

ORAL PRESENTATIONS

PHYSICAL ACTIVITY LEVELS OF MEDICAL STUDENTS

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Introduction: Physical activity has been reported to have an important role in both emotional and environmental adaptations. The purpose of this study was to assess the physical activity levels in medical students.

Methods: Sixty-nine medical students of fourth year of I.A. University Najaf Abad Branch aged 24.1 ± 1.4 (M $\pm$ -SE) completed the Persian version of International Physical Activity Questionnaire, during two weeks in October 2003. Data including age, sex, frequency and amount of moderates and severe physical activity, walking and sitting periods during last seven days were recorded.

Results: Number of severe and moderate physical activity and walking days were 0.8 ± 0.19 (M $\pm$ -SEM), 1.43 ± 0.25 and 5.6 ± 0.22 days respectively.

Duration of severe, moderate physical activity, walking and sitting was 82.2 ± 10.0 , 49.3 ± 8.6 , 93 ± 14.4 and 475.2 ± 24.5 minutes respectively.

Conclusions: The results of this study shows low level of physical activity in the lifestyle among the students participated in this study. Proper programs are necessary for modifying the activity level of these students.

PHYSICAL ACTIVITY AFTER KIDNEY TRANSPLANTATION

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Introduction: Physical activity level of patients after kidney transplantation is an important component of their quality of life. Physical activity of these patients is reported to be depended on transplantation and its pre and post conditions. But still there is lack of studies determining the factors, which have influence on physical activity after kidney transplant (KT) patients.

Methods: An extensive Medline search was carried out covering the period from 1989 to January 2004. Medline was searched through Medical Subject Heading data base. Physical Activity, Motor Activity and Kidney Transplantation have been selected as main keywords. This search induced human subjects and articles in all languages. A total of 21 articles were selected for study.

Results and discussion: These articles studies the physical activity status, exercise capacity and their importance in kidney transplant patients as well as the factors that influences exercise capacity in KT patients and reveal some recommendations for improving their physical activity and physical capacity.

The reviewed studies indicated that KT patient have diminished tolerance to exercise and physical activity that may be due to pre KT status, post KT obesity or muscle damage due to glucocortycoid therapy. These articles also reveal that Physical activity may reduce bone loss, on the other hand may improve oxygen consumption, heart rate, maximal ventilation rate, blood concentration, muscle strength and may correct the hyperlipidemia in KT patients. The last finding required more investigations. It is suggested to elaborate special training program for KT.

Total hemoglobin has been reported as main factor that influences positively exercise capacity in KT patients. Risk of hypertension changes during exercise, especially in the patients who had received vasopressor medications such as Cilospirin, and patients with cardiovascular risk factors should be taken into consideration.

In conclusion strenuous physical activity should be undertaken with caution.

A SURVEY OF BODY FAT PERCENTAGE (%BF) IN ATHLETES AND COMPARISON WITH INTERNATIONAL STANDARDS

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Introduction: One of the main goal for the athletes in many fields of sports is maintenance high lean body mass and low fat body content. The body needs a specified amount of fat mass for the natural functions, however the extra fat mass has the destructive impact on physical performance. In this research, the amount of the fat mass of the athletes participated in the medical university matches were measured and then compared with the international standards.

Methods: The measurements were made on 330 males and 270 females participated in the five medical university matches. The main focus in this research was to compare fat content between sexes. Thus a sample of 30 athletes was selected in each group of them. At first, the weight and height of these athletes were measured. Then the body fat mass was measured using the bioelectric impedance method. The table below shows the data which was gathered in this research:

Conclusion:

- Body fat of male athletes in Wrestling, Basketball, Swimming, Shooting & Volleyball were higher than international standards.
- Body fat mass of male athletes in Taekwon-do, Track & Field, and Chess, Soccer were in the range of international standards.
- Body fat mass of male athletes in Tennis, and Badminton were lower than international standards.
- Body fat mass of female athletes in shooting, Tennis, Track and Field Fitness were higher than international standard.
- Body fat mass of female athletes in Chess, Volleyball, Swimming, and Badminton were in the limits of international standards.
- Body fat mass of female athlete in Basketball was lower than international standards.

Suggestions: In this research the body fat mass of a sample of athletes was measured. The next step is to find out a relation between the body fat mass and the kind of sport, strips, genetic, etc. By this way a complete nutritional program can be prepared for the athletes.

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IT IN FINSWIMMING SERVING HEALTH AND EFFICIENCY FINSWIMMING

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It has become indispensable to use IT in finswimming besides continuously developing sports science. It has a significant role in the hydrodynamic design of fins and other equipment (bottle, snorkel), in biomechanical optimization of the trajectories of movement, performance diagnostics, planning, cross-checking and evaluating trainings, in movement analysis, setting the hardness of the fins, education, communication – of course – data acquisition and coach training.

Design of fins: Modern fin production is based on the computer-aided design of fins. The design of the fin plate and fin head is created with design programs on computer, although practical experience is essential, as well, and individual differences should also be taken into consideration. The first step of producing a competition fin for top

sportsmen/sportswomen is to determine the dimensions of the fin that fits his/her body size and physical condition. The Hungarian world championship and world record holder Norbert Savanya and Péter Vinkler enter competitions with unique fins, while in the other countries sportsmen/sportswomen use factory-made fins (e.g. Italy, Germany).

Performance analysis: The heart rate monitors produced by the Finnish POLAR company since 1982 are the best in their category. The results of the state-of-the-art products can be downloaded to computer and this makes it possible to carry out analyses according to several aspects.

Its target zone settings mean a great help to the sportsmen/sportswomen and the coaches already during trainings. With its help, not only a training diary but also a sophisticated electronic training diary can be kept.

Biomechanical motion analysis: During motion analysis with the help of an 18-point body model 3D kinematical parameters are obtained on the basis of which the motion sample and fin motion (the occasional bottle) became easy to be analyzed. Analysis is completed with APAS video image processing and motion analyzer system (developed by Ariel Life System Incorporated, San Diego, USA). We are looking for answers to questions about the health protection of sportsmen/sportswomen and the minimization of the occurrence of injuries on the basis of data obtained in the above-mentioned way. A lot of sportsmen/sportswomen have physical problems on several parts of their body. It is not surprising that the number of this problem proportionally increases with the number of years spent in training. With the help of computer analysis prevention and joint protection can be supported, which is a token of a long sports life and efficiency.

Communication: The role of communication, information acquisition and distribution is enormous in finswimming just like in other sports. The World Wide Web, hence the web sites and electronic mailing are indispensable means of obtaining up-to-date knowledge and being able to plan the trainings in a sophisticated, scientific way. The application of multimedia is a great help in teaching motion structure of finswimming and in understanding the proper technical execution of this sport. Digital technology, laptops and different software (such as FOODAlyzer® sport-diet planner and analyzer) can also be realized at the pool during competitions, trainings and training camps.

THE ASSESSMENT OF THE NUTRITIONAL STATUS OF FEMALE BASKETBALL PLAYERS AT VARIOUS LEVELS OF PERFORMANCE

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The aim of the study was to assess the nutritional status of female basketball players at various levels of performance.

Materials and methods: Anthropometrical measurements (body weight, height, waist and hips girths, biceps, triceps, subscapular, knee and abdominal skinfold thicknesses), biochemical indices including serum protein, glucose, lipids, minerals, urine and blood cell count were assessed in 39 female basketball players. The group comprised: 14 basketball players from a second division team, 11 students from a university basketball team and 14 university students attending basketball training obligatorily. The study was conducted at the end of academic year which coincided with the end of the basketball season. The statistical analysis was carried out by means of the SPSS 11.5 PL for Windows computer programme using the one way ANOVA and Tukey's post hoc procedures.

Results: The level of performance had statistically significant impact on: height, subscapular and abdominal skinfold thicknesses, HDL cholesterol, apolipoprotein A and apolipoprotein B levels, mean corpuscular volume and the number of players meeting the norms for the level of HDL cholesterol and haematocrit. There was no statistical impact of the level of performance on the minerals and urine.

The players from a second division team had the highest total cholesterol level and the lowest HDL cholesterol, apolipoprotein A and apolipoprotein B levels. In comparison with the players at lower levels of performance, more second division players met the norms for the levels of red blood cells, haemoglobin and haematocrit.

In the university students attending basketball training obligatorily total cholesterol and triglyceride levels were the lowest and serum iron level was the highest.

Conclusions: The level of performance had significant impact only on several indices of nutritional status of female basketball players. No interrelation between the level of performance and nutritional status was observed. The nutritional status of the majority of the female basketball players was satisfactory. In order to improve their nutritional status more attention of both the players and the coaches should be drawn to the correlation between nutritional habits, nutritional status and performance.

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EFFECTS OF NOS INHIBITOR (L-NAME) ON EXERCISE-INDUCED PRO- AND ANTI-OXIDANT PROCESSES IN THE BLOOD PLASMA OF RATS SUBJECTED TO DIFFERENT TRAINING MODELS

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The aim of the study was to elucidate the effect(s) of nitric oxide synthase (NOS) inhibitor (N^G-nitro-L-arginine methyl ester, L-NAME) on exercise-induced pro- and anti-oxidant processes in rats subjected to different training models.

Material and methods: In the present study, male Wistar rats were used, and they were divided into 4 experimental groups. In the group 1, the animals were left untrained and were used as controls. In the groups 2 and 3, the animals were subjected to continuous training model on a treadmill at speed of 10 m/min and 22 m/min, respectively. The animals were daily trained for 60 minutes (5 day/week) for 3 weeks. In the group 4, the rats were subjected to the interval training model using a treadmill (30 m/min), and they were trained for 60 minutes per day (10 x 2 minutes following 4 minutes of rest) for 3 weeks (5 days/week). On the last day of the training period, half of the randomly selected rats from each group (n=8) were treated *per os* with either a single dose of L-NAME (30 mg/kg b.w.) or normal saline (control), and they were subjected to exhaustive treadmill exercise (22 m/min; 15°) two hours later. The animals were killed by cervical dislocation at 3 hours post-exhaustive exercise, and their blood was analysed. Thiobarbituric acid reactive substances (TBARS) as a biomarker of lipid peroxidation and total anti-oxidant status (TAS) in the blood plasma were assayed to calculate the ratio of TBARS/TAS (TB/TA), a novel indicator of pro-/anti-oxidative balance in both resting- and exercise-trained animals.

Results and conclusions: Pretreatment of animals with L-NAME decreased (vs. saline control) the TB/TA value in the untrained rats, which have been subjected to exhaustive exercise, showing a potent role of nitric oxide (NO) from the NOS origin in the exercise-induced lipid peroxidation. Similar effect(s) was observed in animals subjected to the interval training model. In contrast, the continuous training (independently of its intensity) abolished L-NAME-related effects. In the present study the NOS inhibitor (L-NAME) was shown to decrease TB/TA ratios, lowering lipid peroxidation only in untrained rats, with decreased TBARS, whereas in interval-trained animals it was connected also with increased TAS level.

RADIOLOGICAL EVALUATION OF THE LUMBOSACRAL SPINE IN ADOLESCENTS WITH LOW BACK PAIN

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The conditions of back pain have been extensively discussed in the literature with respect to its etiology and development. Radiological evaluation of the lumbosacral spine in adolescent patients with back pain put more attention on the problems concerning formation of some geometrical parameters in this region of the spine.

Our own observations and the data found in the literature showed that configuration of lumbosacral spine in sagittal plane in adolescents was the essential pathomechanical factor in the development of back pain. The aim of this study was to estimate and find possible correlations between geometrical parameters in sagittal plane of the spine in adolescent patients with back pain.

ARTERIAL OXYGEN PRESSURE AND FAT EMBOLI

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Introduction: Fat emboli (FE) is a serious complication in long bone fractures. Arterial oxygen pressure (PaO_2) has been reported as diagnostic marker of FE. PaO_2 disturbances before clinical manifestation of FE or may be the only finding in slighter form of FE. Despite the diagnostic and prognostic value of PaO_2 determination in FE, a lot of physician delay this test until the clinical manifestation of FE appears. In this stage, the condition of patient and its prognosis may be insufficient.

This study was conducted to determine the frequency of FE after lower leg long bone fractures, PaO_2 disturbances and clinical manifestations of FE.

Methods: This cross sectional study was undertaken during 2002-2004. Two thousand sixty two patients (185 male and 77 female) hospitalized in our medical center with lower leg bone fractures were studied. Data including demographic characteristic, site of fracture, clinical manifestation of FE and their onset and PaO_2 were gathered.

Results: Patients were 25 (SD=5) years old. Nine of the 262 patients (3%) were diagnosed as having FE. All of these 9 patients had respiratory and consciousness disturbance. Only 4 patients had petechia. PaO_2 has been requested only in these nine patients and after the appearance of clinical manifestation of FE.

The onset of clinical manifestations of FE was for one patient in first 24 hours after the fracture, for 4 patients in 24-48 hours, for 3 patients in 48-72 hours and for one patient after 72 hours after the fracture. PaO_2 was 54(SD=13) in all of the FE patients. Five out of nine patients had femur fracture; three patients had femur and tibia fracture and only one patient had tibia fracture alone.

Discussion: The results of this study showed that despite the disturbance in PaO_2 in all FE patients, physicians did not use PaO_2 for diagnosing FE before the appearance of clinical manifestations of FE. Atrial Blood Gas testing for PaO_2 determination in high group patients: young patients with fracture of femur or tibia, in first to three days after the fracture can be a useful tool for diagnosis of FE before the appearance of FE clinical manifestations.

EFFECT OF PHYSICAL TRAINING, DIET AND WEIGHT REDUCTION ON FREQUENCY OF EARLY COMPLICATIONS AFTER HEART SURGERY

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The aim of the study: The influence of physical training and diet introduction within 3 to 6 months prior to elective heart surgery on the frequency of early complications after these operations.

Methods: Retrospective analysis of surgical results in a group of patients, which were physically active and on low-calories diet in comparison with patients not taking such measures was performed. Results of operations in a total of 204 operated patients (144 male and 60 female) aged 60 were analysed. There were no differences in operative risks (Euroscore Logistic calculated at $3.62 \pm 5.1\text{SD}$), mean ejection fraction ($51.5 \pm 11.57\text{SD}$), type of operation or comorbidities between the groups. There were 96 overweight and 64 obese patients. Before the operation 101 patients (49.5%) reduced weight. 62 patients (30.4%) lost more than 5 kg. 21 patients (10.3%) achieved normal weight. 106 patients (52%) took up physical exercise. 117 patients (57.4) took up diet. 77 patients (37.8%) took up both diet and exercise.

Results: Low output syndrome occurred less frequently in patients that were exercising and on a diet leading to weight reduction before the operation (2.4% vs. 11.1%, $p=0.04$) and also in those patients that were exercising and on a diet which has not resulted in weight reduction (3.9% vs. 12.6%, $p=0.02$). Reduction of weight by 5 kg or more resulted in lower frequency of atrial fibrillation after the operation (6.5% vs. 20.4%, $p=0.007$) and lower frequency of significant elevation of cardiac enzymes related with perioperative myocardial infarction ($\text{CKMB} > 100\text{U/l}$ in 1.6% vs. 9.2% $p=0.02$).

Conclusions: 1. Physically active and dieting patients have lower risk of low output syndrome after heart surgery. 2. Weight reduction by 5 kg or more results in lower frequency of atrial fibrillation and lower frequency of significant elevation of CKMB after the operation. 3. Weight reduction, diet and physical exercise do not influence the mortality of heart operations.

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SWIMMER'S SHOULDER

Marek Kintzi

Among professional swimmers approximately 35% have experienced shoulder pain that hampers the ability to go in for professional sport. The term 'Swimmer's Shoulder' has been encountered since 1964 and it relates mainly to freestyle and butterfly stroke, whereas it is less frequent in back stroke. Due to the requirement of wide range of shoulder movements as well as managing the burden of professional training, the dynamic stabilizers are of great importance. They are prone to overload and weakness and, as a result, may generate muscular dysbalance of the shoulder girdle, which, in turn, may end up in instability and secondary impingements. Proper rehabilitation program which complies with the changes in the patterns of movements allows the continuation of swimming. Moreover, the programs of intensifying and stretching the anatomical structure of humeral joint along with biomechanical knowledge enable appropriate training scheme and the prevention of overload. If the prevention and rehabilitation programs fail, the attempts of operational treatment are made. In this respect, arthroscopy receives great recognition which contributes to better understanding of pathomechanics and to achieving the objective which in this case is the swimmer's return to sport after the overload damage of the shoulder girdle.

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INTERNAL IMPINGEMENT

Marek Kintzi

Athletic activities involving intensive repetitive movements of the arms are fraught with danger of impingement. Neer was the first orthopedic surgeon to focus on improper alignment of bones and tissues in the subacromial space. This pathology, often referred to as Subacromial or External Impingement, stems from numerous outlet and non-outlet causes presented in the paper. As opposed to External Impingement, Walch (1) and Jobe (2) described Internal Impingement, which has to do with the partial thickness of the rotator cuff lesion and/or labral lesion as a result of repetitive loads contact of the deep surface of the rotator cuff and the posterosuperior aspect of the glenoid. Another example of impingement, Intraarticular Impingement, was identified by Gerber as partial tear of subscapularis tendon and pulley lesions.

In treatment of Internal Impingement non-operative management should be performed in the first place. If it fails, arthroscopy ought to be applied. However, there is no agreement as to one etiology, thus, the operative treatment ranges from repair to reattachment, debridement, anterior capsular procedures and finally derotational osteotomy.

Awareness of the risk of impingement may help to prevent pain and injuries in athletics.

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THE EFFECTS OF SEVERAL-MONTHLY, INITIAL TRAINING ON THE SPORTSMANSHIP AND PHYSICAL EFFICIENCY OF THE BEGINNER OARSMEN

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The aim of the study was to analyze the physical fitness changes of young oarsmen during the initial several-month period of specialistic training. The study was conducted during the winter season, from November to April, after the

initial, autumnal, general development training.

Material and methods: Thirteen boys (15 age) classified to rowing-class in Championship School of Sport in Płock participated in the study. The study involved measurement of the selected indexes of strength power and endurance. For this purpose the test of pulling a load to the desk in 7 minutes, 4 specific tests on the rowing ergometer Concept 2 – rating the maximum power, achieving in 15 seconds, medium power and the time need to cover 500, 2000 and 4000 distance, efficiency test PWC, run on a distance of 3000 m and a free style swimming on a distance of 50 m and 200 m.

Results: The results of analysis showed that the most statistically significant training-induced changes were in power range (from 24,58% to 29,53%). Improvement results of swimming, PWC 170 and the power output achieving on a distance of 4 km was in the range 15-19%. Changes of run on a distance of 3000 m results and test on 500 and 2000 m on the oar-ergometer were minor, non- statistically significant.

Conclusions: Authors discuss about changing quantity of all analyzed indices, analyze reasons of difference between training effects, compare to the appropriate load program, they propose to modify them to improve the efficiency of training.

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PHYSIOLOGICAL CHARACTERISTIC OF 9-11 YEARS AGED CHILDREN–SWIMMERS

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The aim of the study was a physiological characteristic of young swimmers on the basis of analysis of somatic, spirometric and physical working capacity indices and an evaluation of its relationship with sports results.

Materials and methods: Forty-three children (19 girls and 24 boys) aged 9-11 years, training swimming in UKS “Polonez” in Wyszów took part in the study. At the end of the school year (June 2004) the measurements of body mass and height was done in all examined children and tissue composition was evaluated with a bioimpedance method (Bodycomp AKERN STA-BIA) with calculation of fat and fat free mass (FM and FFM), mass of muscles (MM), total body water and its distribution (TBW, ECW and ICW), Body Mass Index (BMI) and a magnitude of basic metabolism (MB). The efficiency of a pulmonary system was evaluated by LUNGTEST 1000 (MES) appointing vital capacity (VC) and forced expired flow indices (FEV1, FEV1 as a % of FVC, PEF, MEF 25 i MEF 50). Physical working capacity (PWC₁₇₀) was estimated with using MONARK 818E. Basic statistical indices (Mean ± SD) were calculated for all measurements. Significance of differences between mean values in age and sex groups were estimated with ANOVA. Relationships between sport results (free style swimming on a distance of 50, 100 and 200 m) and somatic, spirometric and physical working capacity indices were estimated with Pearson's r correlation.

Results and conclusion: Results were referred to age norms and compared with available data obtained in other studies. Values of some spirometric indices referred to population norms appeared to be much lower than expected (FEV1 – 102,2%; VC – 101,3%; FEV1%VC – 97,7%; PEF – 101,5%; MEF50 – 85% i MEF25 – 77,7%).

CONTAMINATION OF NUTRITIONAL SUPPLEMENTS BY DOPING AGENTS

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Nutritional supplements and performance-enhanced drugs are in common use among competitive athletes, but may be contaminated by illegal substances, and hence there is risk of “positive” results of anti-doping control. The results of the investigation undertaken by W. Schänzer from Cologne were alarming. The percentage of contaminated samples amounted 14.8% of the total (n=634) ones. The similar problems with supplements contamination, have been reported by G. Gmeiner from anti-doping laboratory in Seibersdorf. Significant part (22%) from tested samples (n=54) available in Austria contained non-declared androgenic-anabolic steroids.

In Department of Anti-Doping Research Institute of Sport in Warsaw 20 samples of supplements available in Poland have been tested. They are used not only by amateur athletes, but also by members of National Teams from numerous

sport events. After isolation from the supplement matrix doping agents were analysed with gas chromatography / mass spectrometry. The study revealed that supplements were contaminated mainly by testosterone precursors (20% of total cases).

Our study showed, that problem with contaminated supplements concerns also polish market and polish athletes. World Anti-Doping Agency try to solve that problem by market monitoring and by encouragement for product certification, however risk of usage contaminated supplements and performance-enhanced drugs incriminate athletes.

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MOTOR SKILFULNESS AND UNSKILFULNESS DEPENDING ON BODY WEIGHT

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The aim of the study: Studying the children's motor performance from different aspects is a popular theme. Literature also involves investigations how positive deviation from the normal body weight, i.e. obesity, affects motor performance. Negative deviations are rarely studied.

Materials and methods: 4 to 10 year old children's (N=200) motor performance was studied and groups were formed on the basis of the body mass index (BMI) calculated from the 90 percentile of the Hungarian reference. Approximately one quarter of the sample is overweight, while almost 20% of the whole sample is underweight. The examination covered body height [cm], weight [kg], and performance in 6 motor tests: 20-m sprint [s], standing long jump [cm], 6-minute running [m], stutter running [s], lower throwing of a 2 kg stuffed ball [cm] and steeplechase [s]. The motor tests were used in studying the agility, force, endurance, change of rhythm and all the motor abilities.

Results: The differences between age groups found in the steeplechase tests can be explained with the formation of the motoric structure. At the beginning of the first childhood the motorium is described by an integrated factor, which disappears at the end of this age and the ability structure develops. It is also characteristic of this age that the performance in the tests is determined primarily by the development level of the given exercise – running, jumping, throwing etc. Structure is first revealed in the endurance test. The significant difference in the 6-minute running between age groups can be explained this way because performance cannot be balanced with other skills in this case.

Conclusions: The following final conclusion can be drawn: until the age of nine obesity limits only the complex motor skills. The importance of this statement is significant in sports medicine since the prevention/treatment of child obesity gains a new ground in avoiding accidents and maintaining healthy joints.

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WHY DON'T WE SUCCEED IN LOSING WEIGHT? COMPUTER-AIDED PLANNING AND ANALYSIS OF BODY WEIGHT CHANGE IN THE FITNESS

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Introduction: It is possible that one has been exercising regularly for a long time and consistently following dietary recommendations but still does not manage to get rid of the surplus weight.

Body mass decrease supported from two sides that is physical exercise and limitation of energy intake can be assisted by computer. A key factor of success is nutrition to which given parameters can and should be assigned while during physical exercise several parameters can be measured and analyzed.

Methods: With the help of FOODAlyser® diet analyzer software, the energy demand and the ratio of protein, carbohydrate and fat can be determined on the basis of the following parameters: sex, age, height, weight, health state and physical activity. The evaluation of food diaries is carried out and then numeric conclusions are drawn about dietetic mistakes and their possible solutions. Physical activity is controlled by a Polar heart rate monitor watch. The recordings are analyzed on computer. Data obtained included: average heart rate, time spent in the target zone, the ratio of calories yielded from fat and carbohydrates and the comparative graph of average daily energy demand and energy consumption increased by exercise. The activity diary makes it possible to calculate personalized daily energy consumption by recording the physical exercises.

Results: The program gives a current balance of registered nutrition data and the energy expenditure in microcycles (daily) and in longer terms, as well. This might reveal the reasons for ineffectiveness of weight reduction program.

Conclusion: Computer is an effective device of moderate, healthy weight reduction both in the phase of planning and analysis.

Keywords: computer, fitness, obesity, body weight loss, analysis

EPIDEMIOLOGY AND TREATMENT OF SPORTS INJURY OF ACHILLES TENDON

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The aim of the study was to evaluate the epidemiology and results of the treatment of 24 patients with Achilles tendon injury occurred during sports activity that were treated between 2000 and 2003 in Dept. of Emergency Medicine and Multiorgan Injury of II Chair of Surgery. The mean age of patients was 37,1 (SD 9,3) years. In 17 patients left lower extremity was injured.

The causes of the injuries were: soccer in 17 cases, basketball in 3, volleyball in 3, squash in 1 and running in 1 case. In 23 cases the total and in 1 case a partial Achilles tendon rupture was diagnosed. Surgery was performed in 22 patients while in 2 patients conservative therapy was applied. The Achilles tendon was sutured in 20 patients using Kessler method, in 1 – using Bunnell method, in 2 - using Dumpell method. In 2 patients the tendon was sutured “end-to-end” and in 3 patients the iliotibial tract grafts were used. After tendon was sutured the lower extremity was immobilized in plaster cast in equine position for 3-6 months. The rehabilitation treatment was started after plaster cast removing and duration of this treatment was 3-6 months. In all patients the total leg function was obtained after treatment was finished.

PHYSICAL ACTIVITY AND QUALITY OF LIFE IN PATIENTS WITH IMPLANTED ADAPTIVE RATE PACEMAKER WITH DOUBLE SENSOR – ACCELEROMETER AND MINUTE VENTILATION

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The aim of the study was to evaluate the impact of double sensor – accelerometer and minute ventilation in Guidant Pulsar Max DR adaptive rate pacemaker on physical performance and quality of life in patients with chronotropic incompetence and sinus node dysfunction.

Methods: We studied 8 patients (6 women, 2 men), mean age of 65 years (56 to 79 years), body weight 66±12,7 kg, height 159,1±6,0 cm, hospitalized in the Electrophysiology Department.

Physical performance was evaluated during treadmill stress test according to modified Bruce protocol. The test was stopped when patient wasn't able to continue the exercise because of fatigue and breathlessness. The test was performed twice – with double sensor on and with only accelerometer sensor on. The rest of pacemaker settings and medical treatment was identical during both tests. Quality of life was assessed using modified Minnesota Questionnaire after 3 months of follow-up on each sensor.

Results: Level of exercise reached by each patient on double sensor and single accelerometer sensor did not differ significantly.

Conclusions: The analysis of the results of the Minnesota Questionnaire which consisted of 21 questions concerning daily activity revealed that quality of life was significantly improved when the double sensor was active (mean score value decreased from $68,87 \pm 25,04$ to $56,25 \pm 30,84$, $p < 0,05$).

AEROBIC CAPACITY AND METABOLIC RESPONSES TO EXERCISE IN SEDENTARY AND PHYSICALLY ACTIVE SUBJECTS SUBMITTED TO BODY CARBOHYDRATE STORE MODIFICATIONS

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The aim of this study was to find out whether acute modifications in body carbohydrate stores influence exercise capacity and metabolic responses to maximal exercise in sedentary and physically active subjects.

Methods: Nineteen healthy male subjects, aged $24.1 \pm (SE) 0.7$ yrs volunteered to take part in this study. They included 9 students who did not participate in any sport activities ($\dot{V}O_{2max}$ 37.2 ± 2.6 ml/kg/min) and 10 nonprofessional athletes practicing endurance sport disciplines ($\dot{V}O_{2max}$ 58.8 ± 2.5 ml/kg/min). The study consisted of four experimental sessions performed in one-week intervals in random order. During the control session (C) the subjects performed graded, incremental cycle-ergometer exercise till volitional exhaustion in the morning, after an overnight fast. The workloads were increased by 50 watts every 3 min starting with 50 watts. Blood lactate (LA) was determined after each load while glucose (BG) and free fatty acids (FFA), were measured at rest, at the moment of exhaustion and after 30 min of recovery. Oxygen uptake ($\dot{V}O_2$), carbon dioxide production ($\dot{V}CO_2$) and heart rate (HR) were continuously recorded (Vmax 29, Sensormedics, USA). In the evening preceding each of the remaining three sessions subjects performed the muscle glycogen reducing exercise lasting 1.5 hrs at a 70% HRmax. Till next morning they were not allowed to eat any meals to deplete liver glycogen but could drink water ad libitum. In the morning the fasting blood sample was taken and subjects were given either a high-carbohydrate (H-CHO) or a low-carbohydrate (L-CHO) meal of approx. 1000 kcal or remained fasted (No meal). The next blood sample was taken 120 min after the meal and then graded exercise was performed similarly as in control session.

Results: There were no significant differences between the session in $\dot{V}O_{2max}$ and HRmax. In active group LA concentrations were significantly lower during submaximal loads (50W – 200W) and higher at the cessation of exercise. At rest only in the no meal session LA was higher ($p < 0.01$) in sedentary group. Lactate thresholds were higher ($p < 0.05$) in active subjects than in sedentary ones except of the No meal session. In both groups respiratory quotient (RQ) values at rest and during submaximal exercise loads decreased after glycogen depletion ($p < 0.05$). After H-CHO meal RQ was significantly increased ($p < 0.01$) while after L-CHO meal RQ values were similar to those in No meal session. After glycogen depletion fasting BG concentration was similar to that in C session while plasma FFA increased from 0.48 ± 0.03 to 0.57 ± 0.02 mmol/l ($p < 0.05$). Two hours after H-CHO meal BG was elevated in both groups while plasma FFA values were decreased ($p < 0.01$). Plasma FFA increased after L-CHO meal ($p < 0.05$) only in sedentary subjects. Immediately after BG did not differ between groups of subjects. After 30 min of recovery BG was lower ($p < 0.05$) after L-CHO than after H-CHO meal (92.4 ± 3.5 vs. 103.5 ± 3.5 mg/dl) only in sedentary subjects. In both groups during exercise in C and No meal sessions plasma FFA decreased significantly. After H-CHO meal the significant meal-induced decrease of FFA diminished the effect of exercise. In sedentary group, after L-CHO, plasma FFA severely decreased ($p < 0.001$) during exercise and remained low after 30 min of recovery. These changes did not occur in the active group.

Conclusion: The present study showed that acute modifications of carbohydrate availability for exercising muscle in spite of changes in the contribution of fat and carbohydrates to exercise metabolism do not alter the subjects' aerobic irrespectively of their training status.

ENDOCRINE RESPONSES TO GRADED EXERCISE IN SEDENTARY AND PHYSICALLY ACTIVE SUBJECTS SUBMITTED TO BODY CARBOHYDRATE STORE MODIFICATIONS

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The aim of this study was to find out whether acute modifications in body carbohydrate stores influence hormonal responses to maximal exercise in subjects varying in the level of physical activity.

Methods: Nineteen healthy male subjects, aged $24.1 \pm (\text{SE}) 0.7$ yrs volunteered to take part in this study. They included 9 students who did not participate in any sport activities ($\dot{V}\text{O}_2\text{max}$ 37.2 ± 2.6 ml/kg/min) and 10 nonprofessional athletes practicing endurance sport disciplines ($\dot{V}\text{O}_2\text{max}$ 58.8 ± 2.5 ml/kg/min). The study consisted of four experimental sessions performed in one-week intervals in random order. During the control session (C) the subjects performed graded, incremental cycle-ergometer exercise till volitional exhaustion in the morning, after an overnight fast. The workloads were increased by 50 watts every 3 min starting with 50 watts. Plasma testosterone (T), growth hormone (hGH), cortisol (Cort), adrenocorticotrophic hormone ACTH) and catecholamines (norepinephrine – NE and epinephrine – E) were determined at rest and at the moment of exhaustion. Additionally Cort was measured after 30 min of recovery. In the evening preceding each of the remaining three sessions subjects performed the muscle glycogen reducing exercise lasting 1.5 hrs at a 70% HRmax. Till next morning they were not allowed to eat any meals to deplete liver glycogen but could drink water ad libitum. In the morning the fasting blood sample was taken and subjects were given a high-carbohydrate (H-CHO) or low-carbohydrate (L-CHO) meal of approx. 1000 kcal or remained fasted (No meal). The next blood sample was taken 120 min after the meal and then graded exercise test was performed similarly as in C session.

Results: Plasma T concentration was significantly decreased after meals and increased after exercise in all sessions in both groups. Glycogen depletion caused T decrease only in sedentary subjects ($p < 0.05$). Maximal T concentrations were lower after both meals only in active group ($p < 0.01$). Concentration of hGH increased significantly during exercise in all sessions. The magnitude of exercise-induced changes in hGH concentrations tended to be more pronounced in the active than in sedentary group and the highest values were obtained during No meal session. ACTH increased significantly during exercise in all sessions in active subjects, whereas in sedentary ones only in C. Plasma Cort was decreased after L-CHO meal in both groups ($p < 0.05$). After 30 min of recovery Cort was significantly higher in active group in all except of No meal session, Catecholamine concentration was increased during exercise. Significantly higher values were observed in both E and NE in No meal session in sedentary subjects. After H-CHO meal NE was increased in both groups at rest ($p < 0.01$).

Conclusion: Hormonal responses to graded exercise depend on the subjects' level of physical fitness and carbohydrate availability.

REMARKS OF THE PHYSICIAN WITH MEDICAL PRACTICE ABOUT WATER SPORTS

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Water environment is not only clear, warm, glittering in the sun lagoon, but also very dangerous when rough masses of water. Sometimes one has to defy the storm to escape unhurt out of the deep waters despite exhaustion mainly because of cold.

It is well known that water environment let many different sport disciplines develop for example: swimming, diving (loose or with compressed air), rowing, canoeing, mountain canoeing, sailing, surfing, windsurfing, water-skiing, water-motor sports and other connected with each other disciplines (triathlon, pentathlon, etc.).

Present social situation demands more and more from sports medicine. Training of the swimmer positively influences general organism's development, motion system, circulatory system, respiratory system, and many others. Ability of behaving in water increases one's safety and makes it possible to be saved from drowning. However, long contact with water can cause inflammatory state of ear (swimmer's ear), nasopharynx, sinuses or bronchi. Moreover, in 17% of swimmers post-effort bronchi contraction or even asthma appear. Specifics of record-seeking swimmer's motor activity can lead to overloads in shoulder joint and low back. The other important issue is the rhythm of breathing which depends on the technique of swimming – different styles, different distances, breaks after plunging in water and during reversions. It is mainly about adaptation of breathing – quick breath-in and slow breath-out under the water surface, what overloads respiratory muscles and causes alveoli expansion while overcoming water resistance. Precise examinations with usage of modern spirometric systems e.g. LungTest MES in rest and mostly during and after maximal physical effort would surely reveal the effects of long-term overloads of respiratory system. Little vital capacity (less than as a rule FEV_1 , $\text{FEV}_1\% \text{FVC}$) is often observed in ex-sportsmen with huge chest, mainly in those who did not continue any kind of training.

In case of "on water" sports intense, general conditioning, directed training is used. It positively influences total development and physical condition. Specifics of rower's, canoeer's, sailor's and mainly surfer's training may lead to overloads of backbone especially its low part (lumbus).

Another problem is the cleanness of water. Breathing-in the air from water's surface of swimming-pool (chlorine) and also from other open waters (lakes, rivers, public baths, bays) which may be polluted, may cause inflammatory state of upper airways and lungs. In humid environment mycosis on skin surface, nails' blastomycosis, skin suppurative inflammation, ophthalmia and some others develop quicker.

Competent usage of water environment is very important in case of healthy training, meaning total development of human physical condition and keeping good state of health. Water environment is also useful in cases of general weakness after different kinds of illnesses, during rehabilitation process (compensatory and recreational swimming) e.g. in spondylarthrosis, etc.

Sports medicine in context of water sports demands precise early diagnosis of health state including indications and contraindications (e.g. epilepsy, labyrinth damages, allergies, etc.), diagnosis of physical evolution and general physical efficiency regarding safety (drowning), as well as physical development prognosis including sports mastership.

Gaining good effects in sport, keeping good state of health and good physical condition depends on proper selection of talented youths to sport by physical education teachers, coaches and their cooperation with sport physicians during training process.

Continuation of temporary health state and physical development examinations, as well as complex diagnosis of physical efficiency and permanent sport physicians supervision are indispensable in early diagnosis of overloads, illnesses and their treatment.

Outstanding athletes, champions, medallists MS and IO have good state of health and physical efficiency at their disposal, which are the essential of success in sport.

Alarming number of drownings during the year and terrifying statistics of cervical spine and spinal cord damages after jumps into water on head, force to carry on preventive campaigns and to teach how to apply first aid and resuscitation to drowning person. Most of all swimming skills and principles of safe behavior in water environment should be rooted among the society.

SPECTRAL ANALYSIS OF HEART RATE VARIABILITY IN DYNAMIC LOADS CONDITIONS – PRELIMINARY REPORT

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Introduction: Examinations of heart rate variability (HRV) are used for evaluation of state of the cardiovascular autonomic regulatory mechanisms (1, 2, 3).

The knowledge of the activity of the autonomic nervous system during physical dynamic loads and also during restitution phase after physical effort can be useful in individual training.

Estimation of HRV parameters using Fourier methods is not useful during physical tests because of non – stationary character of the analysed signals. Spectral analysis of those signals demands using more advanced methods based on time – frequency analysis characterised by good frequency resolution.

The aim of the study: The aim of this work is presentation of most frequently used methods in joint time - frequency domain and evaluation of their usefulness in examination of cardiovascular autonomic reactions during dynamic physical tests.

Methods: Short time registration of ECG (Framed, Gliwice) was carried out in a group of 5 healthy volunteers aged 19 –20 years in conditions of graded every 2 minutes physical load (25 W, 50 W, 75 W and 100 W) with the use of bicycle ergometer (Kettler).

HRV signals were analysed with the use of short time transform (STFT) as well as with continuous, discrete and packet wavelet transform (WT).

Results/Conclusion: Authors experience in HRV analysis in conditions of graded exercise loads indicate special usefulness of continuous as well as packet wavelet transform.

Methods based on WT allow to trace local changes of frequency spectrum during different profile of physical exercise load.

WT allow to observe the detailed signal structure not observed in methods based on traditional Fourier analysis. WT gives new possibilities of complex structure signals analysis.

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CARDIO – VASCULAR REACTION AND HEART RHYTHM VARIABILITY AFTER PHYSICAL EFFORT

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Introduction: Physical activity causes profitable influence on the efficiency of autonomic regulation of cardio – vascular system. Intensive tonic part of parasympathetic part of nervous system is caused by increased physical efficiency [1,2,3]. Simple tests based on heart rate and blood pressure analysis are often used to physical efficiency estimation.

The aim of the study: The investigation of the comparison between cardio-vascular reaction type after Martinett physical test and the selected parameters of heart rhythm variability (HRV) during orthostatic test was analysed.

Material and methods: The investigation was carried out in a group of 33 volunteers, students, women and men, aged 19-20 years old. The type of cardio-vascular reaction was estimated after physical Martinett test and short-time registration of ecg was noticed during orthostatic test (5 minutes of registration in standing and lying positions). 30 persons who presented normotonic type of cardio-vascular reaction were divided into 3 groups depended on circulation parameters restitution time after physical effort: group A – restitution after 2 min; group B – restitution after 3 min; group C – restitution after 4 min. In each group the analysis of HRV parameters was carried out using specialistic computer programs.

Results:

Tab.1 *Mean values of some heart rate variability parameters in examined groups*

Conclusions:

1. In persons who presented short time of restitution (2 min.) after Martinett physical test more profitable state of autonomic regulation of cardio-vascular system was observed.
2. HRV parameters analysis seems to be a complement in efficiency tests, for instance in estimation of biological regeneration of sportsmen.

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KNOWLEDGE AND CONSCIOUSNESS CONCERNING DOPING IN SPORT – COMPARISON AMONG STUDENTS OF THE UNIVERSITY SCHOOL OF PHYSICAL EDUCATION IN POZNAN

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Introduction: Sport has adjusted to various needs of contemporary society, which is seen in its commercializing. For many sportsmen winning has become the aim itself since it opens huge financial possibilities and other kinds of benefits. Doping has become a tool to achieve all these goals and records at any cost. It is becoming a social problem and it affects not only professional sportsmen but also teenagers, who just begin their sport career, and people practicing sport as leisure activity as well. So far researches do not present a complete picture of threats and range of used doping substances among the whole society. There is a need of standardizing the research methods so all the educational materials could reach certain groups, threaten by health problems caused by using doping substances.

The aim of the study is to compare the knowledge and consciousness concerning doping among the students of the fourth year studying Tourism and Recreation and Physical Education in Poznań. The practical aim is to show the threats and the level of consciousness of students to the teachers, tutors and coaches. The results presented in the work can be useful in modifying the content and structure of programs for educating physical education teachers, coaches, sport animators and motor recreation instructors.

Material and methods: For this work the authors used the method of diagnostic opinion poll accompanied by questionnaire. The questions concerning the knowledge about doping were compared. Empirical data has been stored in computer's database in EXCEL and the set of counting procedures has been worked out. In order to achieve respondents' preferences concerning doping in open and half-open questions the authors ranked them, ordering the answers according to the level of feature's intensity. As far as multiple- choice questions are concerned the Likert's scale was used. The research itself was done in 2001 year; the comparative analysis included only the questionnaires of the fourth year students. The number of examined students was 138 (including 53 women). 50 of them studied at Tourism and Recreation and from the other department 59 people were studying to be coaches and 29 teachers.

Results: The research results show and prove a very well knowledge of the term “doping” – almost 95 to 97% correct answers. Great differences between students appeared in a question concerning the differences in defining doping and aid (assistance)- coach major students 81% and tourism and recreation students 58%. It seems to prove the presumption that students of sport profile acquire more knowledge about doping. There were no significant disproportions concerning threats connected with permanent usage of doping substances (almost 80% of respondents named 4 and more possible answers). The students of Tourism and Recreation showed the weakest knowledge of doping substances (62% cannot name any or just one). Physical Education Department's students often mentioned the university and mass media as the sources of the knowledge about doping. As far as Tourism and recreation students are concerned their knowledge has rather social character.

Conclusions: The results of the questionnaires present students of the fourth year of The University of Physical Education in Poznań in a rather favorable light as far as the knowledge of doping in sport is concerned. However, they also show that new lessons concerning doping should be added to the syllabus.

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THE COMPARISON OF EFFECTS OF TWO TYPES OF PHYSICAL ACTIVITY ON IRON STATUS AND SERUM FERRITIN AND SOLUBLE TRANSFERIN RECEPTOR IN ATHLETES

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Aim of the study: In recent years many investigators have observed a decrease in hemoglobin concentration in top athletes, as well as high prevalence of iron deficiency, particularly among endurance runners and female athletes. The increase in iron requirements due to intensive prolonged exercise, the increase in iron lost particularly by sweating, and an often inadequate iron supply from dietary intake especially in female athletes, explain the appearance of an iron deficiency, that, when it is not corrected, leads to anemia. The aim of this study was the comparison of two kinds of physical activity on the changes in concentration of Iron, ferritin, transferrin receptor, HB and HCT.

Methods: Thirteen healthy females (aged 22 ± 2.71 yrs; height 168 ± 1.68 cm; weight 57.46 ± 13.72 kg; body fat 17.25 ± 11.56 percent; $\dot{V}O_{2\max}$ 31.23 ± 7.33 ml/min/kg) participated in this study. Participants completed an informed consent form and health history questionnaire. Subjects carried out 2 exercise: an incremental running test until exhaustion (test A) and a 30 minute constant speed running at 50 % HR max(test B). Venous blood samples were obtained before and 15-20 minutes after both test.

Results: Iron level was decreased after 2 tests ($P=0.05$). HB and HCT concentration were increased after test A ($P=0.05$). Test B had no significant effect on ferritin, transferrin, HB and HCT. The effect of test A on ferritin and transferrin was not significant too.

Conclusion: Low mean concentration of ferritin and the changes in iron levels, would suggest that physical exercise leads to a decrease in body stores of iron. Interestingly, this did not lead to iron deficiency anemia; because mean concentration of HB and HCT was in normal range. But it may be that the decrease in body iron levels with recurrent exercise bouts leads to iron deficiency anemia. Because in general, women are considered to be at greater risk of iron deficiency anemia, getting adequate iron from foods is necessary for them.

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CHANGES OF ANAEROBIC THRESHOLDS DURING RECREATIONAL TRAINING IN WOMEN

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We have examined the influence of a 12-week recreational endurance training program on changes of lactate (LAT), bicarbonate (HCO_3^- -T) and base excess (BET) thresholds and the relationships among them in women with different anaerobic capacity. Forty untrained women (mean $\pm$ SD) – age $36,08 \pm 4,63$ years; height $164,18 \pm 4,84$ cm; body weight $58,74 \pm 6,66$ kg were divided into three sub-groups (each consisting of women in the same age): I (n=13) with the lowest, II (n=14) with the average and III (n=13) with the highest anaerobic capacity. The training program was conducted three times a week. Each training session lasted 40 min. with the intensity set at 130-140 heart beats/min. The above mentioned three thresholds were determined before, as well as, after the training. Before training the lowest workloads at the thresholds were observed in the subgroup I and they were significantly lower in comparison with the subgroup III ($p < 0,001$). Moreover, the workloads at HCO_3^- -T and BET threshold were significantly lower in the subgroup II compared to the subgroup III ($p < 0,01$). The training caused a significant shift of all three thresholds towards higher workloads in all examined women, as well as, in each subgroups ($p < 0,01$). However, the workloads of the thresholds maintained lower in subgroup I compared to subgroup III ($p < 0,001$ HCO_3^- -T, BET; $p < 0,01$ – LAT). After the training HCO_3^- -T occurred at $69,63 \pm 8,01$ W in the subgroup I and it was still lower than in the subgroup III – $85,46 \pm 12,39$ W. There was no significant difference among the workloads at which LAT, HCO_3^- -T and BET were detected before and after the training in all trained women and in particular subgroups. Significant correlation coefficients were found among the workloads of investigated thresholds in all tested women, as well as, in the II-nd and III-rd subgroups before and after the training. However, in subgroup I a significant correlation existed only between LAT - HCO_3^- -T before ($p < 0,005$) and after ($p < 0,02$) the training. The thresholds expressed in percentage of maximal workload changed and correlated in a similar way as the absolute values both before and after training. In summary: A 12-week recreational endurance training program resulted in an increase of exercise loads at which LAT, HCO_3^- -T and BET occurred, independently of anaerobic capacity. Correlation between the investigated thresholds were linked to the level of the women anaerobic capacity.

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DETERMINATION OF THE ANAEROBIC THRESHOLD BASED ON HEART RATE AND STROKE RATE ANALYSIS IN A INCREASING POWER EXERCISE IN KAYAKERS

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Introduction: It has been hypothesised that changes of heart rate dynamics (HR), observed as a deflection point (DP) in increasing power (PO) exercise, can be depended on stroke rate (SR). Hence PO/HR relationship, as well as PO/SR and SR/HR relationships was analysed in graded test on a kayak ergometer, and times of DP occurrence was compared. Moreover, validity of a method of anaerobic threshold (AT) determination, based on three DP, was evaluated.

Methods: Twelve kayakers performed the Conconi test (1) with freely chosen SR. PO at DP in the three above mentioned relationships was taken as a criterion of intensity for 30-min exercise (PET), which was conducted the next day.

Results: DP was not observed in two kayakers in PO/HR relationship, and in one in PO/SR. However, in SR/HR relationship DP was clearly observed in all athletes. There were no significant differences in the times of DP occurrence. Lactate concentrations in PET showed, that DP slightly overestimated maximal lactate steady state (MLSS), taken as the AT criterion. In spite of this, all kayakers were able to complete PET. It is in contrast to other studies (2, 3) where majority of subjects had to premature terminate exercise because of fatigue.

Conclusions: Obtained results allows maintain the hypothesis about dependence of changes in HR and SR in the increasing power exercise. Moreover, lack of differences in times of DP occurrence in PO/HR, PO/SR, and SR/HR

relationships makes possible non-invasive determination of AT even in these cases, when classical PO/HR relationship is linear. Exercise intensity determined by proposed method slightly overestimates MLSS, but allows to perform of work at least by 30 min.

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THE DHEA-S CONCENTRATION CHANGES IN 4X400 M. RELAY RACE COMPETITORS DURING THE PREPARATION PERIOD BEFORE THE OLYMPIC GAMES IN SYDNEY 2000

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Introduction: The training cycles in the professional sport consist of mezocycles with intensity and duration. This kind of effort may be the significant load for the human endocrine system.

Dehydroepiandrosterone sulfate (DHEA – S) is known to be the suprarenal hormone with the anabolic effect (1).

The aim of this investigation was to answer the question: how the training load applied during of prolonged training - cycles to competitors-athletes modify on the DHEA-S concentration?

Methods: The investigations were carried out on 5 men. In 1999 these competitors conquered the vice-championship in the Indoor Summer World Championship in the relay race of 4 x 400 m, and in 2000 in Sydney they took the 7th place during the Olympic Games. Blood samples were taken from the elbow vein after five selected training mezocycles. The DHEA-S concentration was measured by use of immunofluorimetric method – ELFA.

Results: During the training cycle after the mezocycles with high intensity of training load, in all the investigated competitors the decrease in DHEA-S concentration was observed. After the mezocycles conducted with the reduction of training load the DHEA-S concentration increased. Worth to notice is that the DHEA-S concentration increased in all the investigated men after the last mezocycle in comparison to the results obtained before the training cycle.

Conclusions: All the DHEA-S concentration results obtained during the training cycle being the preparatory training to the Olympic Games in Sydney, 2000, prove that the high intensity of training loads may cause the decrease in the DHEA-S concentration. The increase in the DHEA-S concentration after the training cycle suggests that it may be assumed as an indicator of adaptation to the training loads.

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NEW INSIGHTS INTO WOMEN'S ENDURANCE EXERCISES

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Narrow range of knowledge was the main cause of restrictions or even bans for women to participate in most sport disciplines for many years. Endurance disciplines were prohibited for the longest period of time. However, those disciplines were practiced by women and revealed their unknown abilities. Results achieved by women in marathon confirm those abilities and they enhance understanding of female organism. Best results accomplished by women in marathon all over the world were the main material for this study. Comparison of the results gained by females to the results gained by males (Olympic athletes) is very helpful in evaluation of women's abilities level. The result of 13 years old S. Jones – 2:52:18 is 3 minutes better than the result of Olympic champion (1908) J. Hays – 2:55:18. Also the result of 17 years old Min-Sin 2:23:37 is better than the result of A. Mimuna another Olympic champion (1956) – 2:35:00. The results presented in table 1 are an interesting and fascinating area of knowledge, which can enhance the understanding of functional attributes of female organism.

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REGULAR PHYSICAL ACTIVITY AND HEART RATE VARIABILITY INDICES IN HEALTHY ADULT MEN

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Regular physical activity induces changes in function of the cardiovascular system at rest and during physical effort. They concern morphological structure, cellular metabolism of the heart muscle and autonomic regulation of the heart action.

The aim of the study was to evaluate the influence of regular physical activity on heart rate variability (HRV) indices in adult men with different physical activity.

We studied 65 patients aged 42 to 67 years, mean age $54,3 \pm 8,1$ year.

Materials and methods: Examined group consisted of 33 physically active adult men (group 1). The mean amount of physical activity in this group was 5,5 hours per week. The second group consisted of 32 sedentary healthy persons. Their physical activity in free time was less than one hour per week.

Time and frequency parameters were estimated from short – term HRV procedure using Medea system. We measured the mean RR interval (mRR), the standard deviation of the RR interval (SDNN), pNN50 in the time domain and low frequency (LF), high frequency (HF) value and the LF/HF ratio in the frequency domain.

Results: The LF and LF/HF ratios were significantly lower and HF and mRR were significantly higher in the group of physically active healthy men in comparison to the group of sedentary healthy persons.

Conclusion: Regular physical activity positively modifies heart rate variability indices in healthy adult men. The performed investigations reveal that the regular physical training increases HRV, reduces the LF component and increases the HF component in the total power of spectral analysis. It can give evidence of sympathetic inhibition and simultaneous activation of vagal stimulation.

DEHYDRATION IN WATER – IS IT POSSIBLE?

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The mechanisms leading to dehydration and the negative influence of dehydration on human body and performance are quite good recognized in athletes performing different kinds of sport activities in non-aquatic environment. Sweating is the primary method of losing heat from the body, especially during exercise in warm environment leading to dehydration. There have also been established some guidelines how to avoid dehydration and how to prevent heat illnesses. There is however poor knowledge about dehydration in sportsmen performing different disciplines in water. It seems that the phenomenon is ignored since the main ways of heat dissipation in water are conduction and convection if the water is cool enough. Nevertheless, fluid lost through sweating is also present though it is not visible. Rise in body temperature and rate of fluid loss through sweating in swimmers are dependent among others on intensity of exercise, water temperature, humidity of air and type of swimming suits (1, 2, 3). Except sweating there are at least three other ways of dehydration during swimming e.g. immersion reflex (in sea water), immersion diuresis, cold diuresis, loss of water through respiratory system during intense breathing should be also taken into account (4, 5). Moreover, plasma shift during exercise in water may be similar to land exercise causing decrease in plasma volume.

According to various authors average sweat rate in swimmers ranges from 230 g/h to 1620 ml/h in men and 1440 ml/h in women (6). Totally, swimmers can lose more than three liters of water each day.

Since hypohydration or dehydration lead to both aerobic and anaerobic performance decrease, current investigation strongly suggest that fluid replacement is probably the most important concern for swimmers. Drinking fluids before, during and after swimming exercise/training let to sustain swimming performance on a high level and protect swimmers against deterioration in hot illness.

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CERVICAL ROOT LESION AND PERIPHERAL NERVE INJURY IN IRANIAN WRESTLERS

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Wrestling is one of the most involved sport in sports injuries. Because of increasing number of wrestlers in IRAN as a native sport, and lack of a scientific study on prevalence of cervical root lesion and associated peripheral nerve lesions, we decided to study prevalence, type and involved root of cervical radiculopathy and also associated predisposing factors in 40 wrestlers of 36-63 year age and at least 10 years of wrestling carries. This study was the cases under taken in Tehran - Iran were examined clinically and then by electrodiagnostic study and finally referred for cervical spine MRI.

Following results were obtained by electrodiagnostic studies in 40 persons and MRI in 21 persons.

About 45% of patients studied by electrodiagnosis had cervical radiculopathy.

100% of patients studied by MRI were reported by a radiologist to have cervical spine involvement as follows:

Degenerative changes = 61% Disc protrusion = 28% Cervical canal stenosis = 19%, Disk extrusion = 9%. The most common involvement in electrodiagnostic study was bilaterally C6 root lesion.

The most common involved level in MRI was C5 - C6 disc. There was no statistically significant correlation between root lesion and previous nerve injury, age of the athlete and years of wrestling carries. Based on this concept that electrodiagnosis is the most specific test, MRI was calculated to have 41.6% specificity in evaluation of cervical root lesion. 27% of cases had associated peripheral nerve lesion of upper limb, among these bilateral carpal tunnel syndrome (15%), tardy ulnar palsy (12.5%) were most prominent. There was high statistical correlation between ulnar nerve lesion and previous elbow injury.

54% of patients had concomitant peripheral nerve injury and cervical root lesion (Double crush syndrome).

Key words: wrestling, electrodiagnosis, sport injury, MRI

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HIGH PATELLA – THE PROBLEM OF THE YOUNG ATHLETES

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High patella is one of the forms of the dysplasia of the knee. Its final result is degeneration of the patello-femoral

(PF) joint, which occurs earlier than usually. In case of excessive overloads, injures and micro-injures lateral subluxation or luxation of the patella are observed. Lately we face this problem more often in young athletes. Arthroscopy procedures are mainly performed because these patients suffer from anterior knee pain.

Material for this study consisted of the results of arthroscopy operations conducted in 300 knee joints of patients aged from 14 to 19. Dysplasia of the PFJ was observed in 136 patients (45.3%). In this group, 84 patients (62 %) practiced sport with excessive overloads. 50 patients had active growth cartilage and arthroscopy procedures were carried out. 86 patients had inactive growth cartilage and in their case operation by Hauser was performed.

Conclusions:

1. Precise clinical and radiological examinations of young athletes are necessary before sports activity is taken up;
2. High sports activity in patients with high patella is impossible;
3. Degeneration of the PFJ occurs earlier in the athletes with high patella.

HAEMATOMA OF THE KNEE – DIAGNOSIS AND TREATMENT

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In this paper there have been presented: the actual opinion about the haematoma of the knee and the problem which is the result of the old therapy schema: decompression haematoma and plaster cast for two weeks (not used at present). Our experience is based on 1377 cases of haematoma of the knee. Haematoma of the knee joint is only the result of interarticular structures damage. Many years ago great specialist of knee surgery and sport medicine De Haven stated that "every haematoma of the knee joint should be arthroscopy diagnosed". Fritschy had similar opinion grieving at same time some statistics of damage defects of the knee, which were performed with arthroscopy technique. Treatment of small cartilage damage was performed with arthroscopy technique. There are big and deep cartilage defects indicating open technique treatment. In these cases we performed OCT and MP technique. In cases of meniscus lesions we performed resection and suture of intraarticular structures of the knee joint which stated performing arthroscopy diagnosis of the haematoma of the knee. The main damage with haematoma of the knee joint are damages of crucial ligament and cartilage damage. In our material (1377 the knee with haematoma) 765 = 55% had injuries of the crucial ligament and 683 = 49.6 had injuries of the cartilage. We observed the meniscus lesion in 18% cases. There are 99% ruptures of the crucial ligaments was performed reconstruction by arthroscopy.

Conclusions:

1. Haematoma of the knee is only the result of intraarticular structures damage.
2. Basic procedure in case of haematoma of the knee is its quick elimination and arthroscopic diagnosis.
3. Quick diagnosis of bleeding joint enables correct treatment and return to full movement and sport activities.

OSTEOCHONDRAL TRANSPOSITION AND MOSAIC PLASTY OF THE TREATMENT CARTILAGE DEFECTS OF THE KNEE

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In this paper we have presented actual possibilities of the big and deep cartilage damage treatment. Treatment of small cartilage defects of the knee is usually performed with arthroscopy technique. However, big and deep cartilage defects indicate an open technique treatment with. In these cases we have two possibilities of the treatment. One – mosaic plasty (MP) proposed by Hangody and Jacob, and second – osteochondral transposition (OCT) offered by us. The basis of both techniques is transplantation of osteochondral fragment.

Materials: Our material consisted of 200 patients and 204 knee joints. Patients were aged 17-67 years (mainly 20 to 40). The most cartilage damages we observed on the medial femoral condylus (75%). We can see that the same defects on the patella surface is smaller considerably (about 8% only).

Results: Objective results: very good 23%, good 42 (65% together) middle 31%, and poor 4%. Subjective results: improvement 84% without improvement 14%, worsen 2%. Generally; results after MP and OCT are the same.

Conclusions:

1. MP and OCT are both very good methods in big and deep cartilage defects treatment;
2. MP is most practical treatment of cartilage defects on the subpatellar surface on the femur.
3. The results of both surgery methods are very good and good (about 70%);
4. Using both technique, MP and OCT is sometimes possible and late results also are good;
5. OCT is cheaper technique than the MP.

DYSPLASIA OF THE PATELLOFEMORAL JOINT – PATHOLOGY AND TREATMENT

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Results of treatment of recurrent or habitual luxation of the patella in the group of 17 patients have been evaluated. In all cases routinely performed tibial tubercle transfer, lateral release and medial retinaculum procedure was not an adequate treatment because of severe patellofemoral dysplasia.

In all cases we reconstructed patellofemoral joint with an osteotomy of the patella and/or subpatellar surface of the femur.

Between 1996 and 2003 we performed 18 osteotomies of the patella and/or subpatellar surface of the femur. Average age of the group (13 females and 4 males) was 19 years. One patient underwent both sides procedure.

Average follow-up was 4 years and 5 months. The results were evaluated with modified Lysholm scale and a subjective questionnaire. 14 patients improved significantly during the follow-up in our analysis.

DIET – MANIFESTATION OF SPORTSMEN'S LIFESTYLE

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Nutrition is one of the important issues in sports medicine. **The aim of the study** was the assessment of ways and habits of nutrition and training supplementation of active athletics sportsmen. It was expected that the collected data would allow to determine whether the athletes pay proper attention to their own health care through a balanced diet and sensible supplementation.

Material and methods: To assess habits, ways of nutrition and training supplementation a questionnaire was used in researches. The questionnaire contained the selected issues in a range of awareness and eating behaviors. In the research participated 60 athletics sportsmen from Tricity sports clubs with the following sports classes III, II, I, M, MM.

Results: All the subjects declare to be personally responsible for their daily diets. Every third respondent claimed that the coach controlled his diet only during sports camps. 62% of those investigated claim that they have a healthy diet and don't make nutritious mistakes. Number, frequency and regularity of consumption of meals were estimated. The hygienic assessment of ways and eating habits revealed that most of the subjects' nourishment is adequate. Nutrition mistakes concerned number of meals a day (two meals – 12% of the respondents), eating so-called dry dinners (instant soup + sandwich – 17%) and eating between meals (every 4th declared). The respondents meet with scope of information about nutrition and supplementation of trainings. The subjects obtain information about nutrition from mass media. Nutrition substitutes apply all sportsmen and commonly used in the investigated group are multivitamin preparations (73% respondents), creatine (37%), and carnitine (33%), aminoacids (27%) and guarana (27%). Frequency of substitutes application is scarce and carbohydrate nutrients (27%) are used preferably.

Conclusion: The majority of sportsmen knowingly influence on their own way of nutrition.

The greatest influences onto knowledge about food, nutrition and supplementation have mass media. However, supplementation applied by the respondents is not considered well enough.

TENSION RESPONSE TO PHYSICAL EXERCISE OF ADULT HEALTHY MEN AND MEN SUFFERING FROM ISCHAEMIC HEART DISEASE WHO ARE TAKING PART IN AN AMBULATORY CARDIAC REHABILITATION

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The estimation of exercise test of a healthy person and the one classified to take part in a cardiac rehabilitation consists of the analysis of four factors: clinic symptoms, electrocardiographic record, physical efficiency and tension response to physical effort.

The aim of the study: the characterization of response of arterial blood-pressure to gradual physical exercise based on examination of a group of healthy men and men suffering from ischemic heart disease (IHD) who are undergoing an ambulatory cardiac rehabilitation.

Materials and methods: a group of 134 healthy men at the age of $44,5 \pm 11,7$ years and a group of 94 men suffering

from ischemic heart disease who are undergoing an ambulatory cardiac rehabilitation combined with basic pharmacotherapy (α -adrenolytic medicines) at the age of $54,5 \pm 8,0$ years were under examination. The submaximal exercise tests were taking advantage of bicycle ergometer done by Monark company using cardiologic software: CASE-16 of DRG company. The measurement of arterial blood-pressure was taken at the left upper arm at rest, on the last minute of every load and 6 minutes after the exercise test. The measurement was taken due to cuff measurer of INCO-Veritas SA company.

Results: Resting value of arterial blood-pressure in both groups under examination were similar: $125,6 \pm 12,8$ mmHg vs $121,5 \pm 13,3$ mmHg. The value of arterial blood-pressure of men under examination measured during the effort test is shown in the table below.

The analysis of tension response to physical effort of adult men suffering from IHD taking α -adrenolytic medicines implies that the tension response is approximately 4% less in comparison with healthy men.

Conclusion: Obedience to modified proper values of arterial blood-pressure during the physical effort should be an essential part of diagnostic tests and control of therapy of men suffering from IHD.

ATTEMPT OF ASSESSMENT OF SELECTED PHYSIOLOGICAL AND BIOCHEMICAL PARAMETERS DURING CANOE SLALOM AGAINST A BACKGROUND OF THE RESULTS OF EXAMINATIONS CONDUCTED IN THE LAB

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Canoe slalom racing is the branch of sport that is still not well known in physiology and sports medicine. The comeback of this sport to the Olympic Games absorbed our attention and we desired to study physiological reaction of the organism to the exercise on arm ergometer and in natural conditions. Hitherto conducted few studies mostly performed on bicycle or arm ergometers, which unfortunately is not adequate to effort exercised in natural conditions: paddling on the water. These faults are partially eliminated by different canoe ergometers constructed specially for this kind of sport, enabling possibility of detection of changes taking place during effort characteristic for canoe racing. But artificial canoe slalom courses create very unusual situations which are unknown during paddling on the flat water.

The aim of the study was to compare organism reaction during arm ergometers cranking to the field test executed in natural condition during canoe slalom race on artificial course.

Firstly the exhaustion test on cranking ergometer was performed. Exercise loads were increased by 30 W according every 2 min until volitional exhaustion, starting from 60 W. During the test the following values were determined: minute ventilation of lungs (VE), oxygen consumption (VO_2), carbon dioxide production (VCO_2) and heart rate (HR). Then, the maximal oxygen uptake ($\dot{\text{V}}\text{O}_{2\text{max}}$) and lactate threshold (LAT) were calculated. In order to find the mechanical effect of performed test work the general quantity of performed work (kJ) and achieved power (W) were calculated. Arterialized blood was taken twice: the first before test and second one was obtained 3 min. after finishing the work on the ergometer and the concentration of lactic acid (La) were determined. Also before and after exercise body weight (BW) and percent of fat (%F) was determined.

Later the 2 races on the canoe slalom course were performed and the same physiological measurements were determined using mobile system Start 2000. On the basis of the obtained results differences between two tests for each athletes were described.

The analysis of our study indicates that physiological and biochemical mechanical values achieved during the tests are slightly different. However, use of the mobile system Start 2000 for tests in natural condition for evaluation of actual effort possibilities is highly recommended. It enables precise analysis of adaptation mechanisms during a standard training program without any exhaustion and disturbances for athletes.

INFLUENCE OF MOTOR-RELAXATION EXERCISES ONTO THE COURSE OF TREATMENT IN PATIENTS WITH PRIMARY ARTERIAL HYPERTENSION

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In cooperation with an attending physician a group of 15 people, both sexes, aged 25-55, following the treatment of primary arterial hypertension (from 3-10 yrs) with risk factors for a coronary disease and systolic/diastolic pressure not over 22/110mmHg was selected for the purpose of the study. The patients were ordered present medical examinations and laboratory investigations (blood morphology, lipidogram, blood-glucose level and ionogram) and complete lead's ECG investigation. The exercise test was applied - an ECG curve recorded on a bicycle ergo meter – Monak, load of 1 Watt/kg of body weight and 40 rotors/min during 5 min. The occurrence of pathological changes in the ECG registration curve, chest pains and vertigo would disqualify the subject for health exercises. However, all of the subjects were positively qualified. The group was divided into 2 subgroups and in each of them motor/relaxation exercises executed: 3 times a week/h for 12 weeks. The exercise unit consisted of a 10 min - warming up, 30 min - exercises based on a typical gym lesson and 10 min - relaxation according to Jacobson method. A doctor supervised a pharmacologic therapy during a fixed period and in cooperation with him only diuretics were eliminated due to a risk factor of hypotassemia. In the course of exercises no serious problems occurred and at the end of exercises the investigations were repeated. The following results of 12-week exercises were observed:

- Statistically significant improvement of physical capacity in the subjects (quantity of work executed and time the exercise lasted);
- Statistically significant lowering of systolic pressure and in a smaller degree diastolic as well as lowering of heart contraction frequency (in exercise and rest);
- Improvement of pharmacological therapy that allowed the attending physician to restrict administration of drugs and in some patients even to eliminate them completely;
- Lowering of a disease risk factors (improvement of lipid metabolism, body weight normalization, lowering of nervous tension and smoking cigarettes);
- Lowering or even regression of subjective symptoms of hypertension, headache, ear buzzing, nervous irritability, dyssomnia and improvement of a day quality.

EFFECT OF NUTRITIONAL SUPPLEMENT (AMARANTH OIL) ON RECOVERY OF ELITE ATHLETES AFTER STRENUOUS EXERCISE

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AmO is a nutritional supplement recommended for use in clinical studies AmO contains tocopherols, carotenoids, squalen, and high concentration of the polyunsaturated fatty acids. The effects of Amaranth oil (AmO) on different metabolic and functional variables in athletes was studied.

Methods: Eighteen healthy athletes participated in this study. AmO effects were evaluated by measuring activities of blood catalase, superoxidedismuthase (SOD), content of thiobarbituric acid reactive species (TBARS), total hemoglobin (Hb), HbO₂, HbCO, HbS, and metHb using spectrophotometry. One ml of AmO in concentrated form (per 60 kg of body weight) was applied. Supplement was given 30 min before meal, once a day during 3 weeks. Heart rate variability (HRV) was measured and cyclo-ergometric test was performed before and after the use of AmO.

Results/Discussions: Taking into consideration subject's total power of HRV spectrum (TP) at the beginning of the study all athletes were divided into two groups: group 1 - moderately resistant (TP < 5000ms², 12 athletes), group 2 - high resistant (TP > 5000 ms², 6 athletes). Heart rate profile of subjects comprising group 2 exhibited less stressful response compared to group 1. Profiles of different Hb forms in group 2 suggested moderately increased strains of oxygen dependent processes and shift to the right in "lipid peroxidation – antioxidant activity" (LP-AOA) system. Obtained data suggests that AmO had normalizing effects on LP-AOA system. This effect was more prominent in group 2. In this group most of studied parameters reached their optimal values. The normalization of catalase and SOD activities were accompanied by increased level of ROS dependent reactions. It was displayed by redistribution of Hb forms and suggested adjustment in the magnitude of their effects on oxygenase, reductase, and peroxidase reactions. Those effects were accompanied by changes in utilization of intermediate metabolites exhibited by decrease in TBARS in both groups. Increase of TP and its parasympathetic component were observed in both groups.

Conclusions: We hypothesize that metabolic effects of AmO facilitated observed improvement in HRV parameters in athletes.

CHANGES IN PLASMA ATRIAL NATRIURETIC PEPTIDE (ANP) CONCENTRATION FOLLOWING SINGLE BOUT OF ENDURANCE AND RESISTANCE EXERCISES IN STRENGTH TRAINED MEN

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The aim of this study was to examine the effects of the single bout of dynamic and resistance exercises on the level of plasma ANP in strength trained men. Three volunteers (at least 2-years experience in resistance training) participated in this study (mean $\pm$ SE – age: 21,3 $\pm$ 0,7 years; height: 175,7 $\pm$ 3,2 cm; body mass: 80,2 $\pm$ 3,7 kg; %fat: 16,0 $\pm$ 0,6%). On separate occasions (2 week intervals) the subjects took part in two experimental sessions: 1) in graded, incremental ergocycle exercise test (3-min workloads increased by 40 W till volitional exhaustion); 2) in resistance exercise test consisting of 6 sets of squats with barbells with a load of 70% of one-repetition maximum (in set 1 to 5 – 7 repetitions and in 6-th set – maximal number of squats). Dynamic exercise test resulted in significant increase in systolic blood pressure (RR_{syst}) (p<0,01), HR (p<0,01), lactate (LA) (p<0,05), Na⁺ (p<0,05), Ca²⁺ (p<0,01), and a decrease in RR_{diast} (p<0,05) in comparison with the initial values. Plasma ANP concentration was significantly higher immediately after the exercise test (p<0,05) as well as during the restitution period: 5' (p<0,05), 10' (p<0,01), 15' (p<0,05) compared to the baseline value. Immediately after the resistance exercise test RR_{syst} (p<0,05), HR (p<0,01), LA (p<0,01), Na⁺ (p<0,05), and Ca²⁺ (p<0,05) were increased compared to the initial values; however, RR_{diast} was not different. Plasma ANP concentration increased from 11,0 $\pm$ 5,0 to 24,2 $\pm$ 10,3 pg/ml but it was not statistically different. Also during the restitution period ANP level was similar to the baseline value. In conclusion: although the applied two exercise tests can not be compared directly, the results show that in spite of the similar increase in HR, RR_{syst} and plasma electrolyte concentrations in both tests, plasma ANP level was significantly higher only following the dynamic exercise in comparison with the resting values.

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CHANGES IN PLASMA ACTIVITIES OF CREATINE KINASE AND LACTATE DEHYDROGENASE IN ROAD CYCLISTS DURING SUCCESSIVE PERIODS OF TRAINING

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Physical effort influences the muscle metabolism by stimulating the activity of intracellular enzymes in blood (1, 2). Activities of creatine kinase (CK) and lactate dehydrogenase (LDH) response to exercise have been used for the detection of adaptation to physical exercise and evaluation of the athletes exercise tolerance for coaching purposes (3).

The aim of this study was to compare the creatine kinase (CK) and lactate dehydrogenase (LDH) activities in relation to training intensity during pre-season, pre-competitive season and competitive season in male road cyclists.

Materials and methods: Ten subjects volunteered to participate in the study (age 23,4 $\pm$ 3,56 years, body mass 72,18 $\pm$ 5,37 kg, height 179,5 $\pm$ 5,06 cm) training for 7,2 $\pm$ 1,2 years. The subjects performed an incremental cycle ergometer exercise tests during the pre-season (PS), at the end of pre-competitive (PC) and in the competitive season (C). Blood samples were obtained before and during the exercises for determination of CK, LDH and blood lactate concentration (LA). The relationships between training workload in pre-season period, $\dot{V}O_{2max}$, and physical intensity at AT was estimated in each exercise tests.

Results: There were a significant differences in $\dot{V}O_{2max}$ during incremental cycling exercise in (PC) in relation to (PS) (p<0.05). Significant changes in CK activity were observed during competitive season in relation to pre-season period (p<0.05). There was a tendency towards higher LDH activity during maximal exercise load during pre-competitive and competitive period. In conclusion, the present study confirmed that exercise induces increases in the enzymes activities and these changes varies with the activation of the aerobic metabolism (training at AT), and also are most pronounced in the competitive period of training.

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HUMAN NONSHIVERING THERMOGENESIS – CHIMERA OR REALITY?

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The survey paper is presented. Non-shivering thermogenesis, well known in small animals, is activated by norepinephrine and occurs in brown adipose tissue (BAT). The small increase in metabolic rate occurred in response to infusions of norepinephrine was consistent with the failure of BAT in humans. It has, however, been demonstrated repeatedly that a greater metabolic response occurs in humans when epinephrine is infused. The metabolic effect induced by the infusions of epinephrine in the winter swimmers was much higher than that in the control subjects. The response to the cold immersion (1 hour in water 13 ± 1 °C) in winter swimmers suggests an important participation of non-shivering thermogenesis in the early thermogenic response. Cold adapted people represented by the winter swimmers exhibit metabolic, hypothermic and insulative types of cold adaptation. The location of the epinephrine-induced thermogenesis is evidently in muscles and in white adipose tissue.

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INFLUENCE OF N- ACETYLOCYSTEINE ON METABOLISM GLUTATHIONE, OXIDATIVE DAMAGE AND ERYTHROPOIETIN CONCENTRATION IN ATHLETES PERFORMING STRENGTH TEST

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It is well known that strenuous physical exercise, especially of the eccentric type, induces the reactive oxygen species (ROS) generation and oxidative tissue damage. Glutathione is a ubiquitous thiol playing important role in cellular defense against oxidative stress. Earlier studies have shown, that glutathione metabolism and production of erythropoietin (EPO) may be modulated by N-acetyl-cysteine (1).

The aim of this study was to determine whether a strength exercise induces oxidative stress and whether intensification of glutathione metabolism by oral treatment with N-acetyl-cysteine reduces plasma protein and lipid damage and results in changes of EPO level.

Methods: Ten healthy male volunteers regularly weight trained for at least 2 years performed an intensive resistance exercise (shoulder press, bench press, straightening up with weights) twice. For three days before the second test subjects have been administered N-acetyl-cysteine 3x600 mg/d (NAC). Venous blood samples were collected 5min before exercise, immediately post exercise and after 24h rest. Hemoglobin, plasma protein carbonyls (PC), lipid peroxidation products (TBARS), total protein, erythropoietin (EPO) and whole blood glutathione (GSH) levels as well as plasma glutamyltransferase (GGT), erythrocyte glutathione peroxidase (GPx) and glutathione reductase (GR) activities were evaluated.

Results: The applied exercise at maximal intensity (post-exercise lactate: 7.71 ± 2.13 and 8.00 ± 2.18 mmol/l) caused significant changes in the tested parameters. The pre- and post-exercise levels of oxidative damage (PC, TBARS) were lower after NAC administration. The glutathione metabolism (GSH, GGT, GPx, GR) was enhanced by NAC. No effect of NAC on EPO activity was observed.

Conclusions: Our study has shown that a strength exercise increases in oxidative damage level and initiates changes in glutathione metabolism whereas the N-acetyl-cysteine administration enhances antioxidative glutathione system and attenuates oxidative stress without any effect on erythropoietin level in subjects' blood.

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