, reaction speed, hand-eye coordination, fine motor coordination.

**Introduction:** One of the reasons of choosing this topic was to prove that Sport Stacking with its new exercise variations has positive effects on both body and mind. The other reason was to introduce Sport Stacking and Speed Stacks to the public because it has not come into general practice in Hungary yet.
A good expert's primary goal is to develop personality in a healthy and harmonious way and to ensure the optimal progression. Sport Stacking helps students to develop bilateral proficiency (of equal performance) on both sides of the body. By increasing bilateral proficiency, a student develops a greater percentage of the right side of the brain, which houses awareness, focus, creativity and rhythm. Stacking helps in training the brain for sports and other activities where the use of both hands is important, such as playing a musical instrument or using the computer. Sequencing and patterning are also elements of Sport Stacking, which can help in reading and math skills.
**Hypotheses:** The author supposed that Sport Stacking has positive effects on hand-eye coordination, fine motor coordination and reaction speed; it can be an important part of PE lessons in kindergarten and primary school; it can develop the analysing, controlling and correcting activities of the nervous system, so the movements will become more accurate and economical.
**Goal setting:** The primary goal of the research is to prove that significant and measurable development can be achieved in a jolly environment where one can have a good time.
In the research answers for the intensity and frequency needed to get positive results were sought.
**Method:** 3 groups (8 persons/group) took part in this study. The development of the abilities was monitored when the students were building pyramids using glasses, while the solution to the problem is born, so the participants can appreciate their creation. Each person's reaction speed was measured by using the simple reaction time test. The first group didn't work with the glasses. The second group worked with them 3 times each lasting 20 minutes. The third group used the glasses once lasting 60 minutes. Among the exercises there were stacking and un-stacking pyramids of various difficulties (3, 6, 10 stacks), relays and skill exercises. After the practice the reaction time test was executed again. University students (aged 18-23) were measured who were leading an active lifestyle. Speed Stacks glasses (5X12 stacks), a non-slippery mat and a stopwatch was used.
**Discussion:** According to the expectations it is clearly seen that the biggest positive change occurred in the group where the students received more intensive stimuli for several times, therefore their concentration time was better. Better results could be observed in the younger age-groups. Performance decreases when you someone is getting older.
**Conclusion:** It can be stated that the spread of Sport Stacking is really useful. Sport Stacking is fitness based sport that kids from all backgrounds and abilities can do. Sport Stacking can be a great enhancement for your fitness routine both in case of athletes and non-athletes. With over 70 fitness based activities, sport stacking helps to motivate kids to be active and fit. Teachers and parents also like sport stacking because it can be done at home.

Non-Athletic kids can compete head to head with their more athletic counterparts. This significantly raises their self-esteem, motivating them to work harder in PE and be willing to participate. It's a WIN, WIN!

The research has great benefits because one can get an insight into an amusing but developing sport that everyone likes who once tried. For the future, this study offers exciting research opportunities, for example, a great chance to be a part of everyday PE in Hungary. The author would also like to have comparisons with other studies done abroad.

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## Features of the Testing System in Preparation of Basketball Players

**Keywords:** testing, preparedness, basketball players.

Significance and efficiency of control of athlete's preparedness and its results upon the quality of training process management is well known. The most widespread way of pedagogical control is testing.

In basketball, there are a lot of tests to estimate the physical and technical preparedness of athletes. However, in basketball practice there has been a tendency to underestimate the testing and analysis of its results, which reduces the objectivity of estimation for training effects and information about the state of basketball players, and it doesn't allow to correct training process differentially.

The research was conducted in the period of 2008-2011. We conducted systematization of tests for physical and technical preparedness that were used in different years in Russia in the practice of basketball players training of all ages and skills. We have also analyzed the tests used in the United States and in basketball clubs in Serbia. After that, we selected the most modern and proven by theory and practice tests, and tested the young basketball players.

The most often used tests to determine the level of physical fitness of basketball players in Russia are as follows:

Sprint 20 m(sec), Speed defensive movements(sec), Serial jumping (number of times),
Max. standing jump up and running jump up(cm), Speed endurance, etc.

The most often used tests to determine the level of technical preparedness of basketball players in Russia are:

Distance throws (40 shots)**,** Free throws (3 sets of 6 shots)**,** and «Speed dribbling» (sec), etc.

The tests used in different countries are:

1. Dynamic balance.
2. «Kamikaze»
3. Throws the ball under the basket for 30 seconds after the stroke counters.
4. Movement in the defensive stance for 30 seconds.
5. Movement in the defensive stance by 6 points.
6. Dribbling test.
7. Static balance.
8. YO-YO test.

Also, we have studied tests and the latest testing data of physical preparedness of NBA players on position.

To study the preparedness of players (men), there are the following tests:

1. Sprint on three-quarters of areas (75.9 ft - 23.1 m)
2. Agility of movement (sec)
3. The maximum standing jump up (cm)
4. The maximum running jump up (cm)
5. Bench press (as determined by the number of times).

Thus, our analysis used in the present system of testing in basketball suggests that testing is one of the most important methods to obtain objective and comprehensive information.

But now, working as a team coach from Junior basketball club "Runa", we have selected from a variety of tests, in our opinion, the most informative ones for basketball, and we have conducted the testing twice for the physical and technical preparedness of young men born in 1996 (14-15 years old). The first tests were carried out in the interval between games of competition period in

the season of 2010-2011. The second test was conducted after the base stage of the preliminary period in the season of 2011-2012. Analysis of the results allowed us to trace the dynamics of the level of physical and technical preparedness of young players.

Thus, the systematization of tests for basketball players of different ages and skills allows us to purposefully apply and reveal selectively dynamics of preparedness at different stages of preparation.

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**Team-timeout, as a Possibilty for Shaping Goal Differences in Handball Matches**

**Keywords:** time remaining, goal disadvantage, time of attacks

**Background:** Handball games have accelerated these days which result in the changing efficiency of some teams; the coaches often use team-timeouts to intervene in powerless periods. They can use it once a half, when it is possible to give tactical and psychological help to their teams. According to my experience the team-timeouts can affect the end of the matches positively or negatively as well.
**Literature:** Although some autors (Fekete 2008, Szedlák 2010) dealt with the topic, but there are some questions which came up and worth analysing.
**Hypothesis:** I assume that the coaches of teams which are losing wait with the timeouts till the minutes left behind would be as much as the number of goals between the two teams. I also assume that the coaches of the leading team do not wait with the timeouts till the losing teams equalized the score. In addition I hipothesize that the periods before and after the timeouts, the shaping of the result was caused by the increasing number of goals gained in clear goal situations. Finally I assume that the average time of attacks is shorter in the winning periods.
**Material and method**: I have analyzed twenty Men's Champions League matches between 2008 and 2010. I have examined the timing of the leading and losing teams' timeouts; the development of efficiency among timeouts in some game situations with different results; as well as the tendency of the average time of attacks before and after timeouts. I used independent t-test to compare the data.
**Results:** The coaches of the teams which are in disadvantage by the goals, did not wait with the timeouts till the minutes left behind would be as much as the number of goals between the two teams. When the coaches of the leading teams waited with the timeouts till the handicapping teams equalized the score, it always caused their losing. In the periods before and after the timeouts, the shaping of the result was caused by the increasing number of goals gained in clear goal situations. The average time of some teams' attack was significantly shorter in the winning periods.
**Conclusion**: In conclusion the coaches time their timeouts regarding the time remaining and the goal difference between the teams. The number of goals gained from clear goal situations determines the efficiancy of a team. Fastbreaks are very helpful for the handicapped teams to decrease the goal difference. It is not advisable for the coaches of the leading teams to wait with the timeouts until the handicapping teams equalize the score, because it can cause their losing.

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**Analysis of Heart Rate Values Measures on School Physical Education Programs**

**Keywords:** Polar heart rate monitor, physical education

**Introduction:** It is important for school physical education programs to provide adequate physical activity for the students. Monitoring the activity levels of the physical education programs by having the students wear heart rate monitors during the class allows provides insight into the activity levels and design of the program.
**Purpose:** The purpose of this study was to analyze the heart rate 14-15 year old boys and girls during physical education classes.
**Methods:** Healthy, 14-15 year old boys (n=13) and girls (n=12) were chosen to participate in this study. Height, weight were measured, and BMI was calculated. Percent fat, fat mass, and skeletal muscle mass were estimated by InBody720 equipment. Heart rate was monitored during the physical education classes using Polar RS400 heart rate monitors.
**Results:** Based on the information obtained from the Polar RS400 heart rate monitors the schools physical education programs provide adequate physical activity for the students. Several differences in average heart rate were found during different portions of the physical education classes. Most commonly it was found that the warm up period of the class had the highest average heart rate for the class period. It was also found that the activity portion of the class produced lower heart rates.
**Conclusions:** Although the physical education program provides adequate physical activity, it may be possible that the design of the physical education classes may be improved. It may be more beneficial for the class to be designed in a way that the average heart rate of the students increases as the class goes on.

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**Profile of Leasure Time, Physical Activity and Sport Related Habit of the Students at the Semmelweis University**

**Keywords**: university students, physical activity, leasure time

**Introduction:** The union of the Faculty of Physical Education and Sport Sciences and the Faculty of Health Sciences, in 2000, as well as the establishment of the Faculty of Health and Public Services in 2010, were major milestones in the recent development of the Semmelweis University. The University consists of six faculties, where total of 8400 students are studying. These students are part of the health education energizing factor, because they work not only to improve the quality of medical training but also inspires national health care reforms. Keresztesi, Kovács, Andrásné and Gombocz between 2002-2004 published their studies, on the Hungarien higher education in physical education situation and development potential. The aim of our research, was to conduct a similar questionnaire to asses the current at the Semmelweis University.
**Theory and Hypothesis:** We suggest that we can explore differences between the faculties regarding the habits of the students, how they organize their leasure time, physical activities and how they think about healthy life style.
**Methodology:** The sample was taken from the five faculties at the Semmelweis University (ÁOK, ETK, FOK, GYOK, TF) full-time students between 18 and 23 years enrolled, at a total number of 935 people. Our questionnaire for the sport and healthy lifestyle habits included 17 items. In addition to basic statistical calculations, chi square test and independent sample t tests and ANOVA with Bonferroni post hoc test were used. The minimum level of significance adopted was $p \leq 0.05$.
**Results and Discussion:** Most of the students connect importance to the sport in terms of design a healthy lifestyle, some of the effects of relaxation and personal development is considered essential. However, only half of the university students does training exercise in a regular, organised way. Each faculty compared to this ratio are even worse. As a percentage of the TF after the ÁOK, most people participate in sports training. There is a difference between the students of regular, structured physical activity and non-athlete students.
**Findings Conclusion:** Our results supported the empirical fact that our health releted concept influences the regular bahaviour concerned with physical activity and sport. In practice, however, only half of the students allocate time to do sports. Our study results reflect the distributions of faculties among some factors that were examined. Based on further cooperation with other universities, we would like to extend our survey in this filed to have a broader insight into the structure of the habits of the students of the Hungaryan higher education.

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# Physical Inactivity, a Call for Concern: Evaluation of Present School Based Interventions, Specifically Daily Physical Activity (DPA)

**Keywords:** physical inactivity, DPA, health

**Abstract:** Physical inactivity is the second leading risk factor for all cause mortality and has been linked to a variety of negative health outcomes, including cardiovascular disease, cancer, type two diabetes and premature death. Among youth, 50.3 percent of males and 67.8 percent of females are inactive. A review of the literature was conducted to examine physical inactivity among children and youth through a population health lens to address the problem, etiology, cost, and evaluate present school based interventions targeted at inactivity, specifically the Daily Physical Activity (DPA) mandate. The DPA mandate requires every child from grade one to eight to participate in twenty minutes of moderate to vigorous physical activity each school day, however 89.5 percent of children do not meet this standard regularly. A discrepancy was found between the DPA mandate and the goal of the program to achieve fitness, health, and learning benefits. Suggestions are made to address the ineffectiveness of the DPA program.

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# The Problem and Analysis of the Development of the Endurance on Recreational Purpose

**Keywords:** heart rate, endurance

In my research, I studied the analysis of the development of the recreational endurance. I made an effort to map cardiac output, taking each individual's applicable exercise records into account. I extended my survey to American students.

**Hypothesis:**

I. The logic of the method developed for adults' recreation is also adaptable among students.
II. I assume that during the development of the endurance on recreational purpose of those students who have athletic history, age: 19-20, we have to define a taller intensity number.
III. Students with different efficiencies will attain different performances during the 30 minute run.

**Used Methods:** In the examinations, Polar Heart Rate monitors were used to measure each participant's Heart Rate (HR) levels throughout. The levels were based on max HR level, lowest HR, and average HR. The results were recorded and processed on a computer and significant statistical conclusions were drawn. The results stored in the Polar watches were saved to computer. The program depicted the single performances on a diagram. Based on the graphs I systematized the relevant data into a chart, including an average HR, a maximum HR, and an SD value. In the chart, I recorded the number of laps accomplished during the performance, which helped to calculate the distance in meters and the average speed. With the data available to me about the students, I calculated the BMI values. During the examination I studied the freshmen of the UWH A.K. majoring in recreation and health improvement and the students of the University of Northern Iowa (UNI).

The study is divided into two parts. In the first course the students had to accomplish a 30 minutes of coherent run, so that no information was given to them concerning their pace, distances and HR. My one and only request to them was to try to endeavor the possible longest distance in their own pace during the 30 minutes. Walking was obviously allowed.

Before the second course, I informed the students about the recommended pulse intensity, and individually made them count their own 65% of the max HR values based. The relative resting heart rate was also defined individually. The participants were specifically asked to control the determined heart rates with the help of the Polar watches and not go out to ± 5% pulse zone.

**Results and conclusion:** When evaluating the results, I only took the data into consideration that I deemed to be important, from the aspect of the topic. In my paper I made an attempt to deduct conclusions. Each participants' efficiency and volitional characteristics yielded the achievement of different performances during the recommended 30 minute time limit, while the cardio-vascular system progressed, validating the individual peculiarities appropriately. Participants have a good chance to learn their own capabilities, potentials, etc., the km/hr speed for example, which is their optimal load during the 30 minutes run, and the distance of the run during the course of the 30 minutes that generated the optimal effect for them. I hope that with the experiences gained in the study, students will be able to participate in planning their own recreational workouts in a more conscious way.

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**Comparison of Duration and Intensity of Physical Activity in American and Hungarian Boys and Girls 9 - 14 Years Old**

**Keywords**: Accelerometer, children, physical activity, obesity

**Introduction:** Vital information can be obtained on the relationship between duration and intensity of physical activity and body composition. Knowing the intensity and duration of children during after school hours can lead to answers of the differences between American and Hungarian obesity.
**Purpose:** The purpose of this study was to analyze the duration and intensity of physical activity of American and Hungarian 9 -14 year old boys and girls outside of school.
**Methods:** Healthy 9 – 14 year old volunteer boys (n = 25) and girls (n = 25) received Actigraph AM7164 accelerometers collecting data continuously for four days of a normal school week (Monday-Thursday). Height and weight were measured and body composition was collectedusing bioelectrical impedance.
**Results:** We have found a significant difference between American and Hungarian students in early after school vigorous physical activity. The American children were more physically active after school. This is due to having more opportunities for sports and access to parks and other places to play.
**Conclusions:** The accelerometer is an important device for generating data to be able to show the effects of intensity and duration of physical activity after school hours. This data can be used to help determine possible causes of the difference between percentages of obese American and Hungarian children. The data can also help to make beneficial recommendations in after school physical activity to lead to healthier lifestyles for children.

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## Measuring Functional Service Quality Using SERVQUAL in Czech Fitness Centers

The contribution represents results of a pilot study which was aimed at estimating the reliability of the SERVQUAL questionnaire in the Czech version by means of reviewing specific reliabilities of individual items evaluating the functional service quality. As a part of the study there was also the Czech version verification of sub-dimensions factor structure of the functional quality and its comparison with the original questionnaire structure. The participants in the pilot study were 166 customers of a Prague fitness center (107 women and 59 men) of the average age of 31 years. The results imply that after slight modifications the Czech version of the SERVQUAL questionnaire will be appropriate for evaluating the functional service quality in the fitness area.

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## Olympic Tourism: Traditions and Innovations

**Keywords:** Games of the Olympiad, Olympic tourism, Olympic movement

Preparing for the Games of the Olympiad the host countries are planning to increase tourist flows to the Olympic capitals not only during the Olympic campaign but also after it. Lately not enough attention was paid to tourism within the Olympic legacy research.

The question of our research was to find out the possible innovative approaches to Olympic tourism development and to determine if tourism has any major positive effect on the Olympic legacy.

The main objective is to study the tendency of tourism development in the context of the Games of the Olympiad organization.

The Games of the Olympiad contribute into the strengthening of a host country position on the international tourism market. The Games' influence on tourist industry is assessed in long-term and short-term prospects.

Short-term planning includes the tourist activity during the Games of the Olympiad, as well as immediately before and after.

The main aim within long-term planning is to use worldwide attention to the Games for popularization of city, region and country images. It is necessary to organize the work with the mass media during the Games, before and after them. The aim of this work is to introduce a country as a tourist destination, to provide the mass-media with extra general information about the country. One of the means to advertise tourism places of interest is the detailed coverage of the Olympic torch relay route.

Another important aspect of tourism development is the cooperation between TOP partners of the International Olympic Committee and the local tourism industry. TOP partners can use those traditional images associated with certain country or region, while local marketers can use a marketing capabilities of TOP partners to emphasize the connection between the destination and the Olympic Movement.

In the period following the Games of the Olympiad it is necessary to conduct extensive market researches to determine the effect the Games of the Olympiad had on the tourist image of the country.

Important issue in the Olympic tourism development is the inability of some national travel agencies selected by National Olympic committees to develop diverse tourist routes. To change this situation it is important to expand the cooperation of local receptive tour operators with national tour operators who organize trips to the Olympics Games.

The conducted analysis allowed us to conclude that the tourism legacy of the Games of the Olympiad is a multifaceted and diversified phenomenon. It can promote not only the city, which hosted the Games, but also the region and the country. Therefore, the organizers of the Games of the Olympiad should plan their activities basing on well-planned tourism development strategy. Also it was determined that the Games of the Olympiad can promote many forms of year-round tourism activities.

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**Inspection of Training Methodology at Age-group Swimmers**

**Introduction:** Swimmers can realize the highest efficiency after long and properly established trainings. The main part of this long lasting process gets to the age-group of 7-14 years. The training in this period determines the following efficiency decisively.
Hungarian children participate on competitions when they are 7 years old. They swim in competitions in almost every month. From 2012 children at the age of 9-10 swim on national championship, and will be champions of the age group. In my research I searched an answer how they do their train, what kind of trainings they do in order to be a champion. In my inspection I wanted to compare the harmony between the trainings done by children and trainings recommended in specialized literature.
**Method:** My examination was made with questionnaire method. The most successful Hungarian clubs are searched accoarding to the champion score table were searched. I studied the works of 7 clubs from Budapest and 10 provincial clubs. I searched with 2 sample T-test the number and time of training and a distance which the swimmers swim in one training. I compared the results of Hungarian clubs with the recommended literature.
**Results:** The independent simple test represents that the joung age-group swimmers train more than the trained distance recommended in the specialized literature. About 15-16 year old swimmers train a corresponding rate. I found significant differences between the distance done by Hungarian clubs and in the recommended literature in one training. In the age group of 13-14 there is a significant difference in the distance of trainings to the advantage of recommended specialized literature but the number and time of training are more in practise. There is no significant difference between the examined rates above the age of 15.
**Conclusions:** From the results I concluded that Hungarian swimmers to age of 12 are exposed from the beginning of the trainings to more stress than they could tolerate. This is a big problem because we can develop our swimmers if we can give them new impulses. If we use the opportunity all of the new impulses too early we won't be able to develop our adult swimmwer's organism at the time when it could be the most important aim.
The other problem is that, coaches sacrifice the skill developing and technic correcting variation exercises and games to get too many m-numbers in swimming Therefore the possibility of sensitive periods will be over without exploitation.

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**The Examination of the 4:4 Game at Diamond and Square**

**Keywords:** football, line-up, small side games

**Introduction:** Our study deals with one of the segments of a training of age group training. This is called 4:4 game, with a small side games with an identical staff number lifted from the area of games. Here, than in another little and big game's case, we may distinguish an alignment form with more types. The trade uses it with predilection and rings changes on it this types. We examined the two frequentest positions, the diamond and the square alignment form mostly.
**Aim:** Aim, that let us prove it, that in the cooperation of the four players the diamond alignment form more successfully applicable opposite the square alignment.
**Hypothesis:** Our opinion in the cooperation of the four players the lozenge alignment form more successfully applicable opposite the square alignment, which one presents himself equally in the technical implementations.
**Methods:** We compare these two positions based on the incidence of the technical elements and his implementation. During the measurement between the technical elements owed the good passing, the bad passing, the tackling and the ball losing. We examined 3 age groups in the course of our surveys (U-11-13 age groups) at a Hungarian second-class club and a first-class club (N=48, 12 team). We grouped concerned with each other against each other in all cases in 4:4 games, without a goalkeeper, 1X2 employed for a goal. We grouped with an identical ability and level of knowledge players with each other or against each other based on the conditioned and technical tests. We examined the given team's alignment efficiency indirectly through the technical implementations. From among the 2 teams, one of played in the square alignment form, one of played in the diamond alignment form the 1X4 minute matches. If the ball left it the playground (30x20m), the game may have continued with kicking in, which one played with adult size 5 ball. After the mach we applied 1:1 resting proportion, changed the alignments and the teams played again 1X4 minute match against each other. We did the distinctness examination with two sample t-test in the processing of the data. Where the value of the significance was $p<0,05$. We did the calculations with the help of SPSS program.
**Result:** The means at the square good pass is 12,71, 14,92 at the diamond. Bad pass at square is 5,33, 5,56 at the diamond. Square tackling is 6,17, at the diamond it is 6,4. The lost ball at the square is 7,73, 8,15 at the diamond. The examinations showed that we found a significant difference only at the good pass. Furthermore we deducted smaller inferences the average based on results.
**Conclusion:** In the case of the diamond alignment form necessary technical elements reported themselves more densely to the game with a more offensive ghost, while the square alignment form was more efficient at the defensive game It's not possible to separate the two line-up forms from each other sharply, in that during the game. In a certain measure, in the case of both positions took shape a positional play and moving away order-like.

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## The Effects of Caloric Restriction and Exercise on Skeletal Muscle Mitochondrial Biogenesis in Selectively Bred Rats of Running Capacity

**Keywords:** calorie restriction, exercise, running capacity

**Introduction:** The positive effects of the exercise are pretty well-known, but recently attention is given to the benefits of the calorie restriction. The lack of carbonilated protein presented due to the calorie restriction (CR) during the aging process (Goto at all.). This raises the question of whether the two effects result in a similar physiological or biochemical changes as far the CR significantly alters the body's metabolism and redox status as the exercise as well.
**Methods:** We worked with $26^{th}$ generation of rats selected by their running capacity, divided into high running capacity (HRC) and low running capacity (LRC) groups. Two of the groups were exposed to CR, while two groups trained on treadmill respectively. From the physiological indicators the relative maximal O2 uptake (VO2max) and the body weight were measured, the understanding of the biochemical background was measured by Western blotting of SIRT1, PGC-1 $\alpha$, Mfn and AMPK protein levels in gastrocnemius muscle.
**Results:** The animals have increased in running speed and greater distances have been able to do, the training effect on VO2max. was shown during the measurement. The weight neither has been arisen in the CR, nor the exercised group. Among the biochemical indicators quantitative changes in SIRT1, PGC-1 $\alpha$ and AMPK content, clearly shows that the training and CR influences the amount of mitochondria.
**Discussion and conclusions:** We have found that LRC animals exercise response on the mitochondrial biogenesis regulatory proteins were significantly more modest than in the HCR group, however, the activity of AMPK in the LRC group, the CR has increased more effectively than in the HCR Our recent results suggest that the major cause of LRC animals weaker runtime performance is the a mitochondrial dysfunction compared to the HRC. The mitochondrial fusion responsible protein (Mfn1) volume was lower in the control rats HRC than in LRC and this difference is eliminated by the exercise and CR which indicates both intervention improves the resistance of mtDNA mutations.

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**Repolarization characteristics of the athlete´s heart**

**Keywords**: Early repolarization (ER), athletes, Left ventricular muscle mass (LVMM).

**Introduction** One such study by Haïssaguerre et al. (1) evaluated relationship between early repolarization syndrome V4-V6 and idiopathic ventricular arrhythmias leading to sudden cardiac deaths. Early repolarization syndrome is a frequently benign adaptation to endurance training. Early repolarization is a slurring producing a hump-like feature called a J wave, typically found at the junction of the QS complex and the beginning of the ST segment. This typically produces a concave upward curve towards the T wave. The QT interval represents the time for both ventricular depolarization and repolarization. QT dispersion is the most significative parameter for ensuring the repolarization characteristics of the athlete´s heart.
**Methods** The aim of this study was to measure left ventricular hypertrophy and QT dispersion with early repolarization syndrome in 13 highly-trained male athletes and in 15 age-matched (18-34 yr) normothensive healthy subjects (who compose the control group). In addition we examined relationship between repolarization dispersion (QT dispersion) and the left ventricular muscle mass.
**Results** Endurance athletes have significantly greater left ventricular muscle mass ($p<0.001$) than sedentary healthy young men. The QT dispersion increased in the athletes group ($p<0.01$) compared with the control group. We found a correlation between the QT dispersion and left ventricular muscle mass ($r=0.56$). Early repolarization syndrome was identified in 50% of the athletes group, and in 10% of the control group.
**Conclusion** The left ventricular hypertrophy did not itself elicit a negative effect on QT among endurance athletes. It is possible that in the athlete´s heart and early repolarization syndrome can be associated with the modifications of the autonomic nervous system of the myocardial structures.

1. Haïssaguerre, M., Derval, N., Sacher, F., et al.: Sudden Cardiac Arrest Associated with Early Repolarization. N Engl J Med 2008; 358:2016-2023

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## Effects of Differently Adapted Exercise Programs on Cognition of 12 and 24 Months Female Wistar Rats

**Keywords:** physical activity, aging, cognitive functions

**Background:** Significant demographical changes have occurred in the developed countries during the last decades. The population size of elderlies has markedly increased. Therefore the prevention of potential degenerative changes in the brain associated with aging has become one of the main needs in the scope of health care. Regular physical activity can play an important role in the prevention of functional decline in brain functions and it can support the healthy aging as well. The aim of our study was to investigate how the intensity and complexity of exercise and social activity influence the function of aging brain compared to adult age.
**Hypothesis:** We supposed an improvement in cognitive functions depending on duration, intensity and complexity of treatments, i.e. the longer, more intensive, more complex the treatment is the more effective it to improve memory.
**Methods:** Three treatment regiments were investigated in 12 and 24 months female Wistar rats. The applied treatments were different in duration, intensity and complexity: (1) 30 min moderate intensity treadmill running through 15 weeks, (2) 1 hour high intensity treadmill running for 7 weeks. In case of the third group (3) a complex exercise and social therapy was applied: 1 hour high intensity treadmill running for 7 weeks, balancing three times a week on Rotarod wheel to improve coordination, applying enriched environment to increase the animal's social activity. After the last training sessions we tested the cognitive functions in Y-maze and Morris water maze spatial learning test. Open field test was used to assay general locomotor activity level, exploration and anxiety.
**Results:** The moderate intensity treatment improved the memory of 12 months animals in Y-maze. The high intensity treadmill running was effective in old age as well; it enhanced the behavioral performance in Y-maze and Morris water maze tests. In case of complex treatment (two different physical activities and social interacts) a marked difference was measured between the control and trained groups in Morris water maze test.
**Conclusion:** In old age the intensive and the complex activity based treatments had beneficial effects on cognitive functions. The results suggest that the sensitivity of aged brain to exercise stimuli is different from that of adult brain, so it is important to select the right quality physical training to reach neurobiological improvements in the elderly. In addition, the increasing exploratory drive measured after the complex treatment allows us to conclude that not only the proper physical activity, but also the social aspects can play a considerable role in behavioral performance and cognitive functions.

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## Specifics of Vegetative Indices of Dancers in Standard and Latin Programmes

**Keywords**: dancers, arterial pressure, vital capacity of lungs.

**The purpose** of our study is to identify gender differences in the reaction of dancers' cardio-respiratory system at various stages of performing the dances of the Standard and Latin programmes.
The study involved the students of the Dance Sport Department of Russian State University of Physical Education, Sport, Youth and Tourism – dancers of the A-S class aged 19-22 (52 people).
**The following methods** were used in the study: 1. Questionnaires. They included questions on definition of qualification of dancers, loading degree, training process and productivity of their competitive activity. 2. Monitoring of heart rhythm by Polar 610 pulse meters. Record of indicators was carried out with a five-second interval 3. Spirometry – Spiro S-100 automated spirometer; 4. Tonometry according to the method of Korotkov (1905). 5. Methods of mathematical statistics.Statistical processing of the received data included calculation of the following indicators: average arithmetic; standard deviation – x, rank correlation factor – r; G-criterion of signs (on D.B.Ouenu), Vilkokson's T-criterion.
**The results**: The identified gender differences suggest that, based on the analysis of vegetative indices, the efficiency of a dance pair's competitive performance might be forecasted. The data obtained prove that after performing the dance of the ball programme "slow waltz" and the dance of the Latin programme "cha-cha-cha" the quality of the dance performance by both partners may deteriorate. This applies more to the Latin programme, where the identified changes are more evident. The quality of dances performed by female partners may deteriorate because in the process of work they fall into a quasi-sustainable condition by most parameters. The subsequent rate of success or failures of female partners will depend on the amount of the functional reserves of their bodies. The study has identified essential reasons for changes in partners' vegetative indices, which give an opportunity to forecast the deterioration of the quality of dances performed by them. Boys, as well as girls, develop a quasi-sustainable condition by most analysed vegetative indices. Such changes are more discernible in the "cha-cha-cha" dance. Besides, the study has revealed substantial changes in lung ventilation, which probably are explained by the development at partners of acute hypoxic condition against the background of kinetic load.
Thus, in comparison with female partners, male partners are in a worse position. They are more exposed to the risk of deterioration in the dance quality when performing ball dances and especially when performing Latin programmes. The risk of deterioration in the dance quality is higher when the dance is to be repeated or dynamic dances are to be performed subsequently.

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**UKK Health - Related Fitness Test Battery for Adults in Hungary**

**Keywords:** Health-Related, fitness-test, UKK

**Background:** Health-related fitness (HRFI) assessment may be useful in promoting physical activity. Health-related fitness refers to those components of fitness that are related to health status. In this study the subjects were middle aged (30-60 years) Hungarian (n=43) and Finish (n=42) men and women who applied voluntarily for the HRFI. My goal was to compare two Europeans nations about motor fitness and health being and feasibility for the UKK health related fitness in Hungary. I used the UKK Health - Related Fitness Test which is developed by the Finish UKK (Urho Kaleva Kekkonen) institution. The Subjects are participated 7 different field tests. 1 balances 2 flexibility and 3 musculoskeletal fitness tests. The cardiorespiratory fitness as measured by 2-km walk test. I also used questionnaire for the HRFI for health screening. I set up a hypothesis begging of my study which is the finish pattern has better performance than the Hungarian one.
**Result:** Wasn't seen big differences between the Hungarian and the finish pattern. Only the one-leg standing and the trunk size bending field test cause significant differences between the two patterns. I think the main reason probably the finish man and women live much healthy life.
**Conclusion:** Test battery offers a safe and feasible method for assessment of HRFI. Those who did the field test, they find an easy way for measure their health and fitness. I planning to continue my studies about this subject but I'm going to change the ALPHA-FIT which was conducted as part of the project ALPHA (Assessing levels of physical activity and fitness), funded by the European Union.

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## Research on Impacts of Maximal Performance on the Balance Abilities of Top Level Artistic Indoor Cycling Athletes

The main task of our research was to find out abut the determinants on the balance abilities of the top level indoor artistic cycling athletes. The success in this sport is depended on the high level concentration and coordination of the athletes to be able to finish the exercises at the competitions. The special balance abilities are influenced by the general and physical conditions and we tried to measure the correlation between these factors.
In our survey we have been analyzing 9 top athletes from the Hungarian female national team analyzing their competition exercises. We asked them to do the same exercise 3 times, having only 10 minutes rest between.
For monitoring the physical performance we used the following methods:
- „Lifecorder ex" accelator monitor - to see the intensity of the movement in the exercises
- „Polar watch (710i) monitor – to check the changes of the hearth rate
- Video camera – to analyze the quality of the exercises
The registered data were compared with statistic analysis (descriptive statistics, correlation matrix, discrimination analysis).
Our results have shown, that the success is significant correlated with the intensity of the performance. Those athletes make less failures, who start with a higher rest level and
have smaller changes in the hearth rate levels. When they get tired they do more failures, which need strength abilities and they loose concentration.
After these results we suggest for the training methods to pay more attention on the practicing balance elements connected with strength abilities. The athletes should start their exercise rested after mental preparation concentrating on the critical moments.

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**Stamina of Smokers and Non-smokers after β-alanine-rich Diet**

**Keywords:** β-alanine, training, smokers

β-alanine is the decomposition product of the dipeptide carnosin. Its main physiological role is to neutralize hydrogen ions thereby maintaining the optimal pH level of muscle-cells, avoiding acidification. As a component of food supplements, β-alanine is used by skeletal muscles to form carnosine with the help of carnisone synthetase enzyme when coupled with histidine. Our team examined the biological effects of β-alanine after executing a 6-week-long training cycle. Aims of the present study were (i) to examine if any obvious physiological differences appear among users and non-users of β-alanine, and (ii) to examine possible parametric disparities among smoker and non-smoker subjects after the 6-week-long training.
Participants were volunteers (n=43) aged between 18 and 25 years (mean age was 22), smokers and non-smokers as well; sexes were represented almost equally (58% male, 42% female). Before the training protocol we examined the participants' health status and fitness level (anthropometric data, spirometry, 20m shuttle run test, measuring maximal muscle strength with dynamometer). We divided the subjects into four groups: smoker males (SM), smoker females (SW), non-smoker males (NSM), non-smoker females (NSW). Food supplement was supplyed by Scitec Nutrition. Half of each group got pills containing β-alanine, taking them consistently (50mg/bwkg) on an everyday basis. The other half of the groups took placebos (microcrystalline cellulose). Groups were formed by a randomized double-blind test.
Since we did not find any significant differences between data from 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). By analyzing data collected before and after the training period, we found significant improvement in all participants in the maximal static strength of their right legs, and in their aerobic endurance ($P<0.05$). Maximum strength of the right legs increased by 8.45% on average (before training 258.31 Nm, after training 280.69 Nm). By the end of the $6^{th}$ week participants ran 243m more on average in the shuttle run test. The maximal oxygen uptake generally increased, but difference was found among groups (SU +6.9%, SNU +1.3%, NSU +8.1%, NSNU +4%). Vital capacity also increased with 6.05% (mean = 106.05±8.5%), showing the improved condition of respiratory muscles. In smokers the rate of improvement is higher (250ml) than among non-smokers (200 ml). Among anthropometric data, changes were found in body fat percentage; the highest change was found among NSU (- 5.45%). Lactate level was measured before and after maximal strength tests, and differences were calculated in percentages. The greatest difference was found among users of β-alanine (SU 22.3%, SNU 17.03%, NSU 27.22%, NSNU 13.63%). Comparing data obtained from the strength test and lactate measurements, the increase in lactate is proportionate to performance, better performance during the executed protocol meant higher lactate concentration.
Our research indicates that cellular metabolism can be improved by using food supplements and a proper training program. The improvement was greater among those who suffer from a metabolic drawback (smokers).

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## Superhero Idol Value Transmitting Role in Young Athletes Motivation

**Keywords:** Visual cult, sportsmen role models, superhero.

**Background:** If we consider values as those motives, that are: good; acceptable; and desirable (same in contrast). Then the superhero is the only register in popular culture, that possess such feat and hasn't gone through recycling past the years (Tóth, 2011). It's representative in our age, that mass media enmeshes our lives, transmitting negative valued icons in our direction. It's capable of enlarging those characters, urging the receiver to identify themselves with those personas (Berta, 2010). It is to be feared, that young sportsmen would choose a wrong role model, in case, if they choose. Motivation for these pupils, with false ideal would lead them in wrong directions. My goal is to prove, that superhero icons would be the most proving role model for young sportsmen.
**Methods:** In my study there'll be N:200 person, ages from 13-21, n:100 athletes and n:100, who doesn't do sports on a regular basis, or not doing any exercises at all. The gender ratio is 50-50%, and based on it there will be a difference in the questionnaire. The study will take form in a simple questionnaire survey with free associational method. In the first question I want to know whether they have a role model, or not. After that there'll be 20 notorious characters/persons. Subjects of the study will have to grade them on a 5-point Likert Scale based on their values they possess. Afterwards there'll be another 5-point Likert Scale, but only personality marks will be noted, the same as the 20 persons/characters listed above, but without names. According to Tóths article these vigilantes show a mirror image of their ages society and their needs, for example: personality, deeds, looks (Batman, 1989/ Dark knight, 2008). If my hypothesis is correct, than superheroes would come out highly as the most valued characters after the survey.
**Results:** We finished a pilot-study, where we asked 63 P.E. students about there role models. 5 of them stated they have none. The sum of the role models gathered was N:103, from them, the largest percentage came from the category of sportsman(41%). Sadly a bigger number came form the category of celebrity, (19%) than parents (18%). No superhero was named, as I suspected.
**Summary:** My opinion is if young sportsmen would be introduced to superheroes and their values, their motivation would lead them to a positive attitude, both in the directions of school activity and sport performance. Surely there would be big shoes to fill, but there'll always be an accomplishment to pursue. Tóths article proves that the values they follow are up to date. For me, I think, their trust would be in the best hands.

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**The Role of Motivation among Throwers**

**Keywords**: intrinsic motivation, extrinsic motivation, task-orientation

**Introduction**: The selection of athletes with excellent ability and motivation is of increasing importance in competitive sport. The presence of certain physical and anthropometric abilities is not enough to judge one's suitability for a sport. Intrinsic motivation and ambition are indispensable for a higher level performance. Seifriz et al. justified via testing that motivational climate and expectations on the part of the coach determine successfulness, and that is why the coach-athlete relationship and the atmosphere ensured by the coach during preparation also have an influence on the motivational interest of the athlete.
**Hypothesis**: The first hypothesis is that intrinsic motivation is more characteristic of throwers than extrinsic motivation, and that the motivation of successful athletes is stronger than that of their non-successful team-mates.
The second hypothesis is that motivational climate is characterized by a task-orientated environment, and that the task-orientation values of successful competitors are higher than those of their non-successful partners.
**Material and methods:** Two different questionnaires were used to examine the psychic-related questions of success. For motivational climate the Perceived Motivational Climate in Sport Questionnaire (PMCSQ-2), and the Sport Motivational Scale (SMS) were used. The number of tested persons was 23, twelve male and eleven female participants.
The sample was divided into two groups to ascertain answers related to success. The athletes considered to be successful were those who took part in Olympic Games or World or European Championships. The remaining athletes were placed in the non-successful category. From the tested athletes, eleven belonged to the successful and twelve to the non-successful group. The obtained data were analysed with descriptive statistical methods. The two-way t-test was applied for the indication of differences between the two groups.
**Results:** Only the first part of the first hypothesis is met. The intrinsic motivational values of throwers are really higher than the extrinsic ones. But on the other hand, no significant differences were found in intrinsic motivation between the successful and non-successful athletes.
The second hypothesis could be partly proven. The first part of the hypothesis can be accepted, as it can be deducted from the results that the values of the Task main scale for throwers are higher than the values belonging to the Ego main scale. On the other hand, the second part of the hypothesis should be abandoned, as successful athletes do not have outstandingly higher results in the Task main scale.
**Summary:** To summarize, it can be deducted that there is great demand in Hungary to determine precisely who is talented among throwers and what their motivation orientation is, and how they can be scientifically selected.It is important to assess the motivational level of the athletes from time to time, and to modify their training plans towards a success orientation based on their results.

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**University of Toronto Concussion Symptom Scale: Reliability during Rest and Exercise**

**Keywords:** concussion, symptom scale, reliability

**Background:** A concussion is defined as a traumatically induced pathophysiological process that affects the brain, and usually causes a short-term disruption of neurological function. Clinical assessment and monitoring of symptoms remains an integral component in the diagnosis and management of concussion. There are a number of available rating scales for measuring and identifying symptoms, which are derived from six primary core scales and range from 10 to 34 items in length. To date, many of the scales have been developed iteratively often based on clinical experience rather than empirically derived.
**Objective**: To assess the reliability of the University of Toronto Concussion Symptom Scale (UTCSS), a 16-item scale designed to measure the severity of symptoms in the recovery of sports-related concussion, and more specifically, to assess the test-retest reliability both at rest and during exercise, and to examine if differences exist between methods of administration.
**Intervention:** 100 healthy athletes from various University of Toronto Varsity teams were randomly assigned to one of two methods of administration: 1) completion by self-report; or 2) completion by first responder. All athletes completed the scale twice, once during a practice or training session and once at the end. A convenience sample of the athletes completed the UTCSS on a rest day with no activity. In addition, Borg's Rating of Perceived Exertion (BRPE) scale was used along with the scale to examine the effects of exertion on UTCSS scores.
**Results:** Mean UTCSS score for healthy subjects was 3.56. No significant differences were found between mean UTCSS scores a) through self-completion vs. first-responder method, or b) between sessions of scale completion. The correlation between BRPE and total UTCSS score was weak but significant ($r=0.28$, $p<.05$).
**Conclusions:** The results of the study show that the UTCSS is reliable between sessions, methods, and both at rest and during exercise. Furthermore, there is a relationship between exertion and total score, which should be accounted for when the scale is used during or immediately after exercise. These findings will enable the interpretation of statistically reliable and clinically meaningful change with the UTCSS, and impact the detection, assessment, and return to play decisions of elite level athletes. Thus, the UTCSS is valuable tool for use in both clinical and research settings, with a total score of 3 or 4 being the average for a healthy individual.

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**Psyhological Skills of Handball Referees**

**Keywords:** handball referee, testing anxiety

**Indroduction:** Why I have chosen this topic for this presentation at the Students' Scientific Conference? Handball has been my field of interest since my childhood. I decided to complete a basic level handball referee course, thus getting nearer to this wonderful sport. During the course the question has been arisen: Is the referee ready to conduct his/her first handball match after finishing a 40-hour theoretical education? Is he/she psychologically prepared for that?
**Aim:** In the research referees recently completing their training are compared with those who have been carrying out activity for years. The main focus of my hyphothesis is concentrating on how the inexperienced referees can adapt themselves to their new roles in their first match. The anxiety and stress situation were the basis of the research, complemented with the measuring of attention skills. Refreeing is a complex activity, accompanied with mental-physical and neural load. Participants of this research are persons of different gender, age, level of education, being before their practical exams (N=15), and experienced referees, who have been practicing this job for long (N=15). They were all observed on this site of certain matches.
Main aims: 1./ After 40 hours of theoretical training, beginners are ready for start to lead in their first handball match?
2./ Can they sufficiently adapt to the occasion of their first practical test?
3./ Their mental preparedness are appropriate?
4./ How differs their psychological skills between beginners and experienced referees?
**Test methods:** During my research I used ACSI-28/2; CSAI-2 /H./ and Pieron-test. The questionnaires were filled by both group, from November 20th 2009, to January 15th 2010. The datas processing with Statistica for Windows 8.0, Stat-Soft Inc., the 2008th STATISTICA (data analysis software system), happened.
**Results:** The beginners were mostly deconcentrated, their reaction time increased that is why they reacted slower in decision making, often making mistakes. The experienced referees are already appropriate for tolerating greater stimuli, thus it was not a problem for them to complete their tasks as a result of their adaptation following their psychic preparedness.
**Discussion:** After the evaluation of the tests the following consequences could be drawn: within the 40-hour course, one and a half hour is spent on psychological preparation, in which handling conflicts and stress anxiety is in a summarized form. This short time is not ebough for the referees, for us to keep our grounds already at the beginning, at the first match, on condition that if we have not the personality factors of the given role (resolution, willpower, motivation, self-discipline, concentration, empathy). Components of refereeing must be learnt at skill level; otherwise the world passes by the handball. One must trust in success, the possible timidity, fear and anxiety can be relieved by careful preparation (Madarász I.; 2007).

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## Why Do Athletes Quit Fencing? - A Narrative Psychological Approach

**Keywords:** sport-abandonment, fencing, narrative psychology

This study uses the resources of narrative psychology to investigate why certain athletes quit fencing. Fencing is one of the most popular sports in Hungary, not only because of a national tradition but also as it is the sport in which Hungary has won the most Olympic gold medals. Unfortunately, the sport has faced a problem with attrition: relatively few young fencers continue competing in adulthood. The causes of attrition most likely vary widely from sport to sport, and as such we believe that there is benefit in assessing sports on an individual basis. Therefore we chose fencing as a historic, conventional Hungarian sport where these problems are increased.

In Hungary sport attrition is a general phenomenon and a serious problem for the future generations of competitors. If we could understand the underlying reasons behind this phenomenon then maybe we may be better able to tackle this issue and keep fencers in sport life. Up to now, there has been no research to reveal the narrative specialities of fencing.

The target population of our study is males and females over 16 years of age, divided into two groups: (1) current competitive fencers, and (2) former competitive fencers. Narrative interviews of the participants are analysed and compared across groups. Participants are also required to complete written questionnaires (Ryff, Rosenberg, BFI, ACSI, STAI). The analysis of the results is expected to provide us with further insight into sport-attrition in Hungary.

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## A Work Site Health Promotion Program

**Keywords:** stress, healthy workplace

Nowadays the increasing working hours cause lot of diseases, stress, communication problems among employees. It means that they cannot work as efficiently, they have to take time off or sick-leaves because of mental or physical reasons. These problems affect the quality of production and cost a lot of money to the companies.
Our previous study, conducted for the XXX. Student's Conference at Bosch Rexroth Ltd., Eger, aimed to reveal employees' quality of life. A few months ago I had the opportunity to conduct another survey with the same research group at another company.
The Short Form 36 questionnaire was used for measuring quality of life, which included the following dimensions: physical functioning; role limitations caused by physical problems; bodily pain; general health perceptions; vitality; social functioning; role limitations caused by emotional problems and mental health. Siegrist stress questionnaire was applied to specify the average well-being on workplace, the safety and contentment. Results were compared to the Hungarian average. 65 workers participated in the survey altogether, mostly physical workers. The average age was 42,8 years (SD 13,203).
Everyday activities like walking over 1 km caused difficulty for 40%. The appreciation of the employee's own health was better than the Hungarian average. Three-quarters of the workers felt their job safe, but only 46% believed that he or she could be promoted. 89% had highly responsible work and half of them reported time pressure. These results suggest that the companies need a more comprehensive health survey, as well as health programs.
Based on the above mentioned results a special health program is being developed for companies considering the environmental facilities and the type of work done. The first part of the program includes the following dimensions for workers:

- general health orientation;
- different physical activities;
- offer for healthy eating, choosing reform kitchen in the canteen;
- policy how to give up smoking, and protecting from passive smoke;
- relaxation techniques to decrease stress;
- team building, communication skills.

The second part includes the following dimensions for employers:

- defining optimal time to take rest;
- developing ergonomical environment;
- negotiating with local sport clubs and restaurants to offer healthy options;
- organizing family days;
- taking prevention about illness.

The program is planned for a half year. The same survey would be done at the end of the program to reveal significant differences in health status, quality of life and stress level of the employees as the result of the program.

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**Waterpolo with Deaf and Hearing Players and Their Non-Sporting Pairs**

**Keywords**: deaf, SWLS, waterpolo

**Background:** The Hungarian national team of waterpolo won the Olympics Games nine times (Rózsaligeti, 2009), moreover the national deaf waterpolo team has similar results: they won six Deaflympics (deaflympics.com). One sport, in which they are the leadings, however they've different difficulties not only in the life, but in the swimming-pool as well.
10% of the habitants of Hungary live with impaired hearing, from this population about 4%, 60000 people are deaf (SINOSZ, Bartha, 2006). The hearing-impaired live with discrimination and sociocultural differences, but there's a field where they can forgot about all of them: getting out from their closed community they enter in a new group and change their lives with sporting (Stewart, 2002).
The actuality of my topic is the lack of the literature of deafsport. There are only a few scripts about sportsmen's satisfaction with life (Pikó-Keresztes, 2006), mainly about the disabled people's. As an athlete I am interested in a language minority's waterpolo's life.
**Methods:** In Hungary 66, 8% of the men don't do any sports, from this group I asked 15-15 deaf and hearing men (n=30) with the help of questionnaire of satisfaction with life scale (SWLS). Furthermore, I examined more 15-15 deaf and hearing waterpolo men (n=30). I watched also other factors, demographical details: average salaries, personal relations, which are influenced on the life's satisfaction. As sampling I used the simple reaching technique, snowball sampling. In the SWLS there are 5 statements that you may agree or disagree with, using the 1 (strongly disagree) – 7 (strongly agree) liking scale. I used descriptive statistic, I calculated min., max., standard deviation, mean.
**Results:** I worked with the Statsoft statistic program and I measured with ANOVA for each statements in the 4 groups. The probability of these results, assuming the null hypothesis are:

1) In most ways my life is close to my ideal $p<0,0003$
2) The conditions of my life are excellent $p<0,0006$
3) I am satisfied with my life $p<0,0037$
4) So far I have gotten the important things I want in life $p<0,001$
5) If I could live my life over, I would change almost nothing $p<0, 071$

It is clearly seen that the deaf waterpolo players' satisfaction is much more higher ($M_1=5,73$ $SD_1=1,28$; $M_4=5,4$ $SD_4=1,06$;) than the non-sporting hearing-impaired's ($M_1=4$ $SD_1=1,25$; $M_4=4$ $SD_4=1,31$). However, for the hearings this result is not true: they are almost equal, but the non-sporting group's results are little bit better ($M_2=5,7$ $SD_2=1$; $M_4=5,47$ $SD_4=0,83$) than the waterpolo players' ($M_2=5,27$ $SD_2=1,03$; $M_4=5$ $SD_4=0,93$).
**Conclusion:** From these results we can see it is worth considering care for the deaf's or disabled's sport, because for a hearing-impaired the sport means more possibilities, than a hearing person. Furthermore, sport is about social contacts, this is a great chance to integrate them to the society.

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**Stamina, Motor Control and Psychophysiologycal Status of Elite Male Handball Players**

**Keywords**: handball, endurance, coordination skills

**Background:** Handball is the second most famous sportgame after soccer in Hungary. A modern handball player is a very good athlete, performing many different moves (running and jumping, changing directions with or without a ball). Somatic, psychological, conditional status and coordination determine efficiency in handball besides technical and tactical knowledge of athletes.
**Aim**: to determine the condition and psychophysiological status of elite male handball players.
**Method**: Measurements were carried out among NBI and NBI/B class players. After somatic measurements the aerobic endurance was tested in training situation with the aid of 20m shuttle run (n=21, 4 pivots, P; 7 back, B, 8 wing, W; 2 goalkeepers, GK) and 30m dash. Throwing strength was measured with a 1kg medicine ball (one hand, sitting position), and 20 vertical jumps (in one series). Psychophysiological tests were carried out (n=15, 4 P, 5 B, 5 W, 1 GK) studying distributive attention (Type: EM.-05.54, EM-05.55), task dependent concentration, choice reaction time (60 stimuli, 5 colors, 2 sounds, 2 leg-stimuli type: EM-05.58K).A test using a stabilometer studying balance was also introduced (Type: EM-05.47M).
**Results:** In the 30m dash W were faster (mean= 4.33±0.19s), while B were somewhat slower (mean 4.81±0.31 s) as it can be expected by the characteristics of the game. Throwing the medicine ball GK were the best (23±0.14 m), while W were the weakest (19.31±1.5 m). The different demands of each position are the most visible analyzing data obtained from the shuttle run and jump test. Mean calculated aerobic capacity of P was 61.425±8.33 ml/kg/min, B 52.58±5.94 ml/kg/min, W 63.96±7.5 ml/kg/min, while GK 57.8ml/kg/min. In the vertical jump series test mean height of W was 50.61±4.15 cm, while B performed 41.26±7.84 cm in the series. Studying distributive attention with one hand B gave 258.2±25 correct answers in 5 min (excellent score), while P:213.5±50.62, GK: 243 were much less effective, W had much more mistakes (178.4±44.81). An attention test with both hands gave similar results. There were no significant differences in choice reaction time test among positions. Mean time was the highest for auditory stimuli (0.83±0.22s), while the shortest reaction time was achieved with legs (0.65±0.11s). No big difference was measured in the range of displacement from the middle point in the balance test between the dominant (2.13±0.31s) and not dominant legs (2.16±0.29s), using a stabilometer. This performance puts GK and P to the average category (51 points, 54 points respectively) while W and B are good according to the scale (66 and B57 points). Positioning within the normal range was average, displacement to the front was 13.6±2.15s on the dominant, and 13.06±4.21s on the not-dominant side, while imbalance happened more often backwards (mean: 14.0±3.65s dominant side, 15.2±4.76s not dominant side).
**Conclusion**: Data obtained from our study are very useful for trainers in terms of structuring handball training. Besides strength and endurance training special attention is needed for proprioception, attention and balance since lack of fast and complex coordination hinders good performance.

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## The Effects of Three Month Proprioceptive Training on Static and Dynamic Stance Stability of Adolescent Women Handball Players

**Keywords:** body sway, stabilometry, centre of pressure

**Background:** Handball is a very vigorous game and therefore it causes many collisions between players and loss of balance and as a consequence it results injuries. It is possible to reduce the incidence of them with well-prepared training programs (Ho Yoo et al. 2010, Mandelbaum et al. 2005). The use of these programs is vital especially under the age of 18 (Olsen et al. 2005). The benefit of proprioceptive training not only manifests in injury prevention, but it can also enhance athletic performance as well.
**Hypothesis:** According to the literature we assumed that the proprioceptive training has favourable effects on the subjects' dynamic balance, but does not affect static balance. Most probably the main effect of training applied would be the decrease in frequency variable of body sway.
**Material and methods:** Seventeen adolescent female handball players volunteered to this study enrolled into two groups: (1) the proprioceptive group (PR, N=8, 13,66±0,67 years) following 3 month training program on Dynair mats and balance boards 20 minutes a day, 3 times a week apart their conventional handball training, and (2) the control group (C, N=9, 14,14±0,30 years) having their regular handball training. Static and dynamic stabilometry was carried out before and after intervention in Romberg position with duration of 20 s measuring total (Stot), anterior-posterior (SAP), medio-lateral (SML) excursion of centre of pressure (CP) and radius of a circle (R) containing 95% of stabilogram. In the dynamic stabilometry the platform was tilted 5.5° unexpectedly while subjects had to regain their balance. Also, frequency of body sway was calculated using Fourier analysis. Mean and SD was calculated. Student t-test was used in pre-post comparison.
**Results:** In static conditions in PR Stot and SML increased significantly ($p<0.05$), in C Stot, SML and SAP decreased significantly ($p<0.05$). The frequency amplitudes in PR 0-1 Hz, in C 0-1 Hz and 1-2 Hz increased significantly along ML ($p<0.05$). R did not change in PR but increased in C. In dynamic conditions in PR SML, in C Stot and SML decreased significantly ($p<0.05$). R decreased significantly only in PR ($p<0.05$). According to the Fourier analysis in PR along both axis (AP and ML), in all frequency ranges the amplitudes decreased significantly ($p<0.05$), in C 1-2 Hz and 2-3 Hz ML decreased significantly ($p<0.05$), 1-2 Hz AP increased significantly ($p<0.05$).
**Conclusion:** Our results indicated that proprioceptive training applied improved the ability to regain balance when quiet standing is disturbed. The most significant findings of our study is that the amplitudes of the body sway decreased in all frequency spectrum. Although the value of R was unchanged in static conditions, between 0-1 Hz the frequency amplitudes increased, as well as Stot and SAP indicating the improved reaction to keep balance which can be a good indicator for avoiding injuries.

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**Relationship between the Activation Level and Pre-tension of the Muscle, and its Effects on the Mechanical Characteristics of Knee Extensors**

**Keywords:** EMG, isometric and concentric contraction

**Background:** It is well documented in the literature that a linear relationship exists between activation and tension level of the muscle. Between the pre-tension and the extent of the following dynamic work also a linear relationship can be detected. The activation level of the muscle affects the extent of the mechanical work, but this linear relationship may not operate if the pre-tension level is required to be reached as quick as possible. Therefore the aim of this study was to explore whether the activation level or the pre-tension influences primarily the positive dynamic work.
**Hypothesis:** Our supposition was thatif concentric contraction is preceded by low pre-tension levels the activation level would compensate the lower pre-tension level to produce as much work as it can be calculated after maximal isometric contraction.
**Methods:** Nine young (19,89±0,78 yrs) subjects were measured on Multicont II dynamometer after warm-up. The maximal voluntary isometric contraction (MVC) of knee extensors was measured at 60° of knee angle. After reaching 100, 80, 60, 40, 20 % of MVC ($QR_{100,80,60,40,20}$) the knee was released from static position and the knee extension started automatically. The pre-tension was reached in two different ways: with no time constraint (NTC) and with the possibleshortest time (PST). During the contractions the activation level (rmsEMG) was measured at vastus medialis (VM) and vastus lateralis (VL) muscles by telemetric EMG. Angular velocity (ω) and -acceleration (β) were defined from 60 to 50 degrees at each concentric contractions. Student's t-test and Pearson's correlation (Statistica 10.0) were used to analyse the differences and relationships among the activation level, pre-tension level and mechanical characteristics.
**Results:** At NTCa significant ($p<0,01$) polynomial relationship was established between rmsEMG and pre-tension level. At PST no significant relationship was observed between activation and pre-tension level.There was also a linear relationship between pre-tension level and ω or rather pre-tension level and β, whereas inPSTthe mechanical work was significantly greater at $QR_{60}$, $QR_{40}$ and $QR_{20}$compared to those in NTC ($p<0,01$).
**Conclusion:** Our results show that the pre-tension and activation levels ought to be separated, because these are not related at maximal activation. The amount of positive work in NTC depends mostly upon the amount of elastic energy stored in the patellar tendon since pre-tension and activation of the muscles increased parallel.In PST positive work was almost the same at all pretension level, so it can be concluded that maximum activation level is the dominant factor in producing work. However, it should be noted that the difference between the work generated without pretension and work estimated at different pretension level indicates the contribution of elastic energy stored during isometric contraction.

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**Influence of Stimulation Frequency on Performance of Cycling by Means of Functional Electrical Stimulation**

**Keywords:** FES- cycling, SCI, frequency

**Introduction:** Functional Electrical Stimulation (FES) is a well used treatment in the rehabilitation of spinal cord injuries (SCI). FES produces cycling movements in paralised legs. It improves the function of cardiovascular- [1] musculoskeletal- [2] [3] and respiratory system [1], reduces the risk of some metabolic diseases [1], mends the mood, provides a good sport opportunity for SCI people. These benefits of FES driven cycling are restricted by the power output attainable. To gain the power output of the training the optimalization of the stimulation parameters is needed. [4]
**Hypotheses:** The aim of my study was to determine the stimulation frequency in which the FES driven cycling training is the most efficient. The aim of my study was to determine the stimulation frequency in which the FES driven cycle training is the most efficient.I investigated whether higher stimulation frequency values generate higher performance during the trainings.
**Method:** I investigated 7 subjects with SCI. 5 participant's measurements were qualified to be analized. The 5 analized subjects included 1 woman, 4 men, 1 tetraplegic, 4 paraplegics, ages between 25 and 41. Each subject participated in trainings 1, or 2 times per week in the National Institute for Medical Rehabilitation. Motomed Viva2 ergometer and PE11 TENS stimulator were used for the exercises. All of the stimulation parameters were constant during the measurements except the frequency. Optional frequency values were 10, 30, 50, 70, 90Hz. Frequency was always constant during one training, but changed randomly between different training occasions. 75 trainings were analysed all together. I used Matlab program to calcultate the power output, Statistica program was applied to perform statistical analyses.
**Results:** My findings show that higher stimulation frequency values are not generate higher power outputs in every occasion. Appointing the optimal frequency is needed individually. Optimal is the frequency that results the highest power output. The performance was the highest in frequency values 50, 50, 90, 30, 90Hz for the 1., 2., 3., 4.,5. subject respectively. Spearman-type rank-correlation showed that adequate values and ranges for the stimulation are 50-70Hz, 30-90Hz, 90Hz, 30-70Hz, 90 Hz, for the 1., 2., 3., 4.,5. subject respectively.
**Conclusion:** Using the adequate stimulation frequency improves the power output during the exercises. My results show that appointing the adequate stimulation frequency for all FES-cyclist is not possible uniformly. Frequency optimization is needed individually. Frequency modulation should be investigated for every new FES-cyclist to improve the efficiency of the trainings.

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## The Effects of a Single Mesocycle and Subsequent Detraining on Jump Height, Eccentric Strength, Running Speed and Leg Stiffness in Elite High Jump Athletes

The purpose of this study was to examine the effects of an acute bout of explosive strength training on subsequent jump performance. Twenty four subjects (age 18-30, 18 males, and 6 females) initially went through baseline testing. Subjects performed 3 Countermovement Jumps (CMJ), 3 Squat Jumps (SJ), and 3 Drop Jumps (DJ) on a force platform. This platform measured both jump height (m) and peak force production (N). Twenty four hours later all twenty four subjects performed a single bout of explosive strength training which consisted of 50 vertical jumps - 10 reps of 5 sets interspersed with 1 minute of passive recovery. Subjects were then divided into two groups. Group 1 performed a SSC Post-Test 20 minutes, 48, 72 and 96 hours after training. Group 2 performed a SSC Post-Test 20 minutes, 72 and 96 hours afterwards. Data analysis showed no significant change in jump height in both groups. However, when analyzing peak force using a repeated measure ANOVA, there was a significant decrease from Pre SSC to 96 hours Post Test. In addition, an Interaction effect between session and group was found at the level of $p=0.05$ suggesting that groups had different recovery profiles. Thus, according the results, recovery from an acute bout of explosive strength training may be greater than 96 hours.

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**Changes in Metabolic and Muscle Damage Indicators Following a Single Bout of Jump Training on Stair versus Level**

**Keywords:** microinjury, plyometric, knee extensor

**Background:** Jump exercises at level can acutely induce delayed onset muscle soreness, loss of maximal voluntary force and vertical jump height [1] due to temporary muscle damage caused by eccentric muscle actions. Immediately after plyometric training oxygen consumption, heart rate, and blood lactate increased in recreationally trained subjects [2]. Though data is available on the acute effects of low intensity stair climb walking [3] and running [4], there is no information about the physiological effects of maximal effort stair-jump training (SJT). As in uphill activities smaller eccentric forces are produced compared with those at level, in the present study we hypothesized that muscle damage indicators are smaller and acute metabolic responses are greater after a single bout of stair-jump exercise, than after jumps at level.
**Methods:** Trained males (n = 8) executed 100 maximal intensity unilateral jumps in two conditions: on stairs (SJT) with one leg, and at level (L) with the other leg. Maximal isometric torque (MVC) and rate of torque development (RTD) of the quadriceps muscle during knee extension (Multicont II dynamometer), and unilateral vertical jump height (VJ) was determined in the trained leg pre-exercise, immediately post- (IP), 24h and 48h after exercise. Serum creatine kinase (CK) level and delayed onset of muscle soreness (DOMS) of quadriceps and gluteals were evaluated at pre-exercise, 24h and 48h. Blood lactate levels were measured at pre-exercise and at IP. Heart rate (HR) was continuously monitored during exercise sets and rest intervals. All variables were tested with two-way ANOVA of repeated measures (condition × time).
**Results:** There was no condition × time interaction in any of the variables, except DOMS in both muscles. DOMS developed only in the L condition. CK elevated significantly at 24h and was about two-fold greater in L and about three-fold greater in SJT, but magnitude of changes was not different. MVC and RTD declined acutely and remained depressed at 24h, but recovered at 48h in both conditions. VJ height was unaffected in both conditions. Lactate elevated to ~8 mmol/l at IP, in both conditions. A non-significant trend ($p = 0.068$) indicated that SJT induces greater HR responses during the rest intervals.
**Conclusion:** Stair and level jumps induced similar heart rate, lactate and CK responses, and similar loss and recovery in muscular performance. We speculate that our participants in the L condition, expecting high stress on muscles during unilateral landings, involuntarily increased the pre-activation level of their muscles. The greater activation may have distributed the workload among fibers that protected the muscles from greater damage, but, on the other hand, increased the metabolic demand. We conclude that vigorous stair-jump training challenges the anaerobic energy system, while this type of training does not compromise power and rapid torque generating ability on the subsequent day, and could be one alternative to prevent delayed onset muscle soreness.

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# Alteration of Mechanical Characteristics of Patellar Tendon under Eccentric Contraction in Vivo

**Keywords**: elastic energy, patellar tendon, in vivo

**Introduction**: It is well known that tension of activated muscles increases during eccentric contraction. One of the reasons of this phenomenon is that resistance of elastic units increases linearly with the external force while elastic energy is stored in them. In vivo circumstances most of the elastic energy is stored in the serial elastic units, mainly in tendons. Elastic energy stored in the patellar tendon (PT) is poorly studied in the literature to date. There is only one study reporting elastic energy storage in PT under isometric knee extension in vivo (Tihanyi et al., 2005).
**Aim of study:** (i) to calculate how much elastic energy is able to be stored in PT during isometric contraction, (ii) to calculate how much elastic energy can be gained under stretch of knee extensors, (iii) to discover if there is anycorrelation between the stored elastic energy and the stiffness of the muscle.
**Methods:** In our study, 31 trained individuals (age: 20.95 ± 1.33 years, height: 171.8 ± 10.04 cm, weight: 65.1 ± 11.95 kg) participated. For measurement of maximal isometric and eccentric torque of knee extensor muscle group Multicont II dynamometer was used. The patellar tendon length was measured using an ultrasonic device (HITACHI EUB-405Plus). PT length was determined at low tension ($L_{LT}$) and at an isometric torque of 100%, 80%, 60%, 40% and 20% ($l_{IC100,\ 80,\ 60,\ 40,\ 20}$). Thereafter the knee extensors were stretched applying 20 °/s velocity and 30° range of motion. Muscle stretch started at a knee angle of 60°. Since the tendon elongated linearly with torque PT length ($L_{EC}$) was calculated by using maxim eccentric torque ($M_{EC}$). Stored elastic energy ($E_{IC100,\ 80,\ 60,\ 40,\ 20}$; $E_{EC}$) was calculated on the basis of torque and elongation values. Stiffness (κ) and Compliance (C) were calculated from the torque-elongation curve. Differences between elastic energies estimated at different torque levels were calculated by Student T-test and the correlation between stored elastic energy and stiffness was determined by Pearson's correlation. Significance level was set at $p<0.05$.
**Results:** $L_{LT}$ values (4,8±0,41 cm) were significantly ($p\leq0,05$) lower than $L_{IC}$100,80,60,40,20 and $L_{EC}$ values. Significant increase was observed in $E_{EC}$ values to $E_{IC100,80,60,40,20}$. κ was 38,14±15,67 Nm·mm-1, while C was 0,034±0,016 mm·Nm-1. No significant correlation was found between tendon stiffness and stored elastic energy in PT.
**Conclusion:** As previous studies have shown elastic energy increases during eccentric contraction. In our studies the stretching force had significantly greater effect on patellar tendon, than previous studies on elite athletes. Most probably it can be attributed the difference in stiffness and supposedly to larger cross sectional area in elite athletes.

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**Force-velocity-power Characteristics of the Muscles of the Upper Extremities Working Simultaneously**

**Keywords:** isometric, concentric contraction, stretch-shortening cycle, bench press

**Background:** The relationship between the force and the shortening velocity of the muscles is characterized by a hyperbolic curve (Hill 1938). The shapes of the force-velocity curves are quite diverse during voluntary contractions. According to Tihanyi (1987), the typical force-velocity relationship exist during vertical jumps and the power ability of the muscles can be characterized with the peak mechanical power. The bench press similarly to the squatting is an important strengthening exercise. However, the relationship was not studied to date.
**Aims:** The aim of this study was to examine whether the hyperbolic relationship exist for the muscles during bench press.
**Methods:** 19 university students (9 women: 20,56±0,53 years; 56,89±6,55 kg; 165,11±7,44 cm; 10 men: 21,5±2,5 years; 75,3±7,7 kg; 182,9±6,8 cm) were positioned supine on a bench placed on a force platform. We measured the maximal isometric force ($F_0$) in three bench press position [fully (FF), medium (MF) and slightly (SF) flexed elbow], the barbell was fixed in the Smith machine and we asked the subjects to push up with maximal effort. Thereafter the students were instructed to extend the elbows as fast as possible from FF and MF position with only arm extension (CC) or with joint flexion prior to extension (EC-CC). The external load was increased at least in five steps until one repetition maximum (1RM) was performed. We measured the velocity at each load with a linear encoder (MuscleLab). We fitted the external load-peak velocity (Le-pV) and average force-average velocity (AF-AV) data to the Hill equation and calculated the variables of the curves ($a/F_0$; $P_0$; $v_0$). The average values and standard deviations of the variables were compared with Student t-test.
**Results:** $F_0$ was the highest in SF (women – FF: 342,2±70,5 N; MF: 476,6±127,3 N; SF: 743,3±243,5 N; men – FF: 722,5±142,4 N; MF: 863,5±160,8 N; SF: 1399,5±296,74 N). 1RM was higher in medium position in both sexes [women – FF: (288,9±65,1 N; MF: 405,6±107,4 N; men – FF: 675,0±181,4 N; MF: 790,0±185,3 N). The differences in $F_0$ and 1RM in FF and MF position were not significant. $L_e$-pV could be fitted to the Hill-equation in FF-CC; FF-EC-CC; MF-CC and MF-EC-CC ($p<0,05$) in both sexes. Although AF-AV showed a fair fitting the hyperbolic curve, the deviation from the linear regression line was greater. The a/F0 was the highest (0.17) when weight and maximum velocity were the input data for men.
**Conclusion:** The main finding of this study is that force-velocity data can be fitted to the Hill equation and the hyperbolic curve during bench press, so that peak mechanical power representing power ability of the muscles can be determine preciously. However, it should be noted that the best fitting is when the gravitational force of the weights applied and the corresponding maximum velocity is the best input data. Using this relationship the optimum weights can be determined individually more reliably.

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**Exome Sequencing of Senescence-accelerated Mice**

**Keywords**: Exome sequencing, senescence-accelerated mice, aging

**Background:** Aging is known as one of the major factors, which increase the risks of various complex diseases, such as diabetes, hypertension, and sarcopenia. In general, habitual exercise has been postulated to be important factors to prevent age-related diseases, but their molecular bases remain largely unknown. Therefore, elucidation of genetic and molecular mechanisms of aging is indispensable for creating more effective exercise interventions for successful aging. Senescence-accelerated mice (SAM) are inbred mice strains consisting of senescence-prone (SAMP) strains and senescence-resistant (SAMR) strains. Although these SAM strains have been used as a model to elucidate the mechanism of aging, the gene mutations responsible for the common senescence-prone phenotype of SAMP strains have never been identified. The aim of present study was to use whole exome sequencing to identify coding-region mutations that are commonly present among the SAMP strains as well as those unique for each SAMP strain.
**Methods**: Genomic DNA was extracted from 6 SAMP and 3 SAMR strains along with AKR/J and C57BL/6J strains. After targeted enrichment of exonic regions, exome libraries were sequenced on the next-generation sequencer (ABI: SOLiD4) as single-end 50-bp reads. Sequence reads were mapped to the reference mouse genome, and single nucleotide variants (SNVs) were detected by using Avadis NGS ver.1.3. To narrow down candidate mutations, only novel homozygous missense SNVs were extracted by comparison with NCBI dbSNP build 128 and UCSC transcripts.
**Results & Discussion:** Whole exome sequencing detected 1,407 to 38,925single nucleotide variants (SNVs) in the coding-region for each strain. Exonic SNVs included 48-1,549 novel homozygous non-synonymous SNVs in each strain. Among them, Ogg1 p.R304W and Moxd1 p.K583N missense mutations were detected as those commonly present among the SAMP strains but absent in the other strains. Monooxygenase DBH-like 1, encoded by Moxd1, is a member of the copper monooxygenase family;however, the function and substrate of Moxd1 have not yet been identified. The enzyme 8-oxoguanine DNA glycosylase, encoded by Ogg1, removes oxidatively modified bases, which is a cause of mutation accumulation. Because Ogg1 p.R304Wwas suggested not to be sufficient alonefor accelerated senescence and a short lifespan, it will be necessary to investigate the combined effect of Ogg1 p.R304W, Moxd1 p.K583N and unique mutations for each SAM strains on accelerated senescence. As a strain-specific mutation explaining the various pathogenic phenotypes of SAM, theOcm p.Q55X nonsense mutation was found uniquely in the SAMP10/TaIdr strain. Oncomodulin, encoded by Ocm, stimulates retinal ganglion cells (RCGs) to regenerate their long axons via CaMK-CREB signaling. Adeficit of Ocm may be involved in cerebral atrophy specific to SAMP10.
**Conclusions:** Whole exome sequencing identified Ogg1 p.R304W and Moxd1 p.K583N missense mutations as candidate mutations for accelerated senescence of SAMP strains.All of the each strain-specific mutations were also identified. Our findings contribute to elucidation of the genetic mechanism of accelerated senescence and short lifespan in the SAMP strains and also to a better understanding of the genetic basis of normal aging.

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## Leisure Opportunities for Youth Development in Europe

**Keywords**: European Youth

In Europe, youth work has been established for a number of years and there are many diverse models that can be drawn from various countries (Chisholm 1995). The main goal of the youth work in Europe is to encourage young people to participate actively in society (community life, civil society, political life), to shape their own future and to contribute to the development of their own environment. The springboard for co-operation among European countries on youth issues was the "White Paper on Youth" (2001), which identified four priority areas for action: participation, information, voluntary activities and a greater understanding and knowledge of youth. European Union started a youth campaign in 1997 supporting young people's initiatives in all member states. One of the strongest programs was the "Youth in Action" for young people aged 15-28 (in some cases 15-30). Its aim was to inspire a sense of active citizenship, solidarity and tolerance among young Europeans and to involve them in shaping the EU's future.
In the last 10 years we organized and evaluated several international youth exchange programs in European towns with over 1000 participants. The main goals were how to bring young people together experiencing each others culture, how to understand each other better, how to develop common projects. The method was to invite young people to international camps to learn about different culture, lifestyle and international cooperation. The participants have been participating in leisure activities, workshops and action projects. The learning process and the results were monitored and evaluated with statistic methods.
This presentation will summarize the experiences and results of this international youth work of the last decade.

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## Appearance of the Sport's European Dimensions in the 2011 Modification of Hungarian Sport Strategy 2007

**Keywords:** EU Work Plan on Sport, Hungarian National Sport Strategy, Social Inclusion

In May 2011 the European Union Work Plan on Sport has been published for the years 2011-2013. It was preceded by many important documents (White Paper on Sport, Communication on Sport). These gave explicit direction how to modify the Hungarian sport law, and the National Sport Strategy. The Hungarian Government worked out the modifications of the 2007 Sport strategy in 2011, which was followed by the acceptance of the new Sport law.
During our research we wanted to answer the following questions:

- Was the EU's Sport-work plan taken into account in the modification of the 2007 Sport strategy?
- If yes which were the certain parts that were built in the new Hungarian Sport strategy, and if not why were these parts left out?

To answer these question document analysis was conducted on the EU Work Plan on Sport and the Hungarian document in question the modification of the 21st National Sport Strategy decree. We determined the relationship between the two documents on the basis of the following three topics: the societal role of sport (A), the economic dimension of sport (B) and the organization of sport (C). Each topic summarizes 3-8 subjects. Our analysis pointed out, that the discussion of which areas is missing from the planned modification of the National Sport Strategy.
The results showed that only certain areas were implemented to the planned modifications. For example one of the most emphasized questions in the EU's document – How to implement sports into society/the societal role of sport – has been discarded. Although there is no direct obligation to implement these questions, the authors urge the Hungarian officials and sport stakeholders to review EU sport documents because Hungary also signed and accepted along the Communication and the EU Work Plan on Sport.
From 2014 the EU will have a sub-programme with the budget for financing European sport projects and the only way to prepare for it is by implementing and preparing action plans in the uncovered fields of the White Paper on Sport.

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## Similarities and Differences of Football Talent Program in Hungary, Canada, and in Malaysia

Football is played almost in every corner in the world. The number of players is growing in each country. To become one of the best, all national football federations have the responsibility to search and to develop talented children and youth. The obejectives of this paper is to compare the talent programs in three countries: Hungary, Canada, and Malaysia which represent three continents, and to study the way they develop a football team. Document analysis and in-depth interview with some coaches and managing staff in Hungary, Canada, and in Malaysia were used as methods for data collection. The results are presented according to the following dimensions: Where do the countries search for talented players? Who has the responsibility to develop their talent? How are they selected? What is the benefit the football teams and federations get? What are the stages the talented young players has to go through? In conclusion the author says that football is a world within sport. We are able to communicate in football even we are not speaking the same language because we are playing under the same set of rules. For developing to a better team, gifted young players should be found and their sporting career should be promoted.

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# Players' Agents Regulations in European Professional Football

**Keywords:** Bosman-case, European football market, players' agents

**Introduction:** Since 1995, the end of 'Bosman case', European football has changed. There is much more focus on the business side of football than before. The labour market of football has liberated, the players' (and agents') financial assets have multiplied, creating huge sums of money in modern football.
Players, who spend most of their time on the field, are not able to fulfil lawyer and diplomat tasks. They need somebody who is behind them, negotiating and arranging affairs.
As a result of the foregoing facts the role of players' agents has increased significantly in the last fifteen years.
The main objectives of my research are: to determine the player-agents' significance within the sport economy, to analyse the current regulations of players' agents and to map the attitude of FIFA, UEFA and the European Union about them.
**Hypotheses:** It is assumed that the renewal of 'FIFA players' agents central examination and license system' is necessary.
Within as secondary hypotheses it is assumed:

- that the agents' rights and duties are centrally regulated
- that the activities of players' agents are continuously under control
- that the players and their agents would act as partners if any new regulations were introduced.

**Test methods:** During the research several methods of examining the activities and regulations of players' agents were applied. The first step was collecting and analysing the relevant documents of the FIFA, the UEFA and the EU. The related official data were then systematized, and a business model was set up which determines the weight of player's agents' in sports economy.
Besides secondary sources, structured in-depth interviews were chosen as a primary method.
During the selection of interviewees, I attempted to get the professional opinion of different interest groups. Coaches, talent scouts and football players from European elite leagues contributed to the research.
**Results:** 30% of football transfers are carried out by unlicensed agents. This opens the door for human trafficking, money laundering, fraud and corruption.
Intervention is required. The first FIFA Regulation on Players' Agents entered into force in 1996. Since then, it has been strongly criticised by the football society.
The EU upholding the complaints sent a statement of objections to FIFA. As a result of this statement in 2001 a new, and in 2002 a revised Code has been introduced. Since then, the value of football business continued to increase, but the regulations remained unchanged.
**Summary:** As sport, especially football is an integral part of European economy, the European Union must handle the problem of players' agents arising today. The EU cannot afford that the commissions of agents become 'uncontrolled agent fees' because of the lack of proper supervision, and unscrupulous business-men manage the career of talents instead of facilitators.

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## Comparative Disquisition of the Laws of the Game Knowledge of Hungarian Football Coaches

**Keywords**: laws of the game, coaches, referee test

The purpose of my disquisition is examining football coaches' knowledge about the laws of the game. For a football coach to be authentic, it is not only enough to be up to date regarding their profession, but it is essential to know the laws of the game accurately and interpret them correctly.
A lot of Hungarian and foreign researchers have studied this topic. My project is based on the studies of Csaba Barta (2006, 2008), Carlo Castagna (1999, 2001, 2001, 2003) and Stefano D'Ottavio (2001), who have analysed, among other things, the professional preparedness of referees and the knowledge of the football players of the laws of the game. Studying the coaches is another important segment of this field of research.
The question that comes to mind is that if the coaches with a higher professional qualification know the rules of the game better.
I suppose that football trainers have less knowledge of the laws of the game, than referees from the lowest grade of qualification. Referees have to pass the rules-test on their given class twice a year, in which, even in the lowest qualified class, have to achieve at least 80%.
I suppose the coaches who have got a referee exam perform better the test of the rules of the game.
I suppose also that the more number of years spent as a trainer the better knowledge they gather on the laws of football.
My sample research consists of students from Semmelweis University Faculty of Physical Education and Sport Sciences, and coaches with an active UEFA licence. The number of elements of the sample was N=121. I chose the elements to the sample by using non variable sampling. The sample represents the Hungarian coach society.
Beside the results of the game rules-test I studied, among the coaches qualification, their language knowledge and how long have they been working as a coach. During my research I used the questionnaire method. The questionnaire complies with first test criterion. I used Statistica for Windows 9.1 program to process my results. To calculate the differences between the groups I used Chi-square test, levels of significance were determined at 5%.
All three hypotheses of mine were proved to be true. The first conclusion was that higher qualified coaches perform better on the rules-test. Although the coaches' knowledge of the laws of the game is lower than the referees' knowledge in the lowest class. It was proved that the coaches who have referee exam performed better on the test than the coaches who do not have this exam. The more time spent coaching the better a coach performed on the rules-test.
I counsel to concentrate on the he laws of the game knowledge in the instruction of the coaches, because these kinds of training have indictable results. By the Hungarian Football Association and the European Football Association regulation, the coaches can only get an A-licenced coach qualification if they passed the referee exam. But the lower qualified coaches have to have a minimum scale of knowledge of the laws of the game.

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**Battle of the Brands – Consumer Perceptions of Nike and Adidas**

**Keywords:** brand, comsumer perception, branding research

**Introduction:** Nowadays we use the phrase globalization more and more. With the spread of this phenomenon some brands gained worldwide reputation and they have become daily-use goods. The products of Nike and Adidas are also included in this group. These two brands count the world's first and third most valuable sports brands. The question is, wether deliberate branding process was succesful, and what people actually associate these brands with.

**Hypothesis:**

I assume that there are no significant differences between the two brands' consumer perceptions.

I assert that people associate these brands primary with team sports.

**Method:** I used quantitative procedures of the primary market research methods, from which I preferred surveys. In the questionnaire I asked closed-ended, open form and biopolar questions as well. The closed-ended issues involved scaled and dichotomous questions, as well as multiple choice. The questionnaire was prepared both in Hungarian and English, so respondents from 22 countries have contributed to the analysis. The response was voluntary and anonymously, and had main focus in the age groop of 16-45. 99 % of those polled were secondary or higher educated women and men. They clustered a database of 212 person altogether. I processed the answers with the statistical program SPSS 17.0.

**Results:** The brand awarenesses of both brands based on the responds of 79 women and 133 men is 100 percent. Moreover, 97,6 % of them also have some items from one of the producers. In the course of purchasing I appointed following order in the priorities of the factors: quality, price, trend, brand loyalty and advertisement. 92 % of the respondents decided on their own about purchasing, without opinion leaders having effect on their determination. 53,3% of the 212 respondents found Adidas more likeable, and they would give 7,9 points on a scale of 1-10 to the brand, while the ratio of the sympathizers of Nike was 45,7 %They gave an average of 8,2 points to the brand. In the course of the associational-study, the responsives described the brands mostly with the same attributes. The polarity profile proves the same, because the values differ only slightly based on a seven-point grading scale. These values are standing out more detailed in a coordinate system with help of a perceptual map. Analizing the brand-personality of two brands above, Adidas shows a mature aged, sporty man, while the Nike is a younger, ambitious, athletic woman. From the two brands, Adidas dominates in team sports (64, 4 %), while Nike is in individual (46, 2 %) and in team (47, 1 %) both strong. 86, 3 % of the respondents do exercise regularly, and the stohastic relation (0, 284) between abode and the sporting habits is weak. 87, 4 % of these athletes use one of these brands for their sports activities.

**Conclusion:** The consumer perception of the two brands is very similar, strong differences cannot be discovered, despite of being a 10 billion US dollar difference between the two brands' market value. The two brands are serious market rivals for eachother, however taking over Nike's first place seems to be an impossible challenge for Adidas.

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**Sports Tourism Opportunitis in Komárno – Biking**

**Keywords:** sport, tourism, science, active-passive tourism

Komárno is a town in Slovakia, on the southeast side of Csallóköz, at the confluence of the Danube and the Váh rivers. Geographical and climatic conditions of the major are oustanding opportunities for tourists. Sport tourism is one of the most effective spheres of tourism, which dominates very much the tourism market. This process is well known for scientists, who underlined the role of sport tourism in discovering new territories for sport activities, in community development, and in tourism motivation. I wrote a case study from Komarno's famous bike tour „Csárda túra". In 2011 was the 8th and from year to year has more participant from Slovakia and other countries. With applicated questionnaire we present the biking habbits. Methods: A literature review, document analysis, map drawing – sport touristic terms, questionnaire n=66. Komarno now has 91 sportclubs, from this 16 is international and 12 have organized races with international visitors. Csárda túra has 4,3 x more attendant in 2x more categories. The questionnaire shows the active bikers and what motivates they to biking. The respondents 92% cycling hobby and casually, from these 52% motivate the organized bike tours. The results show, we must occupate more with the development of active sport tourism.

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**The Economic Background of Canoeing in Hungary**

**Keywords:** canoeing, salaries and subsidies, sponsorship

**Introduction:** Canoing is one of the most successful sports in Hungary, it is confirmed by international results and national recognitions. It creates lasting value not only at senior but also at junior age. Nevertheless, financial problems affect sport clubs and even the members of the Hungarian selection. The aim of my research is to reveal the economic circumstances of the Hungarian selection athletes, the role of the parents in supporting future talents, and the required amount of money to maintain the high level performance in this sport.
**Hypothesis:** I supposed that the salary of the members of the Olympic "A" selection would be around 320 euros, consequently their financial conditions primarily depend on bonuses, subsidies and the sponsorship market. I assumed that in the background of outstanding results the activity of the business sector would appear. I supposed that the two main components of the income of the Hungarian Canoe Federation would be the public sector's subsidy and the money from the sponsors. I also assumed that until the age of 18 without the financial and logistical assistance of the parents canoeing could not be exercised.
**Methods:** I examined members of the the 2012 Olympic "A" selection (43 athetes) and the junior selection team (46 athletes) using two different list of queries, to obtain data about their financial background. Data were analyzed by the means of descriptive statistics. Furthermore I made deep interviews with 5 members of the selection, the secretary general and the head coach of the national team.
**Results:** The net salary of the selected people was mainly between 340-510 euros, which money came from two different sources; from their clubs and from the Wesselényi public foundation, through the Hungarian Olympic Committee. Just a few of them have income from their own individual sponsors. The top athletes earn a bit more than the Hungarian minimum wage yet they depend notably on the sponsor market. Success is jut partly related to the existence of the sponsor. In the selection there are athletes from clubs with and without sponsors too. In the Federation's budget, the public support is a prominent source, which proceed from different public institutions. During the years, the Federation has managed to contract with some powerful sponsors, they contribute to the financing of the selections and provide the second largest source of income. The parents of the junior selection members pay the membership fees, contribute to the acquisition of training equipments and the costs of the training camps.
**Summary:** Despite the critical economic situation, it seems that with the governmental assistance and the sponsorship support canoeing can maintain its successes in Hungary. Being a top athlete in this sport provides an average subsistence, benefits related to the results greatly inspire the athletes, but only the best can win. The junior team needs attention and support to reach the senior top level, they not only need to be supported professionally but also financially to reduce the economic pressure on the parents. I will continue my research comparing the economic situation of the clubs with and without sponsors.

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# Analysing the Dual-level School-leaving Exam in PE and Its Relation to the School Achievement of First-year TF Students

**Keywords:** PE, school-leaving exam, dual level

**Introduction:** Introduction of dual level final state exam in 2007 meant a new challenge both for the teachers and the students. The responsibility of the secondary schools increased as the final state exam replaced the entrance exam.
The aim of the investigation is to gain a picture about the present situation and about the changes in trends by comparing the data of the school-leaving exams of the last 5 years. It was also investigated if the final PE exam can filter out those students who are suitable for studying at the body cultural courses.
**Hypothesis**: It was supposed that
1./ the result in certain sports show an improving tendency
2./ a continuous increase can be demonstrated in the points given for the practical parts
3./ the auxiliary materials appearing in the book market meant a great help for the students in their preparation for the exam, thus their oral exams were more successful.
4./ more students possessing an A- level exam were admitted to the university in 2011 than those with B-level exam.
5./ there is a significant difference in the results of the A-level and B-level students, based on their first semester studies.
**Material and method:** The quantitative data of the PE exam (at A and B-level) gave the basics of the research. A further investigation was carried out among 115 first-year students who started their studies in the PE-Coaching and the Recreational Course in the autumn of 2011. The research was carried out among 67 first-year students at the PE and Coaching Course. During the work the questionnaire method was used. The received data were analysed by the Microsoft Office Excel 2003 program, and during the processing mathematical statistical methods were applied.
**Results:** During the **s**tudied 5 years the number of students applying for the final exam from PE significantly increased. As far as the performance in certain sports is concerned a stagnation and a slight increase can be observed at advanced (A) - level. At B-level an obvious decrease in the performance can be observed. As far as the total exercise performance is concerned it can be said that an improving tendency can be seen at A-level, while at B-level a declining result. The A-level auxiliary materials appearing in the Hungarian book market have contributed to the fact that the results of the oral exams increased at both levels. There is no important difference in the number of those admitted to the university. Students taking an A-level school-leaving exam had better results in the practical subjects in the first semester, than their mates taking the B-level one.
**Summary:** The appearance of the dual-level school-leaving exam had a positive effect on the judging of the subject. PE is the second most popular among the optional subjects. This fact is backed by numbers as well. It can be seen that both the students (and their teachers) take the exam more seriously. Students at A-level are really more prepared and are better in the main practical subjects. As a summary it is important that those who apply for practice-orientated sports-scientific courses should be obliged to take the A-level school-leaving exam in PE.

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## The Influence of Body Fatness on Sports Participation among School-children: The CHAMPS study-DK

**Keywords:** health sciences, children

**Background:** Childhood overweight and obesity has reached epidemic proportions, especially in economically developed countries and in urbanized populations. It is suggested that physical inactivity in children is a result of body fatness rather than being the cause of it (Metcalf et.al.2010).
**Objective:** To investigate if the amount of leisure-time sports participation among Danish schoolchildren is influenced by accumulated body fat.
**Methods:** A subpopulation of 343 children (167 boys and 176 girls, aged 8-11 years) participated fromThe Childhood Health Activity and Motor Performance School Study – Denmark (The CHAMPS Study – DK). The CHAMPS Study-DK is an observational comparative cohort study among school children in the community of Svendborg. Body composition was determined by Dual energy X-ray Absorptiometry (DXA) and used to calculate the total body fat percentage (BF%). New Agenda Solutions SMS-track system provided weekly a proxy-parent questionnaire to assess sports participation. A multilevel latent variable model was used to examine the influence of body fatness on sports participation, adjusted for potential confounders using backwards stepwise elimination and hierarchical structures of nested clusters in data.
**Results:** As the weekly amount of sports participation increased across a gradient represented by 4 levels, from no sports, few number of times (1-2 times), a moderate number of times (3-4 times) and a high number of times (>4 times), the probability for participating decreased by 4% (OR=0.96, $p<0.001$) for every 1% increase in BF% and by 44% (OR=0.56, $p=0.021$) if the child were overweight/obese compared to a normal weight child.
**Conclusion:** The degree of accumulated body fat has a significantly negative influenceon the amount of leisure-time sports among Danish children, aged 8 to 11 years. Health promoting interventions should be targeting early age children with special emphasize on children showing overweight/obese tendencies and low habitual physical activity levels.

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**Relationships between the Blood Glucose Level, Lactate Formation and Performance in Atlethes with Diabetes type I**

**Keywords:** diabetes type I, exercise, athletes, lactate

**Aims:** To compare the effects of insulin and different blood glucose levels on lactate formation, elimination and performance.
**Hypothesis:** The insulin and the euglycaemic condition can optimize the atlethes' performance with diabetes, type I.The insulin can influence the production and elimination of lactate.
**Methods:** We measured the diabetic athletes' blood glucose level, lacticacid production and elimination, gas exchange and performance. Our examination was performed on three male athletes with well-controlled diabetes type 1 (HgA1C 6,5 % +/-0,5%). A 34- year-old kayakracer, a 23- year-old football player and a 22- year-old professional dancer. The patients ran three times on $VO_2$max. During the 1. test they ran under hyperglycaemic conditions with insulin (2-5 IU Novorapid, 15 minutes before the test). During the 2. test they ran under euglycaemic conditions without insulin. During the 3. test they ran under euglycaemic conditions with insulin (2 IU Novorapid before the test). Euglycaemia was at 5.0 mmol/l, hyprglicaemia was at 11 mmol/l.
**Results:** The performance was the highest under euglycaemic conditions with insulin and the performance was the lowest under hyperglycaemic conditions with insulin. The lactate formation was higher under hyperglicaemic conditions, but the lactate elimination was faster under euglycameic condition swith 2 IU insulin.
**Conclusions:** The use of insulin before doing sports and the euglycaemic condition for diabetic athletes have a considerably positive impact on performance and regeneration.

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## Effect of Weight Loss on the Changes in Dynamical Marks of Centre of Gravity at Different Age-classes

**Keywords:** weight loss, centre of gravity, dynamical marks

**Introduction:** The quality and dynamical marks of movement deteriorate due to obesity and overweight. Several studies suggest that body weight begins to normalise and the health status improves resulting from submaximal, aerobic training. Based on these data the movement dynamics is also improved by recreational training (Katzmarzyk and Lear, 2012).
**Aims:** We investigated the changes in dynamical marks of centre of gravity (CG) after weight loss in case of simple movements like crouch and jump.
**Methods:** 93 participants (age: 11-70 years, mean BMI: 26,9±0,57) took part in our study. They did 60 minute long recreation trainings two times a week for 3 months on 60 percent of maximal heart rate. APAS 3D system was used for movement analysis. The examination was performed in the beginning and at the end of training program in 2 dimensions with 4 reference points and 11 joint points (ankles, knees, hips, shoulders, elbows and forehead). Participants crouched and jumped in front of a camera. The speed of video record was 30 frames per second. We analysed the position, velocity and acceleration of CG. Changes of body weight, fat and muscle mass were determined by InBody230. Participants were divided into the following five age groups: gr. I: 11-18 years, gr. II: 19-29 years, gr. III: 30-45 years, gr. IV: 46-60 years, gr. V: 61-70 years.
**Results:** Significant decrease of body weight was detected in gr. II (-1.17±0.6kg), gr. III (-4.83±1.5kg), gr. IV (-1.15±0.6kg) and gr. V (-1.19±0.3kg). The fat mass was reduced in gr. II (-1.65±0.8kg) and gr. III (-3.9±1.3kg). We observed significant increase in lifting of CG in case of jump in gr. III (+2.6±1.3cm) and gr. V. (+2.2±1.1cm). The increase of CG velocity was significant in gr. IV (+47.5±17.5cm/s) and gr. V (+25.75±8.7cm/s). In case of crouch the extent of sinking and the velocity of CG were enhanced significantly in gr. IV (-5.09±2.7cm and +85.37±43.9cm/s). We did not detect any significant changes in acceleration of CG in neither group.
**Conclusion:** Our results suggest that low intensity recreational training optimizes the body composition and the dynamics of movement. Weight loss mends the position and velocity of CG in case of crouch and jump. Our training program was the most effective among 30-60 year-old people.

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**Serum Vitamin D Status in College American Football Players**

**Keywords:** Vitamin D deficiency, Serum 25-hydroxyvitamin D, Athletes

**Background:** It is widely accepted that vitamin D is necessary for bone health. Moreover, recent evidence has found vitamin D is important for musculoskeletal health and neuromuscular function, and it helps to prevent various chronic and autoimmune diseases. Numerous studies have recently reported a high prevalence of vitamin D deficiency and insufficiency in the general population. However, much less is known about the vitamin D status of athletes.
**Purpose:** The purpose of this study was to assess the prevalence of vitamin D insufficiency and deficiency in college American football players.
**Methods:** A total of 71 Japanese college American football players (mean age, 19.6 years; range, 18-22 years) were recruited to participate in the present study with 25 players enrolled in winter 2011, and the remainders were enrolled in summer 2011. Serum 25-hydroxyvitamin D [25 (OH) D] concentration was measured using an enzyme-linked immunosorbent assay. Participants were classified by serum 25 (OH) D as deficiency (<20 ng/ml), insufficiency (20-30ng/ml), and sufficiency (>30ng/ml). Percent body fat was measured by dual energy x-ray absorptiometry.
**Results:** Of the 71 enrolled players, 28 (39%) were deficient and 31 (44%) were insufficient in 25 (OH) D; leaving only 17% of the players having sufficiency levels. There is a significant difference in serum 25 (OH) D level ($p<0.001$) between summer (24.5±7.3 ng/ml) and winter (19.4±4.7 ng/ml). In winter, over half of participants had 25 (OH) D levels less than 20ng/ml, and nobody was classified into the sufficiency range of more than 30 ng/ml. Even in summer, there was still a high percentage of vitamin D insufficiency (44%) or deficiency (30%).
**Conclusions**: There is a high prevalence of vitamin D insufficiency and deficiency among Japanese college American football players, even in summer.

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**Development Trends of Major Events in Triathlon Between 2000 and 2011**

**Key words**: competitive sport, triathlon, development trends

**Introduction**: Nowadays, the goal of every young sport is to become part of the Olympic Games. The career of triathlon could be an excellent example for them. When the International Triathlon Union (ITU) was founded in 1989, they made an important decision to put the sport onto the list of the Olympic Games. That happened in 1994, and triathlon made its debut in Sydney. The Olympic distance consists of 1500 m swimming, 40 km cycling and 10 km running. From 2000 the sport triathlon did a huge growth. It not only gained a wide reputation and support from the media, but ITU took advantage of that, as well. They created a system for the elite athletes to qualify for the Games. The 50-55 places for both gender is really few, so they have to be better and better, just like in other competitive sports.
**Purpose**: The aim of this study is to determine the developement trends in the overall time of the major events: in Olympic Games (OG), World Championships (WC) and European Championships (EC) both for female and male athletes. The period from 2000 to 2011 is separated into three parts.
**Methods**: Overall times of the first, second and third placed athletes of both gender at the major events were analysed with ANOVA (analysis of variance) method. The means of the three groups were compared. The calculations were carried out by using the statistical program SPSS.
Results: In the three examined periods significant development was found both in female and male athletes in the EC, only in male athletes in the WC in the period between 2000 and 2004. From 2004 to 2008 no development was found. During the past three years significant development was found only with males in the EC.
**Conclusion**: Over the years, the overall time has decreased in case of both genders, but the growth trend was not constant. One explanation for that may be the last discipline, the running: the times of that discipline improved. An empirical study confirmed that running times improved with about 2 minutes in males. Running has been upvalued over the years, but it is not manifested in the percentage of the total competition time and training distance. Comparing an average elite triathlete's competition time in percentages (swimming 15%, cycling 55%, and running 29%) with the training distances in percentages (swimming 7%, cycling 72% and running 21%) (Millet et al., 2002), Fröhlich et al. (2008) find it in their study: „Shifting resources in favour of running may be beneficial." Millet et al. (2002) recommend a combination of running and cycling in order to improve the last discipline. Resulting from the references and studies, it can be stated that in triathlon the training methods need to be reconsidered.
References:
G.P. Millet, R.B. Candau, B. Barbier, T. Busso, J.D. Rouillon, J.C. Chatard. Modelling the transfer of training effects on performance in elite triathletes. *International Journal of Sports Medicine*. 2002, 23: 55-63.
M. Fröhlich, M. Klein, A. Pieter, E. Emrich, J. Gießing. Consequences of the Three Disciplines on the Overall Result in Olympic-distance Triathlon. *International Journal of Sport Science and Engineering*. 2008, 4: 204-210

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## The Impact of 4 Week Training of Lower Limb on the Jump Height on Dynamometric Platform

**Key words**: inclined plane, dynamometric platform, training loads.

**Introduction**In sport training we are looking for training model which will help us to achieve tangible results in the form of a sport result. Each method specifies the number of sets, repetitions and the time of rest breaks. The structure of loads is related to the periodization (Monteneiro et al., 2009). According to the Pac-Pomarnacki (2006) it is "variability of the work and rest sequence, and the distribution of training loads in the sequences of exercises, sets, classes, micro-cycles etc." Thanks to the variability of the work one is supposed to achieve optimal physical predisposition, and this in turn will enable the athlete to achieve the objectives contained in the training program for particular periods. Another factor influencing the changes in athlete's physical characteristics is the break of adaptive threshold. According Bompa (2005), the effect causes only the intensity, whose strength of the stimulus is higher than the initial function level of organs and tissues. Which means that if the player performs the same work without changing the volume and intensity, its effectiveness greatly reduces, because the body adapts to the constant effort. Therefore, the author took an attempt to assess the reaction of the body in relation to the physical characteristics of the lower limbs under the influence of two four week training sessions on the inclined plane, with the maximum intensity and varied training load structure.
**Methods** Training lasted for 4 weeks with 5 trainings in a week (Mon, Tue, Wed, Thu, Fri). The number of repetitions in a week micro-cycle riggings and the time of rest break between series in both groups were the same. Group I performed the training with various number of series (Mon. 5, Tue. 8, Wed. 4, Thu. 5, Fri. 8) of 10 jumps, which gave 300 repetitions per week. Group II, the same number in the micro-cycle, but six series of 10 repetitions during each training. The study involved students of the Józef Piłsudski Univercity of Physical Education in Warsaw (2 male groups of full-time students for 18 people in each group) aged 21.9 ± 1.1, weight 78.4 ± 7.5 kg and height 180 ± 5.9 cm .
**Summary** Analyzing the results of the research, an incensement in the height of jumps on the basis of the measured speed (V) and work (W) is noticeable. In group I, where the trainings were performed with a variable structure load the increases reached 4.8% and 4.8% respectively. Group II is also characterized by the increases in these parameters, but they are significantly lower, 1.8% (V) and 1.9% (W). This difference is also reflected in the overall height of jump. The results of Group I are characterized by 4.4% improvement, while Group II by 1.8%. Analyzing the impact of periodization of the training load, it can be stated that the training with different numbers of series in the Group I was more effective, as it is evidenced by better results achieved during the jump.
**References**
Bompa T. O., Carrera M., (2005): Periodization training of sports. Human Kinetics Publishers.

Monteiro G. Artur, Aoki S. Marcelo, Evangelista L. Alexandre, Alveno A. Daniel, Monteiro A. Gizele, Picarro Ivan da Cruz and Ugrinowitsch Carlos, (2009): Nonlinear periodization maximizies strength gains in split resistance training routines. Journal of Strength and Conditioning Research, volume 23 nr 4: 1321-1326.
Pac-Pomarnacki A. (2006): Zasada okresowości-fundament struktury cyklu treningowego. Sport Wyczynowy 7-8: 9-21.
Staniszewski M., Mastalerz A., Urbanik Cz., Lutosławska G. (2009): Ocena skuteczności dwóch wariantów treningu o zróżnicowanych składowych obciążenia. W: Urbanik Cz., Mastalerz A. (red.) Biomechanika sportu i rehabilitacji - wybrane zagadnienia, AWF Warszawa: 215-236.

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**The Preventive Medical Efficacy of Regular Exercise in Menopause**

**Keywords: menopause, exercise, prevention**

**Introduction**: Menopause changes the physique, the body shape, reduces the body's basic metabolic level appearing on the excess kilograms. In this age many women begin to improper body weight reduction cures, resulting in loss of bone mass which is further enhanced by oestrogen deficiency resulting in osteoporosis. The combination of obesity and oestrogen deficiency also significantly increases the risk of cardiovascular diseases, and the inactive way of life just enhances these problems (Vuksanović et al., 2008).
**Methods:** Women over the age of 50 were involved to the test (n=96; mean age: 57.64 years; age range: 50-76 years; BMI: 28.41±0.51) who did aerobic physical activity three times a week (mean HR: 115.74±2.91 bpm). Psychosomatic health status was analysed (survay method) in the beginning and at the end of the program. The intensity of training was followed by Polar system (pulse, calorie consumption). The changes in fitness status (step test), resting blood pressure and heart rate, just as body composition (InBody230) were measured every month. These results were completed with lab tests (glucose, LDL-, HDL-cholesterol, triglyceride, HbA1c) and plasma leptin and insulin; levels (ELISA).
**Results:** By the effect of regular physical activity, the fitness status of the tested women improved significantly, and their blood pressure, resting HR and exercise pulse decreased. The weight loss of participants was 1.79±0,41 kg in average after the four months program. They lost 2.39±0,40 kg fat mass, while their fat-free mass increased by 0.58±0.16 kg. Their mineral mass content increased by 30±0.01 g. The decrease of abdominal obesity degree was less pronounced than the obesity degree related to the whole body, which can be explained by the different impact of sexual steroids expressed in femoral-gluteal and abdominal areas (Kirchengast, 1998). Improvement can be detected also by analysing the hormone and bloodchemical laboratory results: the glucose level decreased, as well as the level of cholesterol and triglyceride.
**Conclusion:** Our results suggest that this combination of multidisciplinary methods is suitable for the investigation of the mechanism of the beneficial actions of physical exercise.

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## The Effect of Training Loads Variability on Maximum Power Obtained during a Jump CMJ on Dynamometric Platform

**Keywords:** Dynamometric platform, maximum power, training loads

The structure of training, i.e. the distribution of training loads over time, determines whether it will bring tangible results. In the literature we can find descriptions of many types of trainings with different load components, such as exercise intensity expressed by the power of exercise, duration and frequency, the number of repetitions and the time of intervals (Hansen 2004; Mastalerz et al. 2006). It is important to control your training by gradual incensement of incentives. In sports practice such actions are intended to knock out the player's body from the state of homeostasis, and thus set at a higher level of adaptation, breaking the threshold of exercise capacity. On the basis of other authors' results, it can be concluded that the influence of a constant stimulus on the player's body causes weakness of his actions (Bompa et al. 2009). Therefore, the purpose of this study was to evaluate the effect of two variants of four-week training with different load structures, on the maximum power obtained during a jump CMJ on dynamometric platform.

The study involved 36 students of physical education, at the age of 21.9 ± 1.1 years, weight 78.4 ± 7.5 kg and height 180 ± 5.9 cm. All participants were divided into two groups of 18 people, and then were training on a inclined plane.

Lower limb training lasted for 4 weeks. Each week micro-cycle consisted of 5 training units, during which the students performed a series of jumps from a dynamometric platform on the inclined plane. The number of repetitions (10) and a series (30) in micro-cycle training, as well as period of time between series (120s) was the same for both groups of respondents. Each week the students were subjected to a control measure: jump on dynamometric platform. Trainings were carried out in two variants:

Group I – variable number of series (Mon. - 5, Tu. - 8, Wed. - 4, Th. - 5, Fri. - 8) x 10 repetitions.

Group II – the same number of series (6 series) x 10 repetitions.

Conducted training resulted in increment of the maximum power over the first day of measurement. In group I, the power increased in the 2nd and 3rd week, while in group II after 3rd and after 4th week of training. In addition, it should be noted that in both groups, the upward trend continues for 10 days from the end of training (39th measurement day). Comparing to the output value, there has been a growth of the tested parameter: in group I at the level of 5.76%, and 4.37% in group II. Higher growth rates may evidence the better effectiveness of training with diverse load components (group I) in relation to the training of uniform structure (group II).

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## Aerobic and Anaerobic Energy Supply Parameters of Middle and Long Distance Runners

**Keywords:** energy supply, track and field, energy production.

**Introduction:** Endurance is the major physical quality on which the level of results of middle and long distance runners depend [1]. The strict quantitative estimation of the level of development of endurance can be executed on the basis of measuring of external performed work to muscular failure (limiting work) and by direct measurements of energy cost expenses at performing exercises.

**Methods and Discussion:** 12 men and 6 women of high qualification specializing in middle and long distance running took part in the research. All persons under test were tested in standard laboratory conditions. The program of the standardized laboratory researches included the tests, performance of which provided a complex assessment of aerobic and anaerobic capacity for work: On treadmill the test of step increase of loading (to muscular failure) was carried out; the test of maximum anaerobic powers (MAP); Wingate test was carried out on veloergometre; and also in field tests of the repeated limiting loads, including repeated 300 meters distances overcoming with the greatest possible speed.

Estimation of level of power expenses and establishment of key parameters of capacity, volume and efficiency of aerobic and anaerobic energy sources was carried out on the basis of registration of pulse exercise costs. For this purpose pulse monitor Team Polar (Firms Polar Finland) was used.

**Conclusions:** 1. The most exact measurement of quantitative characteristics of endurance can be done on the basis of measurements of indicators of capacity, volume and efficiency of both aerobic and anaerobic energy production sources.

The way of definition of energy expenses which is most convenient in the practical relation at exercise performance is continuous registration of indicators of pulse exercise costs.

2. On the basis of measured pulse exercise costs it is possible to carry out strict quantification (a quantitative estimation) of training and competitive loadings.

So in particular in running exercises it is possible to define 6 ranges of exercises with various character of physiological shifts at work:

- Loadings of mainly aerobic influence (to AnT);
- Loadings of the mixed aerobic-anaerobic character (from AnT to W cr.);
- Loadings of the mixed anaerobic-aerobic character (above W cr.);
- Loadings of the glicolytic anaerobic character (nearby W exhaustions);
- Loadings of the mixed anaerobic alactic-glicolytic character;
- Loadings of alactic anaerobic influences (close W maximum anaerobic).

3. It is necessary to create various bases of experimental data for athletes of various age, sex, specialization and qualification.

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**Changes in Tissue Components Measured Using Anthropometric and Bioelectrical Impedance Analysis (BIA) in Female Volleyball Players in Season 2010/2011 - Comparative Analysis**

**Keywords:** body composition, anthropometric method, bioelectrical impedance, female volleyball players

**Background:** The aim of this study was to observe the changes of selected body components measured using two methods - anthropometric and bioelectrical impedance in female volleyball players in season 2010/2011 and compare the results.
**Basic procedures:** Eleven female volleyball players participated in this study. The measurement of tissue components of the body was done using electronic weight (BIA method) adjusted to STANDARD motor activity level and the anthropometric method by Piechaczek. Total fat-free mass content, total fat body content and water content were evaluated. Control measurements in season 2010/2011 were made before the preparatory period (Measurement 0), one week before the end of the preparatory camp (Measurement 1), after the first (Measurement 2) and the second (Measurement 3) phase of the competitive season and four weeks after the end of the tournament (Measurement 4). Additionally, during the fifth measurement body composition analysis using BIA method for ATHLETIC motor activity level was performed.
**Main findings:** Body mass, LBM and hydration have not changed throughout the analyzed period. Fat mass as determined by the $BIA_{STANDARD}$ increased from 20.7±5.3 kg (Measurement 0) to 22.2±5.0 kg (Measurement 1) but subsequently decreased to 21.2±5.7 kg (Measurement 2) andremained at this level until the end of the season. In the case of FAT values estimated using Piechaczek equations a significant increase in FAT from 18.4±3.0 kg to 19.3±3.4 kg, 19.5±3.5 kg and 19.8±3.6 kg was observed respectively. Analyzing the values of the LBM and the FAT significant differences were observed between the values obtained using BIA method for the ATHLETIC motor activity level and the results registered for STANDARD level and estimated using the anthropometric method.
**Conclusions:** Results obtained using BIA method for the STANDARD physical activity and using anthropometric method did not differ significantly. Significant correlation between values obtained in measurements made using BIA method and anthropometric method was found.

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**Anti-inflammatory Role of Recreational Physical Exercise in a Rat Model of Colitis**

**Keywords**: inflammation, physical exercise, rat

**Background:** The sedentary lifestyle can lead to health problems such as metabolic syndrome including obesity with hypertension, insulin resistance and high blood lipid levels. Metabolic syndrome is associated with a chronic low-grade inflammatory state. Many studies reported that physical activity is an effective way of controlling body weight, but the influence of long term low intensity exercise on inflammation and activity of anti- and proinflammatoric enzymes is not well known. We used a rat model, trinitrobenzene-sulphonic acid (TNBS) induced colitis, to investigate the changes of inflammation and activity of heme oxygenase (HO) and nitric monoxid synthase (NOS) enzymes in the colon after running.
**Aims:** We investigated the effects of long-term leisure-type physical exercise on the activity of HO, NOS and myeloperoxidase (MPO, an inflammatory marker) enzymes in the trinitrobenzene-sulphonic acid (TNBS) induced colitis in rats in dependence on time.
**Methods:** After 3, and 6 weeks self-administered physical activity (running wheel) male Wistar rats were treated with TNBS (10 mg). 72 h after TNBS challenge we measured colonic inflammatory parameters and HO, iNOS, cNOS, MPO activity.
**Results:** While after 3-week running we found no difference in the severity and extent of colonic inflammation in the sedentary and running TNBS treated group, the 6-week freewheel running significantly increased the activity of HO (from 1,3±0,2 to 2,8±0,3 nmol bilirubin/h/mg protein), constitutive NOS isoforms (from 321,1±35,2 to 438,0±30,1 pmol/min/mg protein) and inductive NOS isoform (from 21,4±5,5 to 26,6±4,8 pmol/min/mg protein).The TNBS challenge after 6 weeks running significantly decreased the level of inflammatory markers including extent of lesions (from 54,6±2,6% to 42,9±3,2%), severity of mucosal damage (from 7,6±0,3 to 6,6±0,3) and the level of MPO activity (from 880,6±79,3 to 568,4±59,9 mU/mg protein), did not changed the activity of HO, increased the activity of cNOS (from 108,9±25,6 to 333,9±32,3 pmol/min/mg protein) and decreased the iNOS activity (from 217,6±26,4 to 128,9±15,8 pmol/min/mg protein) compared to the sedentary TNBS-treated group.
**Conclusion:** Long lasting recreational physical activity, at least 6 weeks by rats, improves body's defence mechanisms. Physical activity-induced increasing activation of HO and cNOS systems, decreased activation of iNOS system may play role of these mechanisms including colonic inflammation.

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## Exercise Training is Associated with a Peripheral Increase in IGF-I and BDNF in Teenagers. Possible Role of CREB

**Keywords:** neurotrophic factor, lymphocytes, physical exercise.

**Background:** Brain Derived Neurotrophic Factor (BDNF) and Insulin-like Growth Factor I (IGF-I) are a family of proteins that are responsible for the growth, differentiation and survival of developing neurons and the maintenance of mature neurons (Neeper et al., 1995). Some studies hypothesize that elevation of brain IGF-I is necessary for the BDNF mRNA expression in this tissue (Carro et al., 2000). In the brain BDNF interacts with its specific tyrosine kinase type 2 receptor that, through second messengers, activates the transcription factor cAMP response element-binding (CREB) wich is responsible for the expression of most genes required for memory and learning at the hippocampal level (Vaynman et al., 2004). The up-regulation of neurotrophic factors due to physical exercise has been extensively described in different animal models and in adult humans (Neeper et al., 1995; Gomez-Pinilla et al., 2008). However, in teenagers whose neural development is in a critical period, the regulation of IGF-I and BDNF and its possible implications in cognitive function remains unclear. Moreover, the study of CREB in lymphocytes as memory cells, can opens up the possibility of study the neurotrophic actions at peripheral level as a reflection of the brain processes.
**Aim:** The major aim of this work was to determine whether exercise training in teenagers is involved in the up-regulation of neurotrophic factors in blood and how it can improve cognitive function through peripheral activation of CREB in lymphocytes.
**Methods:** Ten cyclists and fourteen sedentary teenagers (13.6±2.3 years old) were recruited for the study at different time points during the season. We obtained serum to determinate IGF-I using an enzyme-labeled chemiluminescent immunoassay; and plasma without platelets to analyze BDNF concentration using a Sandwich ELISA kit. We also isolated lymphocytes to determinate total and phosphorilated CREB by western blot.
**Results:** Our data show that the trained teenagers have significantly higher serum IGF-I and plasma BDNF levels, when compared to the sedentary group ($p<0.01$). However, the study of pCREB/CREB in lymphocytes do not show differences between groups.
**Conclusions:** Exercise training is able to increase the peripheral levels of two of the most important neurotrophic factors, IGF-I and BDNF. This improvement opens up the possibility that physical exercise could contribute to the development and protection of the nervous system in teenagers. However, this peripheral stimulation of neurotrophic factors does not change the CREB transcription in lymphocytes.

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**PE Teacher: New Challenges. Analysis of the Results of All-russian Contest**

**Keywords:** PE teacher, PE pedagogical experience, school sport education

**Introduction:** Contemporary conditions place new demands on PE teachers for the formation and development of healthy lifestyle values and upbringing of the younger generation. These are the main priorities of Russian state policy. Official statistics shows the deterioration of school children's health. In this regard Russia requires new standards and technologies in the educational process, especially connected with children's health and physical activities. The whole system of PE education requires new innovative technologies, which can make a regular PE-lesson more interesting, effective, various and smart.
The objective of the research was to initiate the development of an educational program for PE-teachers based on the analysis of the results of All-Russian Contest "PE lesson of the XXI century". We had to select the most innovative lessons of 1756 presented to the competition in 6 nominations.
**Discussion:** All-Russian contest "PE lesson of the XXI century" was organized by Russian fitness-aerobics Federation in 2011. It was organized in conduction with the Ministry of Sports, Tourism and Youth Affairs, Ministry of Science and Education, Russian State University of Physical Education, Sport, Youth and Tourism, edition "Sport at School". The contest was designed to increase the importance of physical education and sports, to perfect the system of school sport education and to promote healthy lifestyle for children and school students. The main goal of the contest was the revelation and expansion of innovative pedagogical experience in physical education and formation of healthy lifestyle for children and school students.
There were 6 different nominations in the contest in which we divided all the projects to achieve certain goals in each nomination.
"Play and grow" (560 projects)
"Funny break" (58 projects)
"Head-to-head" (56 projects)
"Together we are a team" (495 projects)
"School of champions" (220 projects)
"A lesson after lessons" (367 projects)
The youngest participant of a contest is a 18-year old teacher from Nizhniy Novgorod and the oldest participant is a 84-year old teacher from Moscow region.
Russian Fitness Aerobics Federation gave an opportunity to visit Russian Fitness Festival, the biggest fitness event in Europe, and seminars for PE-teachers "Fitness at School" for 279 finalists of a contest. They came to visit Festival and Seminars to get new information, programs, innovative technologies of the best Russian and European fitness specialists.
**Results and Conclusions:** The analysis of the results of the contest proved that the system of PE education requires new innovative technologies, which can make a regular PE-lesson more interesting, effective, various and smart. The results of our analysis can become a basis for discovering a new educational program for PE-teachers. 60 best video projects were downloaded on a website of Russian Fitness Aerobics Federation (http://www.fitness-aerobics.ru/ru/contest/) as an example of good methodical material which enables PE teachers to master innovative technologies in PE education.

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## The Electrical Activity of Thigh Muscles during Cycling as a Function of Speed and Resistance

**Keywords:** cycling, EMG, knee-muscles

**Introduction:** Investigating electrical activities (EMG) of healthy persons' muscles during cycling is helpful to build a functional electrical stimulation (FES) pattern for spinal cord injured (SCI) patients. This helps patients to make cycling movements by their paralyzed limbs. If the EMGs of healthy muscles are known during a movement than a similar movement can be reproduced on paralyzed muscles. As the velocity of cycling movement increases, the electrical activity of the quadriceps and hamstring muscles increases, but it is an open question that the rate of change in EMG amplitudes is the same for the 2 muscle groups. The issue is that if the velocity of FES cycling is to be increased how differently should the stimulation of knee extensors and flexors be increased. Our hypothesis is as the velocity is increasing both muscle groups' EMG grows and the rate of the growth is the same for the 2 muscle groups.
**Methods:** Muscle activities (EMG) of quadriceps and hamstrings muscle groups were recorded for 41 healthy subjects' (age: 16-33 year) cycling on a recumbent stationary bike. A ZEBRIS movement analyzing system was used to record EMG with 1000 Hz sampling rate. Cycling was performed with 2 pedaling speeds (around 45 rpm and around 60 rpm) and against 3 resistances (gear conditions). After filtering (Butterworth), smoothing (RMS) and normalizing data were analyzed with Matlab. It was tested that the 2 cycling speeds were significantly different. The cycles in 2 speed conditions were characterized by the mean EMG values of both muscle groups during the cycle. A ratio was calculated (ratio of slow and fast mean EMGs), which shows the increment in mean EMG as a result of speed change. Ratios for the 2 muscles were compared with Student's T-test. The correlation between cycling speed and EMG amplitude was computed for all gear conditions.
**Results:** The effect of speed change is significantly higher for hamstrings than for quadriceps (mean quadriceps ratio: 1,307; hamstrings ratio: 1,477; $p=0,0264$). The effect of resistance change on EMG amplitudes is similar for the 2 muscles. Besides the correlation between speed and muscle activity is stronger as the resistance increases and the rate of increment of correlation coefficients is alike for the 2 muscles. Correlation data shows, that in higher resistance the correlation between speed and mean EMG values is stronger (gear1: $r<0,3$; gear5 and gear8: $r>0,45$).
**Conclusion:** The cycling movement is mainly the result of the quadriceps muscles activity. The hamstrings muscle group is liable for fine control of the movement. As the velocity is increasing the activity of both muscle groups is increasing, but the activity of the hamstring is increasing relatively more, because faster motion needs not only more force but better regulation, so if we want to increase the velocity of the SCI patient's FES cycling we have to increase both muscle groups' stimulation, but not in the same rate for the 2 groups, the stimulation of the hamstrings group must be relatively more increased. Moreover if the required force grows with higher resistance the knee muscles getting more prominent for the motion.

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**Joint Kinetic Comparison of the Tennis Serve among Various Competitive Levels**

**Keywords**: tennis, serve, overuse injuries

**Background**: Overuse injuries to the upper limb joints remain the most common medical problem in tennis (Marx et al. 2001) that concerns not only professional tennis players but also recreational and advanced competitive players (Jayanthi et al. 2005).Joint injuries have been linked to excessive joint loads during the tennis serve (Kibler, 1995). However, serving kinetics at various competitive levels have not been documented, as previous studies have been limited to professional players (Elliott et al. 2003, Reid et al. 2008). Moreover, professional tennis players have been suggested to be more efficient by minimizing their risk of injury and maximizing their ball velocity but, this has not yet been confirmed.Consequently, the aim of this study is to compare the joint forces and torques for the dominant upper limb during the serve for players at different competitive levels (professional VS advanced) and investigate their relationship with the concept of "efficiency".
**Methods**: 11 professional players, (ITN 1; age 25.5 ± 4.3 years ; 1.88 ± 0.07 m; 80.4 ± 7.7 kg) and 7 advanced players (ITN 3 or 4; age : 25.3 ± 7.3 years ; 1.81 ± 0.04 m ; 70.1 ± 6.2 kg) performed 5 successful 'flat' serve.Motion Capture (300 Hz) was carried out using an optoelectronic motion capture device Vicon MX (Oxford Metrics, UK). Ball velocity ($V_{ball}$) has been measured with a radar (Stalker Professional, TX).Peak kinetic values (joint forces and torques) of the shoulder, elbow and wrist joints have been calculated with dynamic inverse method.
**Results**: $V_{ball}$ was significantly faster for the professional players (177.1 ± 17.2 km/h) compared to the advanced players (146.7 ± 16.3 km/h) ($p<0.001$). Results show that advanced players are less efficient than professional players, as they have significant lower $V_{ball}$ but similar range of normalised peak joint forces and peak torques values, except for proximal elbow force.
**Discussion:** While a coordinated action may reduce upper limb loading, it is plausible that modifications of the kinetic chain may increase forces on the upper limb joints in advanced players (Kibler, 1995). Consequently, we can suppose that advanced tennis players have improper service technique compared to professionals that could result in overuse injuries of the upper limb joints.

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## Changes in Static Balance Ability of Female Artistic Gymnasts as Measured over Two Years of Sporting Training

**Keywords:** rhythmic gymnastics, static balance

**Introduction**: Most of the components in artistic gymnastics that are evaluated by judges are based on postural balance. These extremely difficult and complex events require significant physical fitness and coordination. The aim of this study was to characterize changes in the abilities of young female artistic gymnasts to maintain static balance, as measured over a period of two years of sporting training.
**Materials and Methods**: The studies were conducted three times: once a year, over a period of subsequent years. Initially, the research material consisted of 24 female gymnasts aged 7 to 12 years ($9.79 \pm 1.41$ - first year of measurements), but over the years, this number decreased to 13 ($12.1 \pm 1.51$ - third year of measurements). The level of static balance was estimated with the use of a method of posturography by means of the "Posturograf" system, which consists of a stabilometric platform and a computer program. Levels of static balance were evaluated in the standard position; while standing on one leg; and in the Romberg position. In each of these positions trials were made under three conditions: with eyes open, with eyes closed, and with feedback. The following parameters for movement of the centre of gravity were analysed: mean radius [mm], developed area [mm2], and total sway length [mm]. The Student's t-test for independent samples was used to assess the significance of differences between the means.
**Results**: In the standard position, the best results of measurement of mean radius of sway were observed in the trials with feedback, with the best result occurring in the third measurement. The improvement in measurement is greater between the first and second measurements than between the second and third measurements. Definitely, the lowest results of the statokinesiogram measurements of the developed area occur in the trial with eyes closed. The best results were obtained by the competitors in the last year of research. The results of measurements of total length of statokinesiogram curve made in the second and third year of the study are much greater than the initial results. Statistically significant differences ($p < .05$) were observed in the measurements between the first and second year of the study under the condition of closed eyes while in the standard position and while standing on one leg.
**Conclusions**: Statistically significant differences were observed only between the first and second years of research. Results improved significantly during this training period. The following year, the differences were not that visible. This is connected with obtaining the high performance results to maintain static balance ability in the second year of research, which are difficult to improve upon. Static balance ability improves, and then stabilises with increased training experience.

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## Uni- and Bilateral Torque Profile of the Knee Extensor Muscles of the Elite Soccer Players

**Keywords:** torque difference, knee injury, soccer

**Introduction:** In most team sports the joint system of the lower limbs of participants are exposed to a heavy load by collisions of other players or performing fast maneuvers like different tackles of any directions or landing after jumps. It is also well known that the reason of the most common injuries like anterior cruciate ligament of the knee joint is the overload of the system. During intensive training sessions as also like in daily activities the neuromuscular system, tend to prefer the dominant side which can cause sever muscledisbalance. This form of muscledisbalance can be a reason of the overload of the joint system which can lead to an injury by critical situations. The aim of our investigation was to test the torque production of the knee extensor muscles of the elite soccer players by different functions and positions using isokinetic device.
**Hypothesis:** We hypothesize that the neuromuscular system is unable properly coordinate the torque balance between the lower limbs during fast movements in that case if both limb in action in the same time in contrast to the slow or unilateral performance by the knee extensor muscles.
**Materials and method:** 10 active elite soccer players participated in the study (20.6 ±1.2 year; 77,.4 ±2.3 kg; 186.2 ±3.1 cm). Isometric (30°, 50°, 70°, 90°) and stretch-shortening contractions (SSC) by the knee extensor muscles (90°/s, 180°/s, 300°/s) were performed after custom worm up exercises in random order on the Multicont II. isokinetic bench (Mechatronik, Hungary). To test the hypothesis the two way ANOVA were used for both cases (isometric and SSC and uni- and bilateral performances and knee angle and speed of knee flexion and extension (SPSS v13).
**Results and discussion:** Differences were found between uni and bilateral conditions by the isometric conditions from 3-9 % which differences are in accordance with normal range of accepted side difference and the same results by the SSC conditions except he 300°/s where significant difference was found ($p<0.05$) between uni and bilateral peak torques. The results support our suggestion, that the fast movement performed by the both lower limb in the same time can cause the situation, that the extensor muscles (in eccentric mode) can not perform balanced torque exertion by bending the knee joint. This situation can lead to the overload of one knee joint where injury can occur. We suggest that the reason of this occurrence based on the lack of the organization capacity of the CNS while the dominant side is preferred to exert higher torque instead of to share the load.
**Conclusion:** According to the detected mechanism we suggest that to be able to avoid injuries caused by the fast movements by the knee joint would useful tool to simulate the movement using the isokinetic bench and train the system to be able to learn the way of fast reactions in the above mentioned situations.

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# A Two-year Longitudinal Study of the Influence of Physical Activity/Hydrotherapy in the EK Motor Functional Scale, in Individuals with Duchenne Muscular Dystrophy

**Keywords**: EK Motor Functional Scale. Duchenne Muscular Dystrophy. Physical activity/hydrotherapy.

**Objective:** To determine if physical activity/hydrotherapy brings benefits regarding functional mobility in Duchenne muscular dystrophy individuals evaluated by the EK motor functional scale.
**Backgroud**: The DMD is the most common type of all this dystrophies which occurs in childhood between 3 and 4 years. Is evolution is progressive and leads to muscular weakness, functional limitations, deformities, reaches cardiac musculature and e decrease the vital respiratory capacity. This disease is cause by the absence or disability to produce the distrophyne protein that destroys the membrane of the muscular cell, avoiding the normal functionality of the muscle. They are able to keep an independent walking until six or seven years old, but normally they don't reach to an adult life, because they die of chronic alveolar hypoventilation or aggressive chronic myocardiopathy, Zatz (1986).
**Methods**: Our sample had three individuals, all boys. Two of them didn't practice any kind of physical activity, and the other one practiced hydrotherapy two times a week for forty-five minutes. It was applied the EK scale and non-parametric tests of Wilcoxon and Mann-Whitney, so we can set the differences between both groups. The EK scale was applied in five occasions to all patients, so that we could quantify in each one of them a value that defined their functional limitations. During this study we developed and applied a practical exercising program, with the main objective to provide functional mobility to the individual, in water with hydrotherapy sessions.
**Results**: The variables analysed were the physical activity issues and the EK scale values obtained, to make sure if the first one had influence in the second. The results showed that both groups increase the EK scale values, but inferiors in the individual that practice physical activity.
**Conclusions**: we didn't find any significant statistical differences; however the individual with hydrotherapy lessons presents a decrease tendency of EK scale values, regarding the ones that didn't had any practice, presenting higher EK scale values instead. Physical activity/hydrotherapy can concur to a treatment in this patients, because once their inside water they can perform several activities with pain relieve, muscular relaxation, in order to be a pleasant and motivator activity.

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## Effect of Physical Activity on Human Prostate Cancer Cells Proliferation: Involvement of Oxidative Stress?

**Keywords:** physical activity, oxidative stress, prostate cancer.

Prostate cancer constitutes a growing health concernwhich affects men in the Western world and it represents the first cause of death by cancer in France. Among the various origins of prostate cancer, sedentarity represents an important risk factor and a decrease of prostate cancer prevalence is associated with exercise. Physical activity is known to slow down and to prevent some cancers, preferentially breast and colon cancers (Kesaniemi et al., 2001; Leitzmannet al., 2007). However,studies concerning its effects in prostate cancer progression are today conflicting and conclusions are difficult to reach since there remains a lack of clarity on activity parameters (in terms of type, intensity, frequency and time).Recently, Farahmand and coll., have suggested that golf enhances the life expectancy about 5 years (adjusted byage, sex and socioeconomic status of subjects). This physical activity which numbered more than 410 377 members in France today corresponds mainly to a walking sport but it attracts moreplayers. Golf could be suitable for men with low risk early stage prostate cancer during active surveillance.

The objectives of this study are (1) to determine if physical activity (golf) has an effect on the in vitro proliferation of human prostate cancer cells and (2) to identify the involved molecular mechanisms. Oxidative stress (OS) phenotypes leading to an imbalance of pro/anti-oxidant in favor of pro-oxidant could play a role in the prostate tumorigenesis (reviewed by Khandrika and al., on 2009). The regular physical activity known to increase antioxidant defenses could reduce the evolution of the prostate cancer through OS-dependent signaling pathways.

Serum of sedentary or golfers subjects (3 golf courses 18 holes/week, $\geq$ 9 MET-h/week) is incubated with LNCaP androgen-dependent human prostate cancer cells. Proliferation, cell death (necrosis and apoptosis) as well as molecular mechanisms are studied, mainly those dependent of OS. We demonstrate that golfers' serum inhibits the LNCaP cells proliferation without inducing cell death. This inhibition of proliferation doesn’t depend on oxidative stress since no difference between the antioxidant status of sedentary serum and golfer serum appears. Golf could reduce the proliferation of prostate cancer cells *in vitro* but the preliminary results require further investigations.

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# Effects of Combination of Heat Stress and Intermitten Weight-bearing on Disuse Muscle Atrophy and Intracellular Signal in Unloaded Rat Soleus Muscle

**Keywords:** hindlimb unloading, hyperthermia, muscle atrophy

**Background:** It has been reported that prolonged muscle inactivity results in structural and functional changes in the skeletal muscle. For example, immobilization due to injuries results in muscle atrophy, which lowers athletic performance. Therefore development of countermeasures to prevent a loss of muscle mass and strength caused by disuse atrophy is required. It has been proposed that heat stress and intermittent weight-bearing could be the effective countermeasure to muscle atrophy. However, it remains unclear effectiveness and its cellular mechanisms of the combination of these countermeasures to disuse atrophy.
**Purpose:** To examine the effect of the combination of heat stress and intermittent weight-bearing on disuse muscle atrophy andsignaling responses in unloaded rat soleus muscle.
**Methods:** Forty male Wistar rats (10wk of age, 261.7±1.17 g) were randomly divided into four groups: control (CON, n=10), hindlimb unloading (HU, n=10), hindlimb unloading with intermittent weight-bearing (IR, n=10), hindlimb unloading with intermittent weight-bearing and heat stress (IR+H, n=10). The HU, IR and IR+H group were unloaded for seven days. IR and IR+H group were released from unweighting for 1h every second days. During this time, IR+H group was exposed to environmental heat stress (41-41.5°C for 30 min) in a heat chamber without anesthesia. After seven days unloading, the soleus muscle was removed and the activation of anabolic (Akt, mTOR, S6K1 and eIF-4E) and proteolytic (Calpain1/2, ubiquitinated protein, Caspase-3) markers were analyzed by western blotting.
**Results:** Seven-days unloading resulted in a 31% reduction in the soleus muscle mass, but only IR+H significantly prevented the reduction (CON; 168.2±6.7, HU; 116.3±3.7, IR; 121.0±3.7, IR+H; 131.1±2.4 mg). In soluble fraction, although 80-kDa form of calpain 1 was significantly increased in IR+H group compared to CON and HU group (HU; 102, IR; 132 and IR+H; 147% of CON), the autolyzed form of IR+H group was lower than CON group. Moreover, autolyzed form of calpain 2 (HU; 267, IR; 236 and IR+H; 105% of CON) and ubiquitinated protein (HU; 164, IR; 140 and IR+H; 112% of CON) in particulate fraction was significantly increased in HU group, but IR+H group prevented the increase. There were no significant changes in the expression of Caspase-3 and the phosphorylation of Akt, mTOR, S6K1 and eIF-4E.
**Conclusion:** The combination of heat stress and intermittent weight-bearingcan attenuate a decline of soleus muscle mass through the prevention of calpain autolysis and protein ubiquitination independently of Akt/mTOR pathway.

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## Changes of the Health-related Fitness Status of the Hungarian University Students in the Last Decades

**Keywords**: physical fitness, university students, Eurofit

**Background**: Many publications reported a negative trend in the performance of college/university students in the recent years[1,2]. Extrapolating this trend, serious social problems can be expected in terms of the health status in the adult Hungarian population[3].
**Aim**: The aim of this study was (i) to test the physical fitness of undergraduate students, and (ii) to compare the results to the data of the representative nation-wide research[4] (N=8345) carried out by MEFS[4] in 1995 focusing on the changes in the last fifteen years.
**Results:** A total of 432 student volunteers (mean age: 21.19 ± 2.19 years) with a mean body mass index of 22.41 ± 4.09 kg/m$^2$ have performed 9 tests of Eurofit Fitness Test Battery. Based on the anthropometric results compared with the data by MEFS the mean height and weight are greater by either the men or women (181.2±6.41cm, 78.27±16.02 kg and 168.1±6.86 cm, 61.58±10.43 kg, respectively), as a consequence of the secular trend, while the body fat percentages (BF%, by OMRON BF300 bioimpedance analyzer, Durnin and Womersley) are less in both sexes (16.16±6.51% and 25.31±5.77%). Data obtained in the Eurofit tests show a performance degradation in terms of general balance (men: 7.91±6.05, women: 8.47±6.29), speed of limb movement (11.12±1.52s, 12.28±1.93s), explosive strength (218.76±31.46, 174.81±32.9cm), abdominal muscular endurance (23.93±4.27, 19.01±4.06), running speed (19.55±2.16s, 21.76±2.69s) and cardiorespiratory endurance (46.72±7.79, 39.05±7.24 ml/kg/min). Greater handgrip strength (52.99±12.01kg, 34.58±11.6kg) and functional arm strength (45.33±215s, 23.75±19.6 s) were observed by men and women than in 1995.
**Conclusion:** The different anthropometric data (age, height, weight, BF%) show significant correlation ($p<0,001$) with the results in the Eurofit items. The better performance in the two Eurofit tests could be explained with the observed anthropometric changes between the successive generations (handgrip strength: $R^2=0,829$ $p<0,001$; functional arm strength: $R^2=0,511$ $p<0,001$). However the observed general deterioration in the performance is probably the consequence of a relative lack of the regular exercise in this population, since greater weight and height just as the less BF% show positive correlation ($p<0,001$) with the efficiency in this Eurofit test items. Even though the youth have bigger bone- and muscle mass and normal BF%, their performance is greatly worse than fifteen years ago.

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**Comparison of the IPAQ-short Form, Borg Scale and Physical Activity in Older Norwegian Adults**

**Keywords:** measures, older adults, physical activity

**Background:** Undertaking physical activity is one of the way to stay independent when becoming older. As the number of older people is growing rapidly it is very important to find the best form of physical activity that will enable them to cope with all the activities of daily living. There are many methods to evaluate level of physical activity. The subjective answers of elderly are especially affected by state of their health, mood, depression or fear (Rikli, 2000). What is more the review done by Shephard (2003) showed that people tend to overestimate the amount of physical activity that they actually did. That is why activity monitors are becoming more and more popular in the research.
**Material:** In the study participated 12 people (10 women, 2 men) at the age of 73,2 ± 4,6 years old. All of them were taking part in gymnastic classes twice a week for 60 minutes in a project called 'GodtVoksne'. The measures took place at the Norwegian School of Sport Sciences in Oslo.
**Methods:** The study used IDEEA device (Intelligent Device for Energy Expenditure and Activity) and a pulse recorder (Polar). In addition, eachperson immediately after class evaluated its intensity with the 20 points Borg Scale. All the people were also asked to fill in the IPAQ- short form questionnaire about the activity undertaken during last 7 days.
**Results:** The parameters measured with IDEEA were work and energy expenditure. Mean work done during exercises was 2,3 ± 0,74 KJ/min and mean energy expenditure for the group was 3,36 ± 0,9 kcal/min. Mean value of heart rate was 105,1 ± 15,41 beats/min. As for the Borg Scale all of the people who took part in research evaluate the classes as hard and somewhat hard (14 ± 1). As for the IPAQ the answers were very varied. All the respondents claimed to do vigorous activity during last 7 days. The mean value of this intensity was 32,7 ± 49,4 min/day. Only half of the group claimed to do moderate physical activity. Mean value for them was 23,6 ± 41,1 min/day. Respondents claimed to spend 99,8 ± 83,6 min/day on walking. As for the sitting mean value was 32,1 ± 24,3 min/day.
**Summary:** The values of Spearman coefficient correlation showed reverse correlation between subjective measures which means that the person who claimed that the training was harder had lower level of physical fitness in IPAQ. Also negative values of correlation were observed between age and maximum, mean and total work as well as total and mean energy expenditure. On the other hand, positive correlation was observed for body weight and height with all those parameters. The study showed no correlation between subjective and objective tools to measure physical activity in older people.

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## Nuclear Respiratory Factor-1, and Peroxisome Proliferator-activated Receptor Gamma Coactivator Alpha-1 could be Responsible to Different Response to Aerobic Training on Rats

**Keywords:** mitochondrial biogenesis, exercise training, skeletal muscle

**Introduction:** It is well-known everybody adapted with different magnitude to the same exercise stimuli. Twin-studies have shown that trainability is partly dependent on genetics. We studied rats which have been shown to react differently to aerobic exercise training. Mitochondrial biogenesis in the skeletal muscle is obligatory to cope with the metabolic challenge given by physical exercise. Therefore, we were interested in the effect of exercise in the mitochondrial biogenesis in training sensitive and training resistance rats.
**Hypothesis:** Our hypothesis is that low response and high response to training rats adapted a different way to the same aerobic exercise training and the effect of exercise training decreasing the gap between the low response to training control and high response to training exercise groups.
**Methods:** Twenty seven selective breeding $11^{th}$ generation for low response to training (LRT) and high response to training (HRT) rats were training for 3 months at the 70% of $VO_{2max}$. Animals were divided into 4 groups: low response control (LRTC) and exercise trained (LRTE) and high response control (HRTC) and exercise trained (HRTE). Treadmill training duration was constant (30 min) with the starting intensity of 15 m/min, then reaching 25m/min on the last weeks. We have measured some physiological parameters, such as $VO_{2max}$, gripping force, running distance during $VO_{2max}$ measurements, etc. Moreover, we have measured the content/activity of some of the key proteins that are playing a key role in mitochondrial biogenesis. Statistical significance was assessed by one-way ANOVA. The significance level was set at $p<0.05$.
**Results:** The maximal oxygen uptake and the running distance were significantly higher in both of the exercise groups and training sensitive rats had more massive increase in $VO_{2max}$. The level of nuclear respiratory factor-1 (NRF-1) and peroxisome proliferator-activated receptor gamma coactivator alpha-1 (PGC-1α) decreased in LRTE group but increased in HRTE group compared to control groups by effect of exercise. Content of mitochondrial transcription factor 1 changed similarly to NRF-1 and PGC-1. Exercise resulted in decreased level of fusion protein, Mfn1, while increased the level of fission protein, Fis1. We measured significant increasing the levels of peroxisome proliferator-activated receptor γ in LRTC and HRTE groups, indicating a shift in basic metabolic processes.
**Discussion:** Our data suggest that one of the reasons of different response to aerobic exercise training is due to the different activation of proteins that are involved in the biogenesis of mitochondria. We aim to identify more proteins that are responsible to different adaptation to aerobic exercise training.

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## Effects of Exercise Training on Cognitive Deficits and Biological Alterations in an APP/PSN1 Transgenic Mice Model for Alzheimer´s Disease

**Keywords:** training, antioxidant, β-amyloid.

**Background:** The beneficial effects of physical exercise, in both the treatment and the prevention of several diseases, have been extensively demonstrated. The most common dementia, Alzheimer´s disease (AD), is a disorder in which exercise induces significant improvement at physiopathological and cognitive levels. The APPswe,PSEN1dE9 transgenic mice is a model for AD that shows an increase in brain β-amyloid (βA) deposits, synaptic loss, alterations in oxidative stress and neurotrophic factors, and cognitive and memory deficits. *M*oderate-intensity exercise produces benefits in the brain at the cellular and molecular levels.
**Aim:** The aim of our study was to determine the beneficial effects of exercise training, at the functional and molecular level, in a double transgenic mice model for Alzheimer´s disease.
**Methods:** Seventeen 10 months old female mice were randomly divided into four experimental groups: wild type rested [WT-R], WT exercised [WT-E], 2xTg rested [2xTg-R], and 2xTg exercised [2xTg-E]. For the training protocol we followed a combination of a voluntary wheel running (free access 24h) and forced treadmill running (3d/wk during 12 weeks). After the training period we performed different physical (maximal aerobic velocity [MAV], grip-strength [GS]) and cognitive tests (object recognition [OR], open field [OF]). Moreover we studied *βA* levels, oxidative stress, neurotrophic status and mitochondriogenesis in brain cortex and hippocampus.
**Results:** Daily voluntary running distance was significantly higher in the 2xTg mice when compared with the WT animals ($p<0.001$). The trained groups showed better performance in the physical tests in MAV ($p<0.05$) and GS ($p<0.01$). We found a lower exploratory activity in the 2xTg mice when compared to WT ($p<0.05$). The exercise training reverted these alterations ($p<0.05$) and the memory impairment found in the 2xTg-R ($p<0.05$).
We found an induction in the brain cortex antioxidant enzymes catalase ($p<0.05$) and glutathione peroxidase ($p<0.01$) in the 2xTg when compared to the WT animals. Moreover, 2xTg-E showed higher levels of catalase than the 2xTg-R ($p<0.05$). Brain cortex protein carbonylation was lower in the 2xTg *vs.* WT ($p<0.01$) while mitochondriogenesis was not affected in any experimental group. Brain-derived neurotrophic factor levels were higher in hippocampus of WT *vs.* 2xTg but not in cortex. Training decreased hippocampal levels of βA in the 2xTg mice ($p<0.05$) while WT does not show βA.
**Conclusions:** Exercise training induced cognitive and behavioral benefits in the memory and exploration capacity levels in our model. The protein carbonylation decreased while the antioxidant defence increased in the trangenic mice being higher in those trained. Neurotrophic status is inverse to the content of βA in the brain.

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**Differences in the Mitochondrial Biogenesis of Exercised Trained and Resveratrol Treated Selectively Bred Low and High Running Capacity Rats**

**Keywords:** genetics, exercise, resveratrol

There is strong statistical association between low aerobic exercise capacity and increased risk for development of complex diseases that remains mechanistically unresolved. Low capacity runner (LCR) and high capacity runner (HCR) rats have been developed by divergent artificial selection for treadmill endurance running capacity as a model system to explore the aerobic biology-disease connection. Here we test if 12 weeks of treadmill exercise training and/or resveratrol can retrieve the low running performance of the LCR and enhance performance in HCR. Training increased running performance in both strains but resveratrol alone did not change running performance in either strain. Resveratrol degraded running performance in trained LCR and increased running performance in trained HCR. Resveratrol increased performance on a test of forearm gripping strength in HCR but had no effect in LCR. Activities of 15 factors that regulate mitochondrial biogenesis and differentiation from gastrocnemius muscle were interrogated for explanation. AMPK, SIRT1, and TFAM increased in HCR and decreased in LCR by resveratrol. Mitochondrial fission and fusion levels were significantly lower in LCR rats and increased to levels not different from HCR by exercise and resveratrol. Resveratrol increased the activity of PNPase in both control and trained LCR but decreased PNPase for both of these conditions in HCR. mtDNA was lower in LCR compared to HCR, and was increased by resveratrol given alone or in combination with training HCR group. Thus, it appears that ergogenic responses to resveratrol can be influenced differentially by heritable determinants of exercise performance.

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**Current Physical Activity and Physical Inactivity Were Not Associated with Cognitive Status in Japanese Community-Dwelling Older Adults**

**Keywords:** dementia; cognitive decline; older population; accelerometer; device-based measurement; neuropsychological screening

**Background:** Daily physical activity has been shown to prevent or delay clinical cognitive decline often emerged in the aging process[1]. However, because most relevant studies have monitored physical activity using questionnaires and other subjective measures, the validity of previous findings is somewhat limited. Alternatively, physical inactivity, such as bed rest and TV viewing, is starting to be considered as an independent risk factor deteriorating cognitive functioning[2], but this has never been examinedin community-based older population. Therefore, the purpose of this cross-sectional study was to determine associations of physical activity and physical inactivity with cognitive statusin Japanese community-dwelling older individuals using a device-based objective measure.
**Methods:** As part of a prospective cohort study in a town located in the western part of Japan, 2,085 participants aged 65 years or older (mean74 years; 42.1% being male) were involved in this study from May to August 2011. Physical activity (PA) and physical inactivity (PI) were measured using a tri-axial accelerometer device[3] (HJA-350IT; Omron Healthcare, Inc., Kyoto, Japan) in up to 7 daysand quantified as METs·hour/day for activities with ≥3.0 METs of intensity (PA) and minutes/day for activities with ≤1.4 METsof intensity(PI), respectively. Cognitive status was determined as a score of the Montreal Cognitive Assessment[4] (MoCA; 0 to 30 points) using a standardized procedure. Multiple linear regression analysiswas performed to examine associations of PA and PI with MoCAin both sexes together.
**Results:** After adjusting for age, sex, years of formal education, body mass index, wearing time of the device, and physical fitness indices including hand-grip strength, leg strength, gait speed, one-leg standing time, and five-times-sit-to-stand time, PA (median 2.2; interquartile range2.6 in METs·hour/day) and PI (mean 331; standard deviation or SD105 inminutes/day) were not associated with MoCA(mean 21.7;SD 3.9 in points), respectively ($p$=.48for PA and .16 for PI)
**Conclusions:** This study demonstrated that current physical activity and physical inactivity were not associated with cognitive status in Japanese community-dwelling older adults.
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## Salivary Lactate Influencing Factors: Effects of the Sympathetic Nervous System and Dehydration during Physical Activity

**Keywords:** salivary lactate, exercise, endurance athletes, RR-variability

**Background:** Numerous publications have reported relationships between pre- or post-exercise salivary and blood lactate (BL) level (Mendez et al., 1976; Chicharro et al, 2006; Santos et al, 2006) as an important and easy measure of training efficiency.
**Aim:** The purpose of this study was (i) to investigate the correlation between BL and salivary lactate (SL) concentration in athlete (SG) and non-athlete (NG) subjects after maximal exercise, and (ii) to determine the possible influence of RR-variability and total body water on SL.
**Material and methods:** Sixteen volunteers (8 endurance athletes, 8 non-athletes; mean age: 22.80±3.18 yrs) performed a maximal treadmill test (Astrand and Ryhming, 1954). Before and after (1, 4, 8, 12, 15, 20 min), then exercise saliva and blood samples were collected and analyzed. Spectrophotometric analyses were applied to assess SL content by using LDH to oxidize lactate in the presence of NAD+ to pyruvate by monitoring NAD+ reduction at 340 nm (Phypers and Pierce, 2006). BL concentration was determined from fingertips with a Lactate Scout Analyzer (Senslab).
R-R interval was registered according to Baynard and his coworkers (2004) with RS-800 HR monitors and an electrode transmitter belt for measuring the changes in sympato-vagal interaction. Anthropometric characteristics, body composition (total body water –TBW-, body fat percent) and physiological parameters (RR-variability, HR) were assessed before the test.
**Results:** In SG we registered two SL peaks at different time points (SG: 1 min and 8 min, NG: 4 min and 12 min) in NG group we found high individual differences among subjects. Pearson correlation analyses between BL and SL concentration showed significant correlation in both groups (in SG r=0.511; in NG r=0.385). We noted relationships between several measured parameters (SL - TBW, SL - RR-variability, maximal SL - maximal heart rate during exercise, SL and BL -1 min after exercise test).
**Discussion:** According to our data hydration level and the status of the autonomic nervous system modify salivary flow rate after strenuous exercise thus lactate level measured in saliva.

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**The Characteristics of Methodological Approach to Physical Education of Senior School Girls with Different Types of Vegetal Regulation**

**Keywords:** physical education, special medical group, types of vegetal regulation

**The aim** of the research is to work out and experimentally prove the efficiency of methodological approach to physical education of senior school girls with different types of vegetal regulation.
120 senior school girls of special medical group were examined.
**The methods:** analyzing the medical cards; A.M. Veins' "Question list to diagnose the symptoms of vegetal changes"; cardiointervalography; investigation of cardiorespiratory system: heart rate, arterial tension, spirometry, breathing rate, timed expiratory and inspiratory capacity; physical fitness tests: angled position from the sitting, hand dynamometry, Romberg test; physical efficiency - Rufie test.
28 senior school girls of the control group were diagnosed with vagotonic type, 22 - with eutonic and 10 - sympathicotonic type, as well as 30, 20 and 10 girls proportionally were diagnosed with those types in the experimental group. The methodological approach considering the vegetal regulation type, as well as functional condition and physical fitness, was offered to students of the experimental group. The control group was training according to typical programme. A lesson for the experimental group included: beginning, preparative part, main part and final. For students with vagotonic type: beginning included breathing exercises, preparative part - basic aerobic steps, breathing exercises, main part – fitball-pilates and breathing with lengthened expiration exercises, final – breathing, flexibility and relaxation exercises. For sympathicotonic type the beginning, preparative and final parts were the same, while the main part included fitball-aerobics, breath-holding and relaxation exercises. For eutonic type: breathing with lengthen expiration, breath-holding and fitball – pilates exercises.
**The results:** The final materials of the experimental group ($p<0,05$): heart rating lowering occurred in vagotonic type – by 11,2 %, sympathicotonic – by 17,8 %, and in eutonic type – by 11,5 %. Increase of systolic pressure in vagotonic type was 12,6 %, eutonic type – 4,6 %. Lung capacity increased by 39,2 % in vagotonic, in sympathicotonic – by 24,8 % and by 27,5 % in eutonic type. Timed inspiratory capacity increased by 26,7 % in vagotonic, 33,7 % - sympathicotonic, and 42,0 % - eutonic type. The increase of hand dynamometry in vagotonic type was 35,1 %, sympathicotonic – 30,8 %, eutonic type – 21,9 %. The data of Romberg test increased by 23,8 % in vagotonic, 25,8 % in sympathicotonic, and 8,2 % - eutonic type. Increase was observed in flexibility test: in vagotonic – 66,4 %, sympathicotonic – 28,4 %, eutonic type – 27,7 %. Students' index of physical efficiency had changed significantly. The data of control group are lower than those of the experimental group.
As a result of integrating special exercises into physical education, positive dynamics of functional condition, physical fitness and efficiency has been detected. Peculiarities of the types' adaptation are the main cause of the differences in the results.

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**Effects of Life-long Physical Exercise on Brain Ageing**

**Introduction:** Accumulating evidenceshows that long-term physical exercise may interfere with the symptoms of brain aging in both normal and pathological conditions. The aim of present experiments was to study how long term regular and moderate intensity physical exercise prevent the functional decline during brain aging in the light of behavioural, cellular and molecular mechanisms of action.
**Methodology:** In one group of male rats, the moderate intensity treadmill exercise started in the young age of 3-months and the training was continuous until the age of 24 months.. The cognitive behaviour of trained and control aged rats were measured at the end of exercise training: open-field activity (OF), novel object recognition (NOR) suitable to measure attention, and Morris water maze spatial learning tests were employed.Biochemical and morphological analyses were performed in the hippocampus at the conclusion of the experiments. The phosphorylation of Akt (protein kinase B), and that of AMP kinase (AMPK), brain derived neurotrophic factor (BDNF), acetylcholine synthetizing enzyme (ChAT), and glucose transporter 1 (Glut1) levels were measured with Western blot technique. Morphologically immune-cytochemical technique was used to measure the cholinergic (ChAT positive) fibre, and the Glut1 positive capillary densities, and the BDNF expression in the hippocampus.
**Results:** The results showed that contrary to the 6 months long exercise training, the life-long training (LLT) increased attention (NOR) in the age of 24 months. The Morris water maze learning was also positively influenced by the LLT.The life-long training markedly increased pAkt and pAMPK levels, as well as Glut1 and BDNF concentrations. The ChAT positive cholinergic fibre density, capillary Glut1 and neuronal BDNF levels were also increased by the LLT.
**Conclusions:** It was concluded that the life-long exercise is much more powerful for interfering with the age related decline in cognitive and neurobiological markers in the brain of aged rats as compared to the long-term moderate exercise started only at the beginning of aging.

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**Morph-functional Asymmetry of Elite Female Basketball Players**

**Keywords:** asymmetry morph-functional, body composition, Vienna Test System

A high degree of morphological asymmetry can lead to injury and provoke the functional asymmetry, which cause a significant reduction in the effectiveness of the player. The aim of this study was to evaluate the degree of morph-functional asymmetry and body composition of the upper limbs of professional basketball players.
A group of 17 highly qualified Polish basketball players aged 17-19 playing in the School of Sports Championship were studied. The average age was 18.11±0.8, the training experience was 6.83±1.75 years. All of the girls had 10 training sessions per week. To study the functional asymmetry, Peripheral Perception Test (PP) and Reaction Time Test (RT) from Vienna Test System were used. The assessment of the degree of morphological asymmetry was based on the results of body composition including a segmental analysis of the right and left upper limbs. For this purpose Segmental Body Composition Analyzer "Tania BC-418" (Japan) was used. The STATISTICA 10th statistical software was employed to process the tests results. Normality of distribution was investigated by using Shapiro-Wilk test. To compare the average results of (the) measurements on both sides of the body, the Wilcoxon sequence pairs test was used.
The analysis of the results of measurement of body composition showed differences in the FAT [%], FAT MASS [kg] and FFM [kg]. Average reaction times (RT) and motor reaction times (MRT) were similar: 222.22±23.67 [ms] and 96.39±42.86 [ms] for the right and 219.33±30.41 [ms] and 98.67±30.35 [ms] for the left hand. The total field of view of the participants was 174.61°: 86.47° for the left eye and 88.14° for the right eye. Moreover, when the stimulus appeared on the right side of the field of view, participants gave more correct answers, and the reaction was faster.
A statistically significant asymmetry in the composition of the upper limbs and laterality of the right eye was observed as well. Larger viewing angle can cause a faster and a more precise response to a signal appearing on the right side of the field of view. No functional dominance was observed in the case of hand tests. The reaction time and the motor reaction time did not differ significantly, despite the declared right-handedness among girls. A high degree of symmetry of the hands is the result of specialized training focused on reduction of the differences in their efficiency. The study confirms the idea that basketball is a discipline which forms the players comprehensively in the field of functional asymmetry.

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## Comparative Analysis of Morphofunctional Features of Athletes Specializing in Speed Skating and Short-track

**Keywords:** speed skating, short-track, morphofunctional features

**The aim** of the paper is to study and compare variability of individual morphofunctional features of athletes who practice speed skating and short-track.
**The object of research:** anthropometric data of 91 athletes from 7 to 16 years of age, specializing in speed skating and short-track sports, investigated in 2011.
In our work we compare such indicators of speed skaters and short-track skaters as: total body dimensions, body mass index, skinfolds thickness (in 9 points), index of leg length to body length,, arm length to body length, biacromial diameter to body length, pelvic diameter to body length, pelvic width to shoulder width and indicators of hand grip strength.
The structure of the speed skates is a complicated mechanism with constant fastening of its edge to a boot in one point, the second point being mobile as in skiing, which is defines as "claps". The blade in short-track skates is fixed to a boot in two points and is shifted in the direction of the left turn. There are also distinctions in the sizes of a rink:the athlete, who practices short-track, spends 90 % of the time in the turn because of the small size of the rink, at speed skating the basic movement is made in long straight lines.
In L.L.Golovina's works it has been revealed that speed skaters are characterized by lower fat accumulation, narrow shoulders, long legs and slight stoop in body posture [1]. The posture of the speed skater is characterized by a sharp trunk inclination and a flexion of legs in coxofemoral and knee joints. The maintenance of this posture demands big static endurance of extensor muscles of trunk and legs [2]. Specific features in short-track techniques include serious efforts to overcome a centrifugal force, deep inclination of an athlete's body in run on turns, very low body set [3]. In the middle of 1990's the skates were changed to completely new "revolutionary" clap skates or slapskates, which cardinally differed from the traditional ones and essentially improved the results. In modern scientific literature morphofunctional characteristics of athletes practicing short-track are practically not studied. Comparative research defines distinction and similarity of morphofunctional indicators of athletes practicing both sports.
**Conclusion:** Though statistically significant differences between the two groups of athletes are not revealed, there is a tendency towards higher fat accumulation in short-track skaters, practically in all skinfolds. Further research with larger sample is needed, as well as a comparison of experimental data to control group of non-athletes.

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**The Effect of Having a Regular Sporting Activity on to the Beginning Period of the Maternity**

**Keywords:** sporting habits, frequency of backache, young mother

**Background:** In post-industrial countries the inactive lifestyle results in five groups of illnesses.We are focusing on one of these: the backache. That's why we are emphasizing the sport positive effect on it. (Somhegyi, 2002) The experience of childhood influnces in the adulthood the willingness to engage in physical activity.(Olvasztóné et al, 2007; Törökné, 2007)
But how far does the need for the regular sport-activity hold out and how does it influence the backache?
**Methods:** To connect these 2 facts, the beginning period of maternity was chosen: The researched young mothers live in the outskirts of Budapest and most of them (67,8% and 86,7%) are well-educated. Although based on these datas they should be rated into the most active group in Hungary, among this group they spend very little time with sport.(Gál, 2008) Their sporting habits before and after pregnancy, the method of birthing and one of their frequent problem, the backache during and after the pregnancy were examined. (Toldy, 2009)
30 young mothers (33,25 years on the average)who were active in their early years(in farther:AM) and later and 59 (34 years on the average) who were not active (NAM) were compared with questionnaire within 6 months to 3 years following birth. For the data-working up SPSS17 descriptive statistics was used.
**Results:** Before the pregnancy 76,6% of AM and 32,2% of NAM did some kind of sport daily or three times a week.
Normal pregnancy have 90% of the AM and 69,5% of the NAM. Endangered-pregnancy had: 3,3% of the AM, 16,9% of the NAM. Never had backache 26,7% of the AM and 13,6% of the NAM. During this time 57,6% of the NAM, 30% of the AM did no kind of sport.
Birth: 48,3% of the AM, 29,3% of the NAM gave birth with caesarean section.
After the birth 37,3% of the NAM and 23,3% of the AM have backache several times.Sporting habits:The 36,7% of the AM continue the sport-movements 2-3 months after the birth, 10% of them as a competitor. 29,3% of the NAM continue the regular sport, 40,7% of them do not spend any time with sport.
**Summary:** As mother, AM are still activer than NAM and have less backache during and after the pregnancy.