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PHYSIOLOGY

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LEVELS OF THE MOST IMPORTANT COMPONENTS OF THE ANTIOXIDANT SYSTEM – ZINC AND SELENIUM IN PREGNANT WOMEN OF THE NORTH

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Abstract. The health status of a pregnant woman and fetus is largely determined by nutrition. It is important to balance the diet not only in proteins, fats, carbohydrates and vitamins, but also in the most important trace elements. One of them are representatives of antioxidant protection – zinc and selenium. The purpose of our study was to assess the availability of zinc and selenium in pregnant women with physiologically occurring pregnancies living in Khanty-Mansiysk. The survey involved 60 women (28 non-pregnant and 32 pregnant women of different gestation periods), aged 18-42 years. The concentration of zinc and selenium was identified in a substrate such as hair using inductively coupled plasma mass spectrometry. This study revealed a decrease in the average concentrations of selenium in all subjects. A significantly lower content of the main trace elements of antioxidant protection, namely zinc (p=0.038) and selenium (p=0.037) in the hair of pregnant women compared with the control group, was found. Zinc deficiency was found in pregnant women, while the content of this trace element in the group of non-pregnant women was at the lower limit of the reference values.
Keywords: zinc, selenium, antioxidant system, pregnant women.

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ASSOCIATION OF SINGLE NUCLEOTIDE VARIANTS OF THE PPAR FAMILY CANDIDATE GENES WITH COMPETITIVE DISTANCE AND QUALIFICATION OF ATHLETES

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Abstract. The objective of the study was to examine the frequency of alleles and genotypes of single nucleotide variants of receptor genes activated by the peroxisome proliferator and their transcriptional co-activator, depending on the competitive distance (short-, medium- and long-distance running) and qualifications of cyclic sports athletes (running in track-and-field, speed skating). We have found that minor alleles C rs4253778 of the Peroxisome Proliferator-Activated Receptor Alpha gene and G rs18012825 of the Peroxisome Proliferator-Activated Receptor Gamma gene can provide an advantage for achieving high performance in cyclic sports over short and medium distances. The minor C allele and the homozygous CC rs4253778 genotype of the Peroxisome Proliferator-Activated Receptor Alpha gene associated with competitive distance in athletes specializing in short- and medium-distance running. The frequency of minor alleles C rs4253778 of the Peroxisome Proliferator-Activated Receptor Alpha gene and G rs18012825 of

the Peroxisome Proliferator-Activated Receptor Gamma gene is associated with advanced training in sprinters.
Keywords: sports genetics, cyclic sports, single nucleotide variant, rs8192678 of The Peroxisome Proliferator-Activated Receptor Gamma Coactivator 1 Alpha gene, rs4253778 of the Peroxisome Proliferator-Activated Receptor Alpha gene, rs18012825 of the Peroxisome Proliferator-Activated Receptor Gamma gene.

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ADAPTATION POTENTIAL AND PSYCHOPHYSIOLOGICAL PERSONALITY TRAITS AS AN OPPORTUNITY TO ASSESS HEALTH OF MEDICAL UNIVERSITY STUDENTS

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Abstract. We have conducted an analysis of the adaptive potential of the cardiovascular system of Samara State Medical University students and identified its relationship with the type of coronary behavior and the leading division of the autonomic nervous system. The study included on 64 students. To assess the adaptive potential, we applied the methodology developed by Konevskikh L.A., Oranskij I.E., Likhacheva E.I.. To assess the leading type of the nervous system, the Kerdo autonomic index was used. The study of the coronary behavior was carried out using the Jenkins Activity Survey. It was revealed that the majority of medical students have an unsatisfactory level of adaptation. The leading division of the nervous system is the sympathetic division. The connection between adaptive potential and the type of coronary behavior has not been established.
Keywords: adaptive potential, autonomic index, type of coronary behavior, level of health.

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FEATURES OF NUTRITION AND CIRCADIAN DYNAMICS OF SALIVA INDICATORS IN EVENING CHRONOTYPE STUDENTS

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Abstract. The aim of the study was to investigate the characteristics of dietary intake, circadian nutrition patterns, and levels of cortisol, leptin, melatonin, and total antioxidant activity in saliva from students of different chronotypes. The chronotype was identified with the Morningness-Eveningness Questionnaire, and food diaries were processed using the "Nutrition for Health and Longevity" and "Individual Diet 5.0" computer systems. Levels of cortisol, melatonin, leptin and total antioxidant activity were identified in mixed saliva in the morning and evening hours. It has been revealed that individuals with an evening chronotype tend to have an increased caloric and carbohydrate intake. The time of their food intake has been shifted towards evening and night (eveningness eating habits). The average daily levels of cortisol and melatonin in saliva increase, and the total antioxidant activity decreases. The morning-evening pattern of the indices also alters. The revealed features could be a sign of pre-clinical metabolic disorders.
Keywords: chronotype, student nutrition, chrono-nutrition, nutritional status, cortisol, melatonin, leptin, total antioxidant activity of saliva.

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PERIPHERAL HEMODYNAMICS AND HEART RATE VARIABILITY IN POSTURAL CHANGES IN FEMALE STUDENTS

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Abstract. The features of hemodynamics in the upper limbs and heart rate variability during postural changes were studied in women 18-20 years old during the follicular and luteal phases of the menstrual cycle. Orthostasis has been shown to initiate a decrease in blood supply of the shoulder-forearm segment and an increase in sympathetic effect on heart rate. In active orthostasis, the detected changes do not depend on the phase of the cycle. In passive orthostasis, the effect is more pronounced in the follicular phase. Passive antiorthostasis causes a slowdown of venous outflow in all subjects. In antiorthostasis, an increase of the parasympathetic centers' activity occurs in the follicular phase.
Keywords: peripheral hemodynamics, heart rate variability, postural changes, menstrual cycle.

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UDC 612.84

MORPHOFUNCTIONAL INDICES OF THE NEURONAL COMPONENT OF THE VISUAL ANALYZER AND ADIPOSE TISSUE ACTIVITY OF HEALTHY YOUNG PEOPLE

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Abstract. The results of the analysis of the effect of body weight deficit, normal body weight and overweight on the morphofunctional parameters of the neuronal component of the visual analyzer in healthy individuals are presented. The study included an in-depth ophthalmological examination using an optical coherence tomograph with an analysis of the parameters of the optic nerve disc and the thickness of all retinal layers according to a standard three-dimensional scanning protocol. According to the results of the study, there is no absolute effect of adipose tissue activity on the parameters of the neuronal component. We have identified the patterns of increasing or decreasing morphofunctional indices depending on the body mass index.
Keywords: physiology, ophthalmology, optical coherence tomography, adipose tissue activity, retinal parameters, body mass index.

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COMPARATIVE STUDY OF SPECIFIC FEATURES OF PEOPLE'S COGNITIVE ACTIVITY IN INDIVIDUAL AND COMPETITIVE CONTEXTS

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Abstract. We studied the effectiveness of subjects' performance of the "Establishment of regularities" cognitive test individually and in dyad competition. The cluster analysis of

performance indices revealed 4 tactics of activity: 1 – "quickly, with errors", 2 – "quickly and accurately", 3 – "moderately", 4 – "slowly". The integral success coefficient was higher in subjects, who use the second and third tactics. In competition, an increase in the success rate relative to the individual stage was revealed, with the majority of subjects retaining their typical tactics of activity. The increase in efficiency occurred due to a reduction in analysis time, an increase in the number of viewed, correctly and incorrectly labeled digital groups, as well as a decrease in missed combinations.
Keywords: cognitive activity, performance, tactics, competition, social context.

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CHARACTERISTICS OF THE MORPHOFUNCTIONAL STATUS AND VERTICAL STABILITY OF BALLROOM DANCERS (THE CASE OF RUSSIA AND CHINA)

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Abstract. The aim of this article is to specify the differences in the parameters of morphofunctional status and vertical stability among elite ballroom dancers from Russia and China. The differences in the anthropometric data of Russian dancers have been identified: lower height, greater girth dimensions of the chest on inhale and exhale, smaller girth dimensions of the waist and thickness of the subcutaneous fat fold on the abdomen and greater maximum voluntary strength of the muscles of the left and right hands, higher basal metabolic rate, lower body mass index and body fat mass values. In terms of the "Target" test performed on the stability analyzer, no significant differences in vertical stability were found. The identified differences allow dancers from Russia to perform dance programs more efficiently in the competition finals.
Keywords: sports ballroom dancing, female dancers, elite athletes, morphofunctional status, anthropometric characteristics, body composition, Romberg test, stabilographic indices, vertical stability, dynamometry, tonometry, spirometry.

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THE INFLUENCE OF TRAINING DISCRETE RELAXATION OF FOREARM MUSCLES ON THE EFFECTIVENESS OF MANUAL SKILL LEARNING

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Abstract. The effectiveness of manual completion of the buzz wire game was identified after specific training ("Buzz wire game"), training for strength relaxation of the forearm muscles ("Relaxation"), combined training and without any training. It was revealed that the path's length, the smoothness of the trajectory and the coordination of the hand joints when completing the buzz wire game increased in the "Buzz wire game" group, less significant changes were found in combined training. No positive changes were registered in the "Relaxation" group. Thus, the additional training of strength relaxation did not have a positive effect on the formation of fine skill.
Keywords: discrete relaxation training, fine motor coordination training, strength proprioception, smoothness of movement.

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FEATURES OF HEART RATE VARIABILITY AND AUTONOMIC RESPONSE TO ORTHOSTATIC TEST IN ELITE FEMALE VOLLEYBALL PLAYERS

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Abstract. Achieving success on the world stage in women's volleyball is of great interest among biomedical specialists. The most informative rapid method for studying the regulatory systems of an athlete's body is currently the analysis of heart rate variability. The study involved 16 elite (Masters of Sport, Masters of Sport of International Class and Honored Masters of Sport) professional volleyball players (190±8 cm; 24±6 years), participating in the Super League of the Russian Championship and international competitions. The revealed changes in average values of female athletes during the transition from a lying position to orthostasis reflects different levels of autonomic sensitivity along individual regulatory circuits. When assessing the response to the orthostatic test, the individual characteristics of the body of volleyball players were examined, taking into account the type of autonomic regulation and playing role.
Keywords: heart rate variability, autonomic response, volleyball, professional sport, types of regulation, orthostasis.

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RESPIRATORY TESTS AS THE FUNCTIONAL FITNESS INDICES OF 13-15 YEARS OLD INTELLECTUALLY DISABLED ADOLESCENTS ENGAGED IN PARACHEER

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Abstract. The article analyzes the results of a study of the influence of ParaCheer on the functional fitness of adolescents with intellectual disabilities. Adolescents with intellectual disabilities (50 people) studying at a boarding school took part in the study in two groups (control and experimental) of 25 people each, identical in functional and anthropometric indices. At the beginning and end of the study, both groups performed respiratory function tests, the physical working capacity test, and lung capacity was measured with a spirograph. The control group at school studied eurhythmics during the third hour of physical education, and the experimental group attended ParaCheer classes. The subjects who took part in the study as part of the experimental group significantly improved the functional index of vital capacity and the results of control tests to determine the functional state of the respiratory system and physical working capacity, which confirms the positive effect of ParaCheer on the functional fitness level.
Keywords: functional fitness, performance, respiratory tests, adolescents, intellectual disabilities, vital capacity, ParaCheer.

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RELATIONSHIP OF PSYCHOEMOTIONAL STATE PARAMETERS AND MICRONUTRIENT STATUS IN HEALTHCARE WORKERS OF THE NORTH (THE CASE OF THE OKRUG CLINICAL HOSPITAL OF KHANTY-MANSIYSK)

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Abstract. Objective: to study the relationship between the psychoemotional state and micronutrient status among healthcare workers of the northern region. 100 doctors and nurses of the Khanty-Mansiysk Okrug Clinical Hospital participated: 23 men and 77 women (38.1±4.9 years). Psychofunctional state was rated in points. In bio-substrates, the concentration of micronutrients involved in the psychoemotional status regulation was identified: magnesium, potassium, vitamins B6 and C. An increased susceptibility to the development of mental burnout and the level of depression, as well as a deficiency of the aforementioned micronutrients (71-34%) were discovered. We have also identified significant connections between the psychoemotional state parameters and the provision of micronutrients involved in its regulation (r=0.711 – r=-0.449), which confirms the possibility of improving the emotional and psychological state by increasing the effectiveness of the micronutrient status of an individual.
Keywords: healthcare workers of the northern region, psychoemotional state, magnesium, potassium, vitamin B6, vitamin C.

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STUDY OF BIOCHEMICAL AND MORPHOLOGICAL FEATURES OF RAT BLOOD WHEN LOADED WITH TANSY EXTRACT UNDER OXIDATIVE STRESS

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Abstract. Tetrachloromethane (CCl4) is widely used in experimental models to initiate and study the effects of oxidative stress, as it is able to cause increased production of reactive oxygen species as a result of its metabolic breakdown, which affects the liver and blood system. The aim was to study reactive adaptations of morphological and biochemical composition of rat blood to intragastric load with tansy extract under oxidative stress. 90 male rats were used in the experiment. The first group – intact rats, no effects were applied to them; group 2 – animals receiving distilled water and CCl4 injections; group 3 – rats receiving aqueous tansy extract and CCl4 injections. Starting from 30 days of the experiment, rats of groups 2 and 3 received injections of tetrachloromethane oil solution for 6 days at a dose of 2 g/kg of animal weight. On days 0, 30 and 37 of the experiment the morphological composition of the rats' blood was identified, and on days 30 and 37 – the biochemical composition of blood. Additional loading of rats with plant antioxidants in the form of tansy extract helps to reduce the intensive effect of tetrachloromethane on the body and restore the disturbed homeostasis, which is manifested by normalization of morphological and biochemical parameters of blood.
Keywords: blood morphological composition, blood biochemical composition, oxidative stress, hepatoprotectors, tansy.

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FEATURES OF THE ORGANIZATION OF MUSCLE SYNERGIES IN DIFFERENT PHASES OF A RECURVE BOW SHOT

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Abstract. The research objective was to study the patterns of formation and modulation of muscle synergies that ensure the implementation of different phases of a complex coordination motor

action – a recurve bow shot. The parameters of muscle synergies were obtained by using the data matrix factorization methods. It was found out that the realization of different phases of a shot is provided by the activity of two main muscle synergies. The features of intermuscular interaction in various phases consist in flexible modulation of the degree of involvement of single muscles in synergies forming stereotypical time patterns of their activation. The formation of two different activation profiles of muscle synergies was found, which determines different strategies for organizing muscle activity to implement a stereotypical motor task.
Keywords: muscle synergies, archery, recurve bow, movement control, factor analysis.

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CHANGES IN HEART RATE VARIABILITY AND ELECTROENCEPHALOGRAPHIC RHYTHMS OF BETA-1 AND THETA RANGES IN RIGHT-HANDERS AND LEFT-HANDERS IN IMAGINED AND REAL LEG MOVEMENTS

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Abstract. The study showed that changes in heart rate variability and spectral power of the beta-1 and theta rhythm depend on the type of motor task and differ in right-handers and left-handers. In right-handers, the imagined and real leg movements caused approximately the same decrease in the rhythms of both frequency ranges in all electroencephalographic leads. In left-handers, the beta-1 rhythm decreased similarly to right-handers, while their theta rhythm changed more regularly when performing imagined movements. Changes in electroencephalographic rhythms correlate with heart rate variability parameters, however the nature of the correlations differs between right-handers and left-handers. The results allow us to speak about the unequal contribution of the right and left hemispheres to the heart rate regulation when planning and performing leg movements in individuals with different motor dominance profiles.
Keywords: right-handers, left-handers, heart rate variability, electroencephalographic spectral power, imagined and real leg movements.

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THEORETICAL AND METHODOLOGICAL ASPECTS OF RESEARCHING HEALTH STATE OF GIRLS STUDYING AT A MEDICAL UNIVERSITY

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Abstract. The results of a content analysis of articles published in Russian and international citation databases from 2019 to 2024 are presented. Of the 76 publications selected by keywords in e-library.ru, 13 publications met the main criteria. The authors of 3 articles conducted a comprehensive study of the health state of girls studying at a medical university. The remaining publications included questionnaires. Four main directions for assessing the health of female students have been identified: firstly, assessing the reproductive potential of students studying at medical universities; secondly, stratification of risk factors for the development of chronic non-communicable diseases; thirdly, self-assessment of health and level of empathy; fourthly, assessing the impact of the consequences of coronavirus on the psycho-emotional state and commitment to a healthy lifestyle.
Keywords: health, self-assessment of health, health protection, girls studying at a medical university.

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EFFECT OF PHYSICAL ACTIVITY ON HEART RATE VARIABILITY DURING MENTAL ACTIVITY DEPENDING ON THE SENSITIVITY OF SYMPATHETIC CENTERS IN STUDENTS

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Abstract. Physical activity causes a change in the nature of the autonomic nervous system's response to subsequent cognitive activity. The objective of the research is to study the effect of previous physical activity on heart rate variability during mental activity in students, depending on the sensitivity of the sympathetic nervous system. Sympathetic sensitivity was assessed based on the characteristics of heart rate in an orthostatic test. Mental load is accompanied by changes in heart rate variability, reflecting the activation of sympathetic cardiac centers. When mental activity is performed after physical activity, an increase in the parasympathetic division activity was noted. At the same time, in individuals with high sympathetic sensitivity, the tendency to activate the sympathetic system remains.
Keywords: heart rate variability, physical activity, mental activity, autonomic nervous system.

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ECHOCARDIOGRAPHIC INDICES OF MIDDLE-AGED AMATEUR HOCKEY PLAYERS

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Abstract. Objective: to assess the indices of the heart's functional state, reflecting the fitness for physical activity of middle-aged men who play ice hockey. The study involved 30 amateur hockey players and 30 non-hockey players aged 45-59. We conducted echocardiography and a cycle ergometer test, measured maximal oxygen consumption, blood glucose and lactate content. The dimensions and volumes of the left and right ventricles of the heart and maximal oxygen consumption of hockey players are significantly higher than those of non-players, while the reference values do not exceed the age norm. The content of blood glucose and lactate under the influence of physical activity increases predominantly in non-players compared to hockey players (8.49±1.63 vs 7.08±1.34 mmol/l and 12.42±3.38 vs 9.68±2.63 mmol/l respectively) ($p<0.05$). There were no signs of cardiac hypertrophy. The players were fit for physical activity.
Keywords: body dimension and composition, echocardiography, blood glucose and lactate content, men, age 45-59 years, ice hockey.

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FEATURES OF MORPHOFUNCTIONAL STATUS AND VERTICAL STABILITY OF ELITE DANCERS

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Abstract. The article deals with differences between morphological status and vertical stability indices of elite ballroom dancers. During a comparative analysis, we discovered statistically

significant gender differences in following morphofunctional indices: body length and mass, girth dimensions of the upper limbs (shoulder and forearm), maximum arbitrary strength of the right and left hand muscles. Results of a stabilographic study revealed reliable differences in the variation of the pressure center oscillations in the frontal plane, area of an ellipse, the length of the pressure center trajectory along the sagittal plane. These changes reflect the difference of morphofunctional status and vertical stability of athletes, formed under the influence of long-term training and the specifics of ballroom dancing. The materials of the study allow to reveal gender differences of adaptation to specific physical activity in elite ballroom dancers.
Keywords: complex coordination sports, ballroom dance, elite athletes, morphofunctional status, vertical stability, anthropometric characteristics, stabilography indices.

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ENDOTHELIAL DYSFUNCTION IN RAT MESENTERIC ARTERIES UNDER MODELING OF METABOLIC SYNDROME

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Abstract. In this work, we sought to clarify whether endothelial dysfunction, which develops in metabolic syndrome, is the main cause of the development of arterial hypertension. The focus was on changes in the relative contribution of endothelial-derived vasodilators to the modulation of vascular reactivity in the mesenteric arteries of Wistar rats fed a 20% fructose solution instead of drinking water for 16 and 32 weeks. After 16 weeks, the rats had an increase in the relative mass of visceral fat, an increase in the concentration of cholesterol and triglycerides in the blood, an increase in the concentration of glucose in the blood and insulin resistance, i.e. symptoms characteristic of metabolic syndrome developed. Consumption of fructose in rats was accompanied by the development of hypertension. Phenylephrine caused contractions of greater amplitude in isolated intact mesenteric arteries of rats with metabolic syndrome compared to rats of control groups, while the contractions of denuded arteries were the same. We showed that acetylcholine-induced relaxation of phenylephrine-precontracted mesenteric arteries was attenuated in metabolic syndrome rats. The NO-mediated component of acetylcholine-induced relaxation (in the presence of indomethacin) was significantly reduced in rats after 16 and 32 weeks of fructose consumption. However, relaxation of the arteries of metabolic syndrome rats due to endothelium-derived hyperpolarization (in the presence of indomethacin and L-NAME) was increased. Endothelium-independent relaxation of the mesenteric arteries of rats treated with metabolic syndrome to sodium nitroprusside was the same as in the arteries of rats of control groups. Thus, the results of our study indicate that the increased contraction of mesenteric arteries caused by stimulation of α-adrenergic receptors in rats with metabolic syndrome is due to a decrease in endothelial NO production. The endothelium-derived hyperpolarization appears to partially compensate for this dysfunction.
Keywords: metabolic syndrome, arterial hypertension, mesenteric artery, endothelium, nitric oxide, endothelial hyperpolarization.

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EFFECT OF BEE PRODUCTS ON ADAPTATION RESERVES OF A BODY IN STRESS

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Abstract. The aim of this work is to study the effect of bee products on the electrophoretic mobility of red blood cells and lipid peroxidation process of rats subjected to stress.

We used 84 white non-linear female rats weighing 180-200 g for the experimental study. The animals were divided into 2 groups. In group 1, we investigated the effect of bee products (bee venom, royal jelly, honey, propolis) on an intact organism. In group 2, we restrained the animals. After the restraint procedure, the animals were treated with bee products. The therapy took 7 days. We have produced a blood sampling from the hyoid vein of rats before and after 15 minutes, 1 day, and 1 week after the last injection of bee products. Then, we evaluated changes in the electrophoretic mobility of red blood cells and the malondialdehyde concentration. Honey, royal jelly, propolis and bee venom caused the restoration of electrophoretic mobility of red blood cells and lipid peroxidation processes in animals after stress caused by the restraint. Royal jelly had the greatest effect.
Keywords: stress, erythrocytes, bee products, bee venom, royal jelly, honey, propolis.

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INDICES OF THE FUNCTIONAL STATE OF THE CENTRAL NERVOUS SYSTEM AND AUTONOMIC HEART RHYTHM REGULATION OF STUDENTS WITH DIFFERENT LEVELS OF PERSONAL ADAPTIVE POTENTIAL

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Abstract. Objective: to analyze the influence of personal adaptive potential on the functional state of a student's body according to the hand-eye response and heart rate variability data. The results of the empirical study are based on the diagnostic data of 61 male students, with an average age of 19 [18.00-21.00] years. We identified and analyzed the features of the functional state of the central nervous system and the mechanisms of heart rhythm regulation in groups of students with different adaptive potential. More pronounced tension of the functional state of the central nervous system and mechanisms of heart rhythm regulation in the groups of students with satisfactory and high personal adaptation potential was found. The obtained data can be interpreted as a "physiological cost" paid by the body for effective adaptation of an individual in the social environment.
Keywords: central nervous system, functional state, heart rate variability, students, personal adaptive potential.

BALNEOLOGY AND REHABILITATION

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SULFUR BATHS IN MEDICAL REHABILITATION OF PATIENTS WITH POST-TRAUMATIC GONARTHROSIS

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Abstract. The objective of the research is to study the effectiveness of medical rehabilitation of patients with post-traumatic gonarthrosis using sulfur baths. The research included 84 patients with post-traumatic gonarthrosis. They were divided into 2 groups by simple randomization: in the comparison group (n=41), the patients had standard spa treatment; in the main group (n=43), sulfur baths were additionally included. In order to assess the effectiveness of rehabilitation, clinical and functional examination methods were applied. The analysis of clinical and functional parameters with the patients suffering from post-traumatic gonarthrosis revealed a 2.4-fold ($p<0.01$) pain reduction on the visual analogue scale in the main group, and 1.6 ($p<0.01$) in the comparison group with inter-group differences. Western Ontario and McMaster University osteoarthritis index knee function improved by 2.7 times ($p<0.01$) for the main group, for the comparison group – by 1.8 times ($p<0.01$). The improvement in clinical and functional indices was associated with a high degree of correlation with the restoration of the quality of life of the patients. In the main group the European Quality of Life Questionnaire's results improved by 1.6 times ($p<0.01$), in the comparison group – by 1.3 times ($p<0.05$) without inter-group differences. The overall effectiveness of the developed medical rehabilitation programs (stage 3 – spa treatment) for patients with post-traumatic gonarthrosis in the main group amounted to 86.4%, in the comparison group – 75.3%. For patients with post-traumatic gonarthrosis, we have developed a rehabilitation program at the 3rd sanatorium-resort stage with the inclusion of sulfur baths, which ensured the restoration of the knee joint dysfunctions and an improvement in the quality of life.
Keywords: post-traumatic gonarthrosis, spa treatment, sulfur baths, Ramed.

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THE RELATIONSHIP BETWEEN THE FUNCTIONAL AND PSYCHOLOGICAL CONSEQUENCES OF RADICAL PROSTATECTOMY IN PROSTATE CANCER PATIENTS

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Abstract. The purpose of the study is to elucidate the causal relationship between the physical functioning of prostate cancer (PC) patients with urologic complications of radical prostatectomy

(RP) and their psycho-emotional state. The study included 90 patients with TI-IIIAN0M0 PC who underwent planned RP 24 months ago in the Urology Department of the Clinical Hospital. The average age was 65.9±6.3 years. Coughing test, 24h Pad-test, International Index of Erectile Function (IIEF-5) were used in the examination. The severity of psychological distress was measured using a distress thermometer and analyzed using the Hospital Anxiety and Depression Scale (HADS). According to the results of the study, patients have urological complications of RP: mild urinary incontinence (UI) in 70% and moderate in 30% of patients, and mild erectile dysfunction (ED) in 8.9% of patients, moderate in 20% and severe in 71.1% of patients. 94.4% of patients had moderate distress (2.3±0.79), clinically significant distress was found in 2.2% of patients, clinically significant anxiety in 15.5% and depression in 20% of patients. The level of distress is mainly influenced by depression, the level of anxiety is influenced by UI and ED, and the level of depression is influenced by ED. Late urologic complications cause and sustain psycho-emotional disorders in patients undergoing RP.
Keywords: prostate cancer, radical prostatectomy, erectile dysfunction, urinary incontinence, psychological distress, anxiety, depression.

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THE REHABILITATION POTENTIAL OF SULFIDE-SILT MUDS IN SELECTED RESORT AREAS OF RUSSIA

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Abstract. We have analyzed studies on the physical and chemical composition of sulfide-silt muds from various lakes of the Samara Oblast and Stavropol Krai. The nature of the protective effect of humic substances of various genesis and seasonal changes in the composition of individual groups of humic substances have been evaluated. While analyzing the rehabilitation potential of sulfide-silt muds, emphasis was placed on the anti-inflammatory effect of preparations from the Lake Tambukan muds, according on their thermal, baric and chemical effects. For comparative assessment of the fractional composition of sulfide-silt therapeutic muds of various mineralization from the four largest mud lakes of the Samara Oblast (Lake Molochka, Lake Teplovka, Lake Solodovka and Lake Sernoe), Lake Bolshoy Tambukan (Stavropol Krai) and analysis of seasonal changes in their group composition we used the "Chernoff Faces" multidimensional pictographs.
Keywords: sulfide-silt muds, humic substances, humic acids, Lake Tambukan, sulfur lakes of the Samara Oblast, mud therapy, anti-inflammatory effect.

SPORTS MEDICINE

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CARDIAC REMODELING INDUCED BY PHYSICAL ACTIVITY

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Abstract. This review provides information on the structural and functional changes occurring in the heart during exercise-induced remodeling. Differences between adaptations in athletes of strength and cyclic sports are reflected, and reference values are shown, which allow to distinguish positive adaptation, associated with increases in the capabilities of the body during training, from pathological processes. Also, the present review reflects data on physiological mechanisms of development of sports remodeling of cardiac muscle, which is extremely important for timely allocation and introduction of changes in training and recovery periods, as well as for avoiding misinterpretation of the obtained data and defining them as pathological processes in the body of the examined individuals.
Keywords: cardiac remodeling, sports heart, adaptation, athletes.

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CYP1A2 GENOTYPE AND THE EFFECT OF CAFFEINE SUPPLEMENTATION ON PHYSICAL PERFORMANCE OF COMBAT ATHLETES: AN EMPTY SYSTEMATIC REVIEW OF RANDOMIZED CONTROLLED TRIALS

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Abstract. Caffeine is a popular ergogenic agent used in combat sports. The ergogenic effects of caffeine on physical performance are well known. However, differences in response to caffeine consumption exist between individuals. Genetic variation in a particular gene, human cytochrome P450 enzyme 1A2 (CYP1A2) (rs762551), may be one of the reasons for this difference. The aim of the study was to systematically search for and analyze randomized controlled trials evaluating the effect of CYP1A2 genotype on the ergogenic response to caffeine in combat athletes. This study was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses statement. Literature searches were performed in PubMed, MedNar, Cochrane Library, Epistemonikos and Elibrary databases. No date or language filter was set. A total of 4503 references were identified in the databases. No studies met the inclusion criteria. Despite the blank review, we believe it is appropriate to publish our results because this study has identified a gap in the literature regarding the association between genetic polymorphism of CYP1A2 isoenzyme and physical performance in combat athletes on caffeine ingestion.
Keywords: CYP1A2 genotype, sport, performance, caffeine, ergogenic aid, combat sports.

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AUTOLOGOUS PLATELET-RICH PLASMA IN COMPLEX TREATMENT OF KNEE JOINT INJURIES IN YOUNG SOCCER PLAYERS

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Abstract. Purpose of the study: to evaluate the autologous platelet-rich plasma effectiveness in the complex treatment of knee injuries in young soccer players. The study included 47 young men 15.06±1.40 years old, duration of the disease was 9.06±2.86 days. 9 athletes (19.1%) had a partial injury to the lateral collateral ligament, 23 (48.9%) – the medial collateral ligament, 8 (17%) – the medial patelofemoral ligament; 7 (14.9%) – patellar tendon. Athletes were divided into two groups: in the main group (n=22), treatment was carried out for three weeks, including exercise therapy, magnet therapy, phonophoresis with ketoprofen, and platelet-rich plasma injections. The control group (n=25) had a similar treatment, but without platelet-rich plasma injections. Athletes were examined before treatment and immediately after treatment. The visual analogue scale was used to assess the maximum level of pain during daily activities. To assess the functional state of the knee joint, specific questionnaires were implemented: Lysholm knee scoring scale and 2000 International Knee Documentation Committee subjective knee evaluation form. The Whole-Organ Magnetic Resonance Imaging Score protocol was applied to assess magnetic resonance imaging before and after treatment. After the treatment, both groups had a statistically significant improvement in terms of pain and functional state of the knee joint – $p<0.05$, however, according to magnetic resonance imaging data, a significant change was noted only when assessing bone marrow edema and joint effusion – $p<0.05$. In a comparative analysis of the results, it was significantly proven that the group receiving platelet-rich plasma injections had a more pronounced reduction in pain level and an improvement in the knee functional parameters – $p<0.05$. According to magnetic resonance imaging, significant differences between groups were noted in terms of joint effusion – $p=0.009$. The data obtained in this study indicate that platelet-rich plasma injections can significantly reduce the pain level and increase the knee functionality compared to the control group. After the treatment, according to magnetic resonance imaging data, it was revealed that the use of platelet-rich plasma injections has an advantage in the form of a more pronounced anti-edematous effect.
Keywords: ligament injury, knee joint, autologous platelet-rich plasma, platelet-rich plasma injection.

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THE TRANSCRANIAL ELECTRICAL STIMULATION COURSE IN RECOVERY OF KARATEKAS IN CONDITIONS OF TRAINING IN MIDDLE ALTITUDE

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Abstract. Previously, the scientific works demonstrated the efficiency of transcranial electrical stimulation in normal oxygen concentration conditions. Under the influence of transcranial electrical stimulation central hemodynamic parameters are normalized, and recovery after physical activity is accelerated. The objective of the work was to study the effects of a transcranial electrical stimulation course for the recovery of karatekas during training in middle altitude. 22 karatekas took part in the study of the effect of transcranial electrical stimulation on the psycho-functional state of athletes. The research was conducted in Kislovodsk, on the Maloe Sedlo mountain in middle altitude conditions at the height of 1240 meters. It was revealed that a course of 8 transcranial electrical stimulation sessions of 30 minutes increases the speed of sensorimotor actions, increases mental capacity, optimizes sympathetic and parasympathetic balance, reduces the amplitudes of beta, delta and theta rhythms. Changes in the parameters of temporal and spectral analysis of heart rate variability, variation pulsometry in male and female karatekas

demonstrate the positive effect of transcranial electrical stimulation on the heart rate autonomic regulation mechanisms, which is more pronounced in women. The course also contributed to the improvement of psychophysiological parameters: reduction of time and stability of simple sensorimotor reaction.

Keywords: transcranial electrical stimulation, physiotherapy, karatekas, middle altitude, recovery.

PHYSICAL CULTURE AND PROFESSIONAL PHYSICAL TRAINING

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COMPONENTS OF MOVEMENT ACCURACY AND THE POSSIBILITY OF THEIR TRAINING IN SPORTS AND PHYSICAL CULTURE

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Abstract. The purpose of the research was to classify the components of motor accuracy and analyze the effects of its targeted training in athletes of different sports and skill levels, as well as in those not involved in sports. During research, data on the composition and structure of motor accuracy was summarized and systematized, as a result of which a classification was proposed for application in physical culture and sports. The main components of motor accuracy are as follows: target accuracy, accuracy of differentiation, measurement, assessment, reproduction of spatial, power, temporal and tempo-rhythmic parameters of movement, accuracy of orientation in the spatio-temporal field, accuracy of postural characteristics reproduction. We have carried out an analysis of the effects of targeted training of motor accuracy, which revealed that the highest positive gains were in groups of beginner athletes of team and extreme sports (situational sports).
Keywords: motor accuracy, spatial parameters of movement, power parameters of movement, tempo-rhythm parameters of movement, target accuracy, badminton, soccer, BMX, track-and-field.

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IMPROVING PROFESSIONALLY APPLIED PHYSICAL TRAINING OF MEDICAL UNIVERSITY STUDENTS

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Abstract. The purpose of the study is to develop and experimentally substantiate a program of professionally applied physical training for students of the Astrakhan State Medical University. 80 students of the main medical group took part in the study. We examined the influence of professionally important characteristics of students on indices of general physical fitness and functional state. Analysis of the data obtained confirms the effectiveness of the developed physical training program, which is confirmed by statistically significant changes in the functional fitness of students of the experimental group: a decrease in the Ruffier index and physical performance index to 25% ($p<0,05$). The average value of students' functional changes index differs slightly ($p>0,05$). The results demonstrated that the developed program contributes to the improvement of the mental and physical qualities of students, their readiness for future professional activities.
Keywords: professionally applied physical training, functional capabilities, functional fitness, physical performance, students.

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ACCELERATED SWIMMING TRAINING WITH A SUPPORT SCULL FOR STUDENTS OF PHYSICAL EDUCATION UNIVERSITIES

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Abstract. Teaching swimming to physical education university students is a professionally applied task, because a qualified specialist must have knowledge of, be able to, and master the skills of basic sports. A specially developed set of tools and methods, focused on the goals and objectives of those involved and limited to training in universities, will help future coaches quickly and efficiently master swimming techniques. The purpose of the study is to identify the influence of support scull exercises on the development of front crawl swimming techniques by students of physical education universities. The results revealed that application of exercises to create an emphasis at the stage of teaching swimming to students of physical education universities contributed to the rapid formation of the skill of staying on the surface, eliminated hydrophobia, and made it possible to efficiently influence the formation of the scull's phase structure while doing the front crawl.
Keywords: support scull, swimming training, front crawl swimming technique, students of physical education universities.

THEORY AND METHODS IN SPORTS

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POSSIBILITIES OF PHYSIOMASTER MOBILE APPLICATION FOR ASSESSMENT OF TRUNK FLEXION-EXTENSION MOVEMENTS ASYMMETRY

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Abstract. The article deals with the use of PhysioMaster mobile application for the assessment of neuromotor indices of movement asymmetry among young age athletes. Using the mobile application the measurements of torso deviation angles in three planes: sagittal, frontal and transversal were carried out for 32 students of the Faculty of Physical Culture of the State University of Education. The possibilities of PhysioMaster mobile application for estimation of asymmetry of torso flexion-extension movements were determined, which allow to reveal individual morphodynamic (structure of musculoskeletal system and neuromuscular regulation of performed movements) peculiarities of this movement and to estimate the characteristics of deviation asymmetry in three planes. It is experimentally established that the root cause of movement asymmetry is the torso deviation from the vertical in the frontal plane, which is compensated by torso rotation in the transversal plane during torso inclination.
Keywords: information technology, gadgets, monitoring, motoneurons, lateral organization profile.

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ADAPTATION CAPABILITIES OF THE CARDIOVASCULAR SYSTEM OF YOUNG SOCCER PLAYERS AT THE STAGES OF SPORTSMANSHIP DEVELOPMENT

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Abstract. The results of a monitoring assessment of the functional state of the cardiovascular system of soccer players aged 12-18 years (n=526) from sports schools in the southern regions of Russia, undergoing sports training at the stages of developing sportsmanship, where competitive activity determines the athlete's qualifications, are presented. Based on the data obtained before and after the load (the Martinet-Kushelevskij functional test), the main hemodynamic indices, efficiency coefficient and type of self-regulation of blood circulation, characterizing the functional state and adaptive capabilities of the athlete's body, were assessed. We have found that by the age of 16, the performance of players approaches the level of an adult healthy person and can be interpreted as normal for non-athletes. Features of the reaction to a standard load for 12-, 13-, 14-, 15-year-old football players reflect the predominance of sympathetic influences in the cardiac activity regulation, with low functional capabilities of the heart. It was determined that the cardiovascular type of blood circulation predominates in 16-year-old soccer players. At the age of 17 and 18 years, an excessive increase in heart rate was detected immediately after exercise, and positive shifts towards the vascular type of self-regulation of blood circulation signal the development of long-term adaptation of the cardiovascular system to playing soccer in the direction of increasing its functional reserves.
Keywords: young soccer players, cardiovascular system indices, adaptive capabilities, functional state.

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THE INFLUENCE OF CLUSTER SETS IN RESISTANCE TRAINING ON THE STRENGTH PERFORMANCE OF WRESTLERS: AN EMPTY SYSTEMATIC REVIEW OF RANDOMIZED CONTROLLED TRIALS

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Abstract. Strength training of wrestlers is an integral part of physical training. Objective: to conduct a systematic search and analysis of randomized controlled trials evaluating the effect of cluster sets in resistance training on the strength performance of wrestlers. This study was conducted in accordance with the statement of Preferred Reporting Indicators for Systematic Reviews and Meta-Analyses. Literature was searched in the PubMed, MedNar, Epistemonikos, Lilacs, Cochrane Library, Scopus, ResearchGate, Library and Google Scholar databases. The filter by date is from 2004 to February 2024. The study did not include a language barrier. A total of 1,855 mentions were identified in the databases. None of the studies met the inclusion criteria. Despite the empty review, we consider it appropriate to publish our results, since this study has revealed a gap in the literature regarding the use of cluster sets in resistance training of wrestlers.

Keywords: wrestling, cluster sets, strength training, resistance training, athletic performance.