

PHYSIOLOGY

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PARTICIPATION OF THE CENTRAL NUCLEUS OF THE AMYGDALA COMPLEX IN THE SYSTEMIC HEMODYNAMICS REGULATION IN CONDITIONS OF REST AND CHRONIC STRESS

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Abstract. The amygdala complex is an important and key subcortical structure of the limbic system, which is located in the temporal lobe of both the right and left cerebral hemispheres. Due to the presence of extensive connections with different areas of the brain, the amygdala performs a number of vital functions (reaction to fear, caring for offspring and sexual behavior, memory, emotions, etc.). The work assessed the consequence of the amygdala on the systemic hemodynamics regulation in conditions of rest and chronic stress. The results obtained suggest that the amygdala complex is one of the key structures regulating physiological reactions aimed at maintaining hemodynamic homeostasis.

Keywords: central nucleus of the amygdala complex, subcortical structures of the limbic system, stress syndrome, cardiovascular system.

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RESPONSIVENESS OF HEMODYNAMIC SYSTEMS IN CYCLIC SPORTS ATHLETES DURING STRESS TESTING

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Abstract. This study investigates the responsiveness of hemodynamic systems in athletes engaged in cyclic sports, characterized by different maximum speeds achieved during load testing. The sample comprised male athletes engaged in cyclic sports (n=76), with an average age of 19.15 ± 2.48 years. The distribution of athletes across sports was as follows: ski racers – 40%, track-and-field athletes – 30%, swimmers – 30%. The test protocol was implemented on the Assault AirRunner treadmill using pulse sensors (Polar H10) and a running power meter (Stryd). The hemodynamic parameter playing a leading role is systemic vascular resistance, particularly the dynamics of its reduction within the groups. In the first group, systemic vascular resistance demonstrated a two-phase reduction, with a minimum value at the third stage and peaks at the first and fifth stages of testing. This scenario reflects an adequate responsiveness of hemodynamic parameters to progressively increasing loads. In the second group, systemic vascular resistance exhibited an alternating reduction within 15% from the first to the fourth stage. At the fifth stage, a maximum reduction of systemic vascular resistance was observed, which was 12.48% higher than in the first group, indicating a compensatory reaction of the hemodynamic system with an insufficient level of reserve capabilities of central hemodynamics and inotropic function of the heart.

Keywords: reactivity, hemodynamic parameters, athletes, stress testing, speed of load execution.

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RELATIONSHIP BETWEEN THE ELECTRICAL ACTIVITIES OF THE MUSCLES THAT PERFORM FOOT MOVEMENTS IN SOCCER PLAYERS

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Abstract. The study of the electrical activity of muscles allows to get an idea of the strategy of control by the central nervous system over individual muscle groups. The aim of the study is to investigate the relationship between the electrical activities of muscles performing foot movements in soccer players. The method of surface electromyography was applied. In the mode of maximum voluntary muscle contraction we recorded electrical activity of functional groups of synergistic muscles: calf – long peroneal, long peroneal – little finger abductor muscle, anterior tibial – long extensor of the big toe of the foot simultaneously from both limbs. Electrophysiological markers of functional fitness of soccer players are proposed, namely: the direction and closeness of correlations in the functional groups of synergistic muscles, as well as the asymmetry of electrical activity of the studied muscles that perform foot movements.

Keywords: calf muscle, long peroneal muscle, little finger abductor muscle, tibialis anterior muscle, long extensor of the big toe of the foot, relationships of the electrical activity of muscles.

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STRESS-INDUCED CHANGES AND RECRETION OF CATECHOLAMINES, RENIN AND ALDOSTERONE

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Abstract. The study presents the results of analyzing the dynamics and recretion into saliva of hormones and catecholamines under conditions of emotional stress in healthy individuals. The study included modeling emotional stress with control of stress parameters, studying the content of catecholamines, renin and aldosterone in saliva and blood serum. It was found that emotional stress changed the permeability of the hematosalivary barrier, causing significant changes in the content of the studied substances. These changes reflected the dynamics of the body's adaptation processes to emotional stress. The analysis of the results made it possible to characterize the sensitivity of the hematosalivary barrier to the effects of emotional stress and identify the specificity of the recretion of the studied hormonal and neurohumoral substances into saliva. The research results can be used for diagnosis and monitoring of the body's condition under emotional stress.

Keywords: renin, aldosterone, catecholamines, emotional stress, recretion, non-invasive screening diagnosis.

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THE EFFECT OF CHRONIC PREDATOR STRESS ON THE SORPTION OF THE SMALL INTESTINE AND LIVER

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Abstract. The aim was to study the nature of changes in the sorption of neutral red in the small intestine and liver of rats when modeling chronic predator stress. In male Wistar rats, colorimetric studies of the concentration of neutral red in alcohol extracts from the small intestine and liver were performed after intracardiac administration of 0.5% aqueous solution of neutral red at the rate of 1.0 ml per 100 g of animal weight. With chronic predator stress, stress-induced changes develop in the small intestine and liver of rats, which affect the sorption of neutral red. In the small intestine, after 15 minutes of exposure to neutral red in the rat body, its concentration increased by 1.886 ± 0.072 times, in the liver – by 1.755 ± 0.098 times. The process of absorption of neutral red from the small intestine into the blood and lymph slowed down, reducing its flow through the portal vein system to the liver. An increase in the sorption capacity of the small intestine for neutral red indicated an increase in its absorption and a decrease in elimination, which expressed a violation of the permeability of the intestinal wall.

Keywords: Wistar rats, predator stress, small intestine, liver, sorption, neutral red.

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MORPHOFUNCTIONAL STATUS AND AEROBIC ENDURANCE OF RHYTHMIC AND AESTHETIC GYMNASTS

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Abstract. This article presents data from a comparative analysis of morphofunctional status parameters, psychophysiological testing data, mental and physical performance of gymnasts engaged in various types of gymnastics. Significantly higher values of volumes and capacities of the external respiration were found in the aesthetic gymnastics group, which is associated with the specifics of physical activity. Significant differences in psychophysiological characteristics were registered in assessing the accuracy of perception of space and time, which is explained by the developed ability of gymnasts engaged in aesthetic gymnastics to respond more quickly to sound and other signals. The results of the Cooper test confirmed the greater aerobic capabilities of the aesthetic gymnasts, who had greater values of maximum oxygen consumption, as well as systolic volume and cardiac output after the test.

Keywords: elite athletes, rhythmic gymnastics, aesthetic gymnastics, psychophysiology, mental performance, physical performance, morphofunctional status, aerobic endurance, Cooper test, spirometry.

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CORRELATIONS OF THE HEMOSTASIS SYSTEM INDICATORS IN EXPERIMENTAL DIABETES MELLITUS

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Abstract. We studied changes in the correlations of the hemostasis system parameters in experimental diabetes mellitus. During the development of alloxan-induced diabetes in rats, on the 3rd day, most of the existing correlations between the parameters of vascular and platelet hemostasis are destroyed, and new ones, both positive and negative, appear between the coagulation hemostasis indicators, accompanied by the development of severe hypocoagulation. On the 7th day, this system tries to compensate the occurred disorders, numerous new connections are formed, but its reserves are not enough. From the 14th day, we have found almost complete mismatch of correlation interactions caused by a violation of all parameters of hemostasis, the anticoagulant system and fibrinolysis.

Keywords: diabetes mellitus, platelets, hemostasis, correlations.

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AUTONOMIC RESPONSE TO ORTHOCLINOSTATIC TEST IN PROFESSIONAL BANDY PLAYERS

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Abstract. An in-depth medical examination is not enough to monitor the impact of the training and competitive process on the functional status of professional bandy players. Daily dynamic monitoring of the functional status is required using the express method of analyzing heart rate variability with functional tests. The study involved 22 players (Candidates for Master of Sport and Masters of Sports of Russia) of the “Rodina” Professional Hockey Club in Kirov during the preparatory and competitive periods (Russian Cup and Championship). In total, about 600 examinations were carried out using the express method of heart rate variability analysis, in the morning immediately after sleep before exercise and breakfast, and then an hour after training. It has been found that the transition from clinostasis to orthostasis is accompanied by increased activity of the central circuit of heart rate regulation. Subsequent transfer to clinostasis reduces tension on the part of the central mechanisms and enhances the trophotropic effect of the parasympathetic division on the heart rhythm. The autonomic response level of bandy players follows a normal pattern. Daily differences in the autonomic response severity were also revealed.

Keywords: heart rate variability, autonomic responsiveness, orthoclinostatic test, adaptation, professional sport, bandy.

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ASSESSMENT OF OXIDATIVE METABOLISM IN YOUNG MALE WINTER SPORTS ATHLETES LIVING IN THE NORTH

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Abstract. Objective: to study the oxidative metabolism parameters in young male winter sports athletes living in Khanty-Mansiysk. 50 young winter sports athletes (18±1.5 years old), permanently residing in a boarding college in Khanty-Mansiysk, participated in the study. Test kits were used to identify the lipid peroxidation parameters: lipid hydroperoxide, malondialdehyde and antioxidant defense: total antioxidant activity and thiol status, oxidative stress coefficient was calculated according to the formula. It was established that the concentrations of lipid hydroperoxide and malondialdehyde in blood exceeded the upper limit of normal against the background of low antioxidant defense parameters, which requires replenishment of antioxidant reserves.

Keywords: young male athletes, northern region, oxidative metabolism, lipid peroxidation, antioxidant activity.

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PHYSIOLOGICAL COST OF BODY ADAPTATION OF COSMONAUTS OF DIFFERENT SOMATOTYPES TO EXTRAVEHICULAR ACTIVITY UNDERWATER

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Abstract. The study conducted in the Gagarin Research & Test Cosmonaut Training Center made it possible to identify the physiological cost of body adaptation of cosmonauts of different somatotypes to the conditions of extravehicular activity underwater. The study involved 24 cosmonauts, who were divided into three groups according to somatotypes (Chernorutskij method). The cosmonauts equipped with Orlan-GN spacesuits performed the typical operations of extravehicular activity underwater. Throughout the training, the physiological indices of the cosmonauts were recorded. Before and after the extravehicular activity training, hemodynamic indices were recorded at rest, physical performance and speed of recovery processes, resistance to hypoxia and muscle strength were also assessed. Comparison of the obtained data revealed different values of functional shifts of the studied indices in cosmonauts of different somatotypes.

Keywords: cosmonauts, somatotype, extravehicular activity, underwater, adaptation cost.

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ASSOCIATIONS OF SOME PSYCHOPHYSIOLOGICAL AND BIOIMPEDANCE INDICATORS OF AN ATHLETE WITH COMPETITIVE PERFORMANCE IN TAEKWONDO

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Abstract. The article presents the results of a study on associations of some bioimpedance and psychophysiological indicators with the competitive success of junior taekwondo athletes. Body

composition was registered using the ABC-01 Medass bioimpedance analyzer, psychophysiological features were evaluated with the “Choice Reaction” test on the NS-Psychotest complex. Statistical analysis included the Spearman’s rank correlation analysis. The results revealed significant correlations between tissue impedance at 5 and 50 kHz and place won. Weak correlations were observed between muscle mass and competitive success. No correlations were found between complex visual-motor reaction parameters and competitive success, but a moderate relationship was discovered between reaction time and sportsmanship.

Keywords: taekwondo athletes, body composition, complex visual-motor reaction, competitions.

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AUTONOMIC BALANCE ASSESSMENT IN THE APPLICATION OF TECHNOLOGY FOR CORRECTING STUDENT-ATHLETES’ BEHAVIOR SELF-REGULATION

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Abstract. The autonomic balance was assessed by the heart rate variability parameters using the Poly-Spectrum complex (Neurosoft, Ivanovo), i.e. background recording in a horizontal position. We analyzed the indicators of spectral frequency analysis of heart rate variability. The calculations were performed with Microsoft Excel 2017 for Windows. The research shows that the use of technology to correct student-athletes’ behavior self-regulation style (while maintaining daily educational and physical activities) has a positive effect on the autonomic regulation of cardiac activity and reactivity. The conducted research has confirmed that non-drug methods of psychophysiological conditions correction through an effective style of student-athletes’ behavior self-regulation contribute to maintaining the body’s reserve capabilities.

Keywords: health, student-athletes, heart rate variability, autonomic regulation, educational and physical activities.

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FUNCTIONAL STATE OF THE RESPIRATORY SYSTEM OF NORTHERN REGION UNIVERSITY STUDENTS

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Abstract. The objective was to assess the functional state of the respiratory system of students of the Northern region. Spirographic examination of 81 students (50 girls and 31 boys) aged 18-20 years was carried out. External respiration was assessed with the “Spiro-Spectrum” device (Neurosoft). As a result, exceeding of proper values by 10-15% of vital capacity of lungs and forced breathing in boys, in girls – decrease of vital capacity of lungs and forced breathing by 10-20% relative to proper values were found. Obstructive dysfunction of varying degrees was found in 50% of the examined girls, in boys this dysfunction was noted only in one fifth of the sample (the differences were reliable). Comparison of our own results with regional studies in 2017 revealed a decrease in the average forced breathing, more pronounced in girls.

Keywords: respiratory system, spirometry, students, Northern region.

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DYNAMICS OF MORPHOMETRIC PARAMETERS OF RAT'S NEUTROPHILS UNDER THE INFLUENCE OF COPPER-ZINC PYRITE ORE

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Abstract. The aim of the study: to study the features of the morphofunctional state of neutrophilic leukocytes under the influence of copper-zinc pyrite ore. Morphometric methods allow us to evaluate the quantitative and qualitative properties (diameter, perimeter, height, area, volume) of formed blood elements under pathological and extreme effects on the body. The study was conducted on 70 white non-linear male rats aged 3-4 months, the experiment lasted 60 days. In accordance with the period of ore intoxication, 6 groups were formed: a control group and 5 experimental groups. In the experimental groups, an aqueous suspension of ore was orally administered to rats for 10, 20, 30, 45 and 60 days. Three main morphological types of neutrophils have been identified: immature morphological type, functionally active mature cells, and degeneratively altered neutrophils. The results of the study found that under the influence of ore, the pool of circulating neutrophils is redistributed towards an increase in the proportion of rod-shaped and hypersegmented cells, which may indicate an imbalance in the cellular composition of the non-specific link of immunity. A decrease in the area of neutrophils was also revealed during all periods of the experiment, indicating a functional insufficiency of the protective functions of the body. The analysis of regression curves revealed a directly proportional relationship between the area of cells and their number in the control group. Under the influence of ore, the dependence becomes hyperbolic: with an increase in the area of cells over 150 microns, the relationship between these variables disappears, i.e. an increase in the number of cells does not affect their size.

Keywords: neutrophils, cell area, copper-zinc pyrite ore, morphometric parameters, rats.

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MORPHOFUNCTIONAL STATUS OF ADOLESCENT BOXERS FROM THE POINT OF SEXUAL DIMORPHISM

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Abstract. The objective of the study was to identify the features of the morphofunctional status of adolescent boxers from the point of sexual dimorphism. The morphofunctional status study involved adolescent boxers (14 years old) and included determination of indicators of heart rate variability, central hemodynamics and body composition. The results of the study have provided a medical and biological basis substantiating the problem of sexual dimorphism in sports, boxing in particular. As studies have shown, for adolescent boxers, sexual dimorphism manifests itself both in morphological indicators (height, weight, body composition), and more significantly in functional indicators of the cardiovascular system activity, which in males works, on the one hand, more efficiently, and on the other hand, it is more productive than that of female representatives. Taking into consideration gender characteristics in sports is not only of social significance,

but also of medical and biological importance from the point of view of preserving the health of female athletes.

Keywords: boxing, adolescence, sexual dimorphism, young athletes, morphological status, functional status, cardiovascular system.

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TECHNOLOGY FOR EVALUATING THE PERFORMANCE OF YOUNG RHYTHMIC GYMNASTS, TAKING INTO ACCOUNT THE TYPES OF AUTONOMIC REGULATION OF CARDIOVASCULAR SYSTEM PARAMETERS

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Abstract. The article analyses the performance indicators of young rhythmic gymnasts, taking into account types of the cardiovascular system's autonomic regulation. The study included 26 gymnasts aged 6-7 years with application of physical activity in the step test (stepping up). As a result, we have identified clusters of the athletes according to the step test results, changes in the indicators of the Kerdo index at rest and after activity. A necessity in improving the methodological support of research for more accurate differentiation of neuroautonomic type of constitution of 6-7 years old athletes was substantiated.

Keywords: 6-7 years old female athletes, rhythmic gymnastics, performance indicators, body functional status, step test.

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ASSESSMENT OF AUTONOMIC BALANCE BY CARDIOINTERVALOGRAPHY IN STUDENTS WITH DIFFERENT LEVELS OF PHYSICAL ACTIVITY

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Abstract. The article presents the description of the autonomic balance of students with different levels of physical activity, which was carried out according to the indices of variation pulsometry and spectral analysis using an active orthostatic test. In students aged 18-25 years, according to the results of preventive examinations at the Health Center, the initial autonomic tone and autonomic reactivity were assessed, and their dependence on the level of physical activity was identified. The positive effect of vigorous physical activity on the autonomic balance of students has been proven. At the same time, in students with low physical activity, there is a mismatch in the work of the autonomic system components – an increased sympathetic influence and a decrease in the activity of the parasympathetic component.

Keywords: physical activity, students, autonomic balance, initial autonomic tone, autonomic reactivity.

PSYCHOPHYSIOLOGY

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ELECTROENCEPHALOGRAPHIC INDICATORS OF STRESS OF WOMEN IN PREPARATION FOR IN VITRO FERTILIZATION PROCEDURE

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Abstract. Aim of the study – to examine the electroencephalographic indicators of women's stress in preparation for in vitro fertilization. The study included 62 women aged 29-45 years. For the neurophysiological assessment of the functional state of the cerebral cortex, we used the electroencephalogram analysis. This method was applied for the main and control group in order to reveal differences in the indicators of the psychophysiological stress. In the main and control groups we have found significant differences in indicators of bioelectric activity of the cerebral cortex, which state the stress in a group of women in preparation for in vitro fertilization.

Keywords: electroencephalography, in vitro fertilization, stress, beta rhythm, infertility.

BALNEOLOGY AND REHABILITATION

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EFFECT OF THE REHABILITATION COMPLEX WITH MYOFASCIAL RELEASE ON THE PSYCHOEMOTIONAL STATE INDICATORS IN INDIVIDUALS WITH DYSAUTONOMIA

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Abstract. The association between dysautonomia and anxiety, depression, aggression and quality of life is known in the scientific literature. Myofascial release (self-massage), as a method of body therapy, can potentially increase the activity of the parasympathetic division of the autonomic nervous system and have a positive effect on the psychoemotional state. Aim of the study: to evaluate the effect of a physical rehabilitation complex with myofascial release on the psychoemotional state of people with dysautonomia. The study included 128 individuals with dysautonomia with a dominant influence of the sympathetic division of the autonomic nervous system, who were randomly divided into two groups: myofascial release (n=64) and control (n=64) groups. Both groups were offered a complex of physical rehabilitation, including aerobic exercises, exercises to increase joint mobility and breathing exercises. Participants in the myofascial release group were additionally exposed to self-massage using additional equipment. Before and after the study, psychoemotional characteristics were assessed using the Spielberger-Khanin and Buss-Durkee tests, the Rosenberg scale, and the SF-36 questionnaire. Statistically significant differences in psychoemotional parameters were found among the subjects of the myofascial release group. A complex of physical rehabilitation with myofascial release helped to reduce the level of aggression, hostility, state anxiety and improve self-esteem.

Keywords: dysautonomia, myofascial release, mental health, physical rehabilitation.

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PSYCHOEMOTIONAL STATUS, PSYCHOMOTOR SKILLS AND MENTAL PERFORMANCE OF ASTRONAUTS DURING POST-FLIGHT REHABILITATION IN SANATORIUM-RESORT CONDITIONS

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Abstract. The aim of this study was to assess the psychoemotional status, psychomotor skills and mental performance of astronauts during post-flight rehabilitation in sanatorium-resort conditions for further calculation of integral health indices. The study involving 6 male astronauts and a group of healthy male volunteers included identification of sensorimotor response, mental capacity and stability, balance and strength of nervous processes, mental state. The results have revealed average values of psychomotor indices, but a high level of balance of nervous processes and mental stability. Low indices of speed-of-response reflect the need to apply and develop specific restorative and rehabilitation measures to increase the functional capabilities of the nervous system. The obtained results will be used to develop adequate programs of post-flight rehabilitation and sanatorium-resort treatment of astronauts.

Keywords: astronauts, psychoemotional status, psychophysiology, psychomotor skills, sanatorium-resort treatment, post-flight rehabilitation.

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CORRECTION OF POSTURAL DISORDERS USING PHYSICAL EXERCISES IN UPPER CROSS SYNDROME

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Abstract. Upper cross syndrome, while not a true disease, is a symptom complex that leads to serious disorders of the musculoskeletal system. It is characterized by the occurrence of musculoskeletal imbalance due to tension in one group of muscles and weakness in another in the upper body. In this case, specific changes in posture are observed, which are manifested by a forward head posture, an increase in cervical lordosis and thoracic kyphosis, raised rounded shoulders, as well as mobility or abduction and winged scapula. Long-term absence of treatment contributes to the occurrence of secondary complications, such as impingement syndrome, cervicogenic headaches, instability of the shoulder girdle due to muscle imbalance, decreased maximum ventilation et al. Classical correction of postural disorders is aimed at activating and strengthening weakened muscle groups through strength exercises and reducing tension in shortened muscles when they are stretched. The combination of corrective physical exercises with manual therapy and other means of physical rehabilitation are effective.

Keywords: exercise therapy, correction of postural disorders, upper cross syndrome, physical exercises.

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RELATIONSHIP BETWEEN TEMPO- AND RHYTHM-RELATED CHARACTERISTICS OF GAIT AND QUALITY OF LIFE IN PATIENTS WITH POSITIONAL DEFORMITIES ASSOCIATED WITH PARKINSON'S DISEASE

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Abstract. Parkinson's disease is a degenerative disease characterized by progressive deterioration of motor functions. Postural deformities are one of the most common complications of Parkinson's disease, affecting quality of life of patients. The aim of the study was to examine the relationship between the tempo- and rhythm-related characteristics of gait and quality of life in patients with Parkinson's disease and postural deformities. The study involved 100 patients with stage 2-4 Parkinson's disease according to the Hoehn and Yahr scale. The study revealed several correlations between the tempo- and rhythm-related characteristics of gait and quality of life. An increase in the length of the step with the right foot is associated with an improvement in quality of life ($r=0.244$), but with a deterioration in the dynamic gait index ($r=-0.221$). An increase in the step width is associated with a deterioration in quality of life ($r=-0.203$), but with an improvement in the dynamic gait index ($r=0.202$). These studies demonstrate the relationship between the tempo- and rhythm-related characteristics of gait and quality of life in patients with Parkinson's disease and postural deformities.

Keywords: Parkinson's disease, physical rehabilitation, postural deformities, quality of life, gait.

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BURN WOUND REGENERATION AFTER QUADRUPLE EXPOSURE TO 50 NANOSECOND MICROWAVE PULSES

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Abstract. The dynamic of regeneration of thermal skin damage and histological parameters of regenerated skin of laboratory rats after a single exposure to 50 nanosecond microwave pulses with an intensity of 140 W/cm² and a pulse repetition rate of 8 Hz were studied. It was found that the process of a thermal skin wound healing is accelerated after exposure to a small number of nanosecond microwave pulses. Histological evaluation of the healing process showed that by the 32nd day of the experiment, complete epithelization of wounds in the control group was observed only in 83% of rats, and in 100% of animals of the experimental group. In addition, in the experimental group after correction with microwave pulses, regeneration was completed with the transformation of young granulation tissue into dense fibrous tissue, with the formation of hair follicles in the dermis and complete restoration of the skin structure without a keloid scar, in contrast to the control group.

Keywords: thermal injury, healing, nanosecond pulses, microwave radiation, Wistar rats.

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EFFECT OF SYSTEMIC OZONE THERAPY IN ADDITION TO PHARMACOLOGICAL TREATMENT ON THE FUNCTIONAL STATUS AND QUALITY OF LIFE OF PATIENTS WITH POST-COVID ASTHENIC SYNDROME

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Abstract. Objective: to study the effect of systemic ozone therapy in addition to pharmacological treatment on the functional status and quality of life of patients with post-COVID asthenic syndrome. The study included 140 patients with post-COVID asthenic syndrome who were randomized into two groups: the main group (n=70) – patients who, in addition to pharmacological treatment, received systemic ozone therapy, the comparison group (n=70) – patients who received pharmacological treatment. The results were assessed with the Post-COVID-19 Functional Status Scale and the 36-Item Short-Form Health Survey. At the end of therapy, statistically significant differences were found between the compared groups in the scores of the Post-COVID-19 scale (p<0.001) and the number of patients without functional limitations (p=0.001), as well as in all indicators of the 36-Item Short-Form Health Survey: physical health (p=0.013), mental health (p=0.013), average total quality of life scores (p=0.026). Application of systemic ozone therapy may be considered as one of the promising effective strategies for the comprehensive treatment of patients with post-COVID asthenic syndrome.

Keywords: post-COVID asthenic syndrome, systemic ozone therapy, functional status, quality of life.

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EXPERIENCE OF USING IMMERSIVE VIRTUAL REALITY (VIARR100) IN THE REHABILITATION OF PATIENTS WITH ACUTE ISCHEMIC STROKE

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Abstract. The purpose of the study is to evaluate the effectiveness of rehabilitation using immersive virtual reality with cycling in patients with motor disorders against the background of acute ischemic stroke. A single-center prospective randomized study was conducted to evaluate the effectiveness of the rehabilitation method using immersive virtual reality (VIARR100) combined with cycling exercises on a robotic simulator. Forty-five patients were included in the study: patients receiving rehabilitation using the immersive virtual reality (n=15); patients receiving a rehabilitation program with exercise therapy and without virtual reality (n=30). Efficacy was assessed using the National Institutes of Health Stroke Scale, Rivermead Mobility Index, Rehabilitation Routing Scale, Rankin Scale, Berg Balance Scale, Hauser Ambulation Index, Functional Ambulation Category. In the group with the use of virtual reality, an improvement was noted in balance indices and in changes of motor activity recovery.

Keywords: rehabilitation, stroke, virtual reality.

SPORTS MEDICINE

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COMPARISON OF THE HYDRATION STATUS ASSESSMENT RESULTS OF BASKETBALL PLAYERS OBTAINED USING ABC-01 MEDASS AND ACCUNIQ BC310 BIOIMPEDANCE ANALYZERS

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Abstract. The purpose of the study was to compare the results of assessing some indices of the body composition and hydration status of basketball players using the extracellular body water/total body water index obtained on the ABC-01 Medass and AccunIQ BC310 bioimpedance analyzers. It has been shown that, in comparison with the data obtained by the ABC-01 Medass analyzer, the AccunIQ BC310 analyzer shows significantly lower indices of body resistance and basal metabolic rate, lower indices of the percentages of lean mass, body fat mass, total and intracellular water of the body, significantly higher extracellular body water/total body water and extracellular body water/intracellular body water indices, high levels of lean mass, the percentages of fat mass and extracellular water of the body.

Keywords: basketball, water sectors of the body, bioimpedancemetry, ABC-01 Medass, AccunIQ BC310, body hydration indices.

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INTERPRETATION OF BODY COMPOSITION ASSESSMENT PROTOCOLS BY BIOIMPEDANCE MEASUREMENT OF STUDENTS PLAYING BASKETBALL – SPECIAL CASES IN THE SPORTS SELECTION PRACTICE

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Abstract. The paper presents depersonalized protocols for assessing body composition by bioimpedance measurement of students playing basketball. It is shown how the “ideal” protocol looks like, which can serve as a reference in the implementation of sports selection. Protocols with a reduced, normal and increased content of the body fat component compared to the population norm are presented. It is also shown how markers of body composition components change their position on the protocol depending on whether the athlete follows the rule of balance in energy intake and expenditure during intense training and games, as well as during periods of decrease or absence of game or training loads due to holidays or injury. The materials of this study can be used by coaches for implementing comprehensive sports selection, including the results of registering the body composition by bioimpedance measurement, as well as by athletes for correcting the component composition of the body by normalizing the balance of energy supplied to the body with food and energy consumed during physical activity, as well as the adjustment of training, which consists in an individual approach to gaining skeletal muscle mass.

Keywords: basketball, sports selection, body composition protocol, ABC-01 Medass bioimpedance analyzer.

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PERIPHERAL MAGNETIC STIMULATION OF THE TORSO MUSCLES OF ATHLETES DURING INTENSE TRAINING ACTIVITY

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Abstract. Aim of the study: to identify the effects of peripheral magnetic stimulation of the torso muscles of athletes during intense physical activity. The study included 45 male athletes, who performed daily intense training loads at training camps in middle altitude conditions. Peripheral magnetic stimulation was performed with the BTL-6000 Super Inductive System, hardware version – BTL-6000 Super Inductive System Elite. Stimulation area – lumbosacral spine. The first session did not reveal any significant effects on changes of the neuromuscular system function and hemodynamics. After the magnetic stimulation course, changes were registered in the neuromuscular system of the lower limbs in terms of M-wave parameters: duration and latency increased, amplitude and area decreased. Positive changes in the hemodynamics of the lower limbs were also found, predominantly on the left side, in almost all the studied parameters: blood flow velocity, elastic modulus and venous outflow. The conducted study has revealed the positive effect of the course of procedures of peripheral magnetic stimulation of athletes’ torso muscles during intense physical activity, aimed at partial relaxation (reduction of neuromuscular activity) of the lower limb neuromuscular system and improvement of hemodynamic parameters, which promotes acceleration of urgent recovery processes after intense physical loads.

Keywords: magnetic stimulation, magnet therapy, recovery, athletes, musculoskeletal system, neuromuscular system.

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FUNCTIONAL STATE OF THE CARDIOVASCULAR AND RESPIRATORY SYSTEMS OF ENDURANCE SPORTS ATHLETES (USING THE EXAMPLE OF SKI RACING)

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Abstract. Under the influence of various training effects aimed at developing endurance, a number of functional changes occur in an athlete's body, which affect almost all organs and systems of the body. The aim of the work was an analytical review of modern studies characterizing the functional state of the cardiovascular and respiratory systems of ski racers. The study showed that Russian and foreign scientists raise questions concerning the large share of participation of both aerobic and anaerobic sources in energy supply in ski racing, and consequently, their directed development in the course of preparation for competitions. The studied articles present data demonstrating high functional capabilities of circulatory and respiratory systems of elite skiers, which are the consequence of specific adaptation to training and competitive loads in ski racing. To a greater extent, the functional capabilities of a skier’s body are manifested during testing with the help of special load tests on exercise machines. Researchers have also identified negative

consequences of ski racing that may affect health in the future: high diastolic blood pressure values in highly trained athletes. High-intensity exercise and cold air have negative effects on the respiratory system, triggering the development of asthma.

Keywords: physiology of blood circulation, physiology of respiration, oxygen consumption, ski racing, adaptation, functional capabilities, incidence of asthma.

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BIOMEDICAL SUPPORT SYSTEM FOR ATHLETES WHO HAVE HAD COVID-19 USING HYPO- AND HYPEROXIA FACTORS IN CONDITIONS OF MIDDLE ALTITUDE

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Abstract. Aim of the study was to develop and scientifically substantiate a biomedical support system for athletes who have had COVID-19 using hypo- and hyperoxia factors in conditions of middle altitude. 225 elite athletes participated in the study. Following parameters were examined: initial level and changes in the functional state of the cardiovascular and respiratory systems; changes in the functional state of these systems under the effect of oxygen therapy and hyperbaric oxygen therapy in conditions of middle altitude. The conducted clinical study has revealed an increased economization of the cardiovascular system, as well as an enhanced parasympathetic activity. The hemodynamic indices, i.e. stiffness index, mean and diastolic blood pressure, also increased (within the physiological norm limits). In women, both those who have had COVID and those who have not, the VO_2 index decreased. Positive effects of the hyperbaric oxygen therapy were more manifested in women, in particular in the form of the enhanced parasympathetic activity after the course. The data obtained allow us to recommend the application of hyperoxic inhalations in conditions of middle altitude in order to simultaneously increase aerobic potential and improve fitness compared to the traditional method (only training in middle altitude conditions). Application of hyperbaric oxygen therapy in conditions of middle altitude is recommended for total body recovery after a training day, micro- and mesocycle, and in the off-season training period.

Keywords: athletes, COVID-19, oxygen therapy, hyperbaric oxygen therapy, middle altitude, hypoxia, recovery.

THEORY AND METHODS IN SPORTS

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FORMATION OF PHYSICAL ABILITIES IN AMATEUR BOXERS AGED 14-15 YEARS

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Abstract. The presented data from the ascertaining experiment examine the results of the formation of general physical motor and sensorimotor abilities in boxers aged 14-15 years during the preparatory training period, taking into account the athlete's weight and its changes in the training process. Thus, six connections between athletes' weight and general physical results and Temporal and Spatial Properties Explorer indices have been identified. Lighter athletes perform worse on speed and agility tests, but they have better reaction time to a moving object. Heavier athletes have better results in speed-strength tests, fewer errors in the motor sensitivity test, and a higher frequency of movement.

Keywords: general physical abilities, individual spatial and temporal properties, athlete's weight, weight category.

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COMBINATION OF AEROBIC AND STRENGTH TRAINING LOAD IN SKI RACING

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Abstract. Aim of the study: to analyze the aerobic and strength training load performed in ski racing. The study methodology includes an analysis of the scientific literature on the distribution of aerobic and strength training load in a combination of power and endurance of muscle contractions. The research pays special attention to the distribution of training load by direction, intensity, form, type, etc. For athletes of cyclic sports, it is characteristic to perform great volumes of aerobic and training load. The active use of a polarized training model in the training of ski racers indicates the prevailing training rates in the aerobic intensity zone. In the process of training ski racers, the direction of the load in the aerobic intensity zone has various forms and effects on the cellular structure of the muscles. The formation of an appropriate combination of power and endurance of muscle contractions for the imposed load will increase the effectiveness of sports training of ski racers.

Keywords: aerobic endurance, training load, strength endurance, ski racing, combination of training load.

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THE AIMING POINT TRAJECTORY LENGTH AS ONE OF THE SIGNIFICANT FACTORS OF SUCCESSFUL SHOOTING IN BIATHLON

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Abstract. The article analyzes the connection between the shooting result and individual components in standing shooting without physical load, analyzes the relationship between the shooting result and the length of the aiming point trajectory in standing shooting in a test with a stepwise increasing load for biathletes at the stage of sportsmanship improvement. It has been found that

the stability of the “shooter-weapon” system is a basic indicator that provides the ability to perform an accurate shot in multiple repetitions. The same result of shooting on different steps of the test after physical activity or in a race can be achieved with different indices of the aiming point trajectory length, while the contribution of the basic component of shooting to the final result in different cases is at least 50%. “Reliable” and stable shooting (repeated accurate shots) for athletes can be achieved only in the case of low indices of the aiming point trajectory length.

Keywords: biathlon, standing shooting, aiming point trajectory length, shooting accuracy.

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RESEARCH AND OPTIMIZATION OF VOLLEYBALL PLAYERS' RESPONSE TO STRESSFUL SITUATIONS IN COMPETITIVE ACTIVITY

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Abstract. The article presents the results of a study of volleyball players' response to stressful situations in competitive activity. In the course of a study involving 16 female volleyball players aged 14-15 years, a significant part of the subjects (31%) revealed a subject- (emotion-) oriented response style, characterized by a lack of objective analysis of failures and ability to cope with emotions. In order to improve the personality traits that determine the style of volleyball players' response to stressful situations in competitive activity, a set of psychological and pedagogical tools was used in the process of a formative pedagogical experiment. After the experiment, the indices of personality traits of the subjects improved at a reliable level, which, in turn, contributed to optimizing the style of the volleyball players' response to stressful situations in competitive activity.

Keywords: female volleyball players, individual response style, stressful situations, competitive activity.

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FEATURES OF PERFORMING UPWARD JUMPS BY PRESCHOOLERS INVOLVED IN SPORTS

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Abstract. The results of a comparative analysis of upward jump performance by young athletes of 5 and 6 years old involved in different sports (gymnastics, tennis, alpine skiing, soccer, hockey) are presented. The aim of this study is to assess the differences in the force-time variables depending on the type of sport and age, to assess the influence of the weight indicator of preschool children on the performance of upward jumps. Upward jumps were performed on a Kistler 9286B force platform (Kistler Group, Switzerland), registration of movement kinematics was made with Baumer TXD004 high-speed cameras (Baumer Group, Switzerland). The data on biomechanical characteristics were obtained from force-time curve analysis. Post-processing of data was carried out with the software part of the “Video Analysis-3D Biosoft” hardware and software complex (Biosoft, Russia). The influence of: age changes in the child's weight on the manifestation of leg stiffness in the concentric phase of the jump; differences in the training programs of sports on the technique of performing the upward jump; the factor of age and sport on the differences in the organization of the upward jump with the priority of age was revealed. Application of allometric scaling of body dimensions when comparing data of athletes of different sports is required.

Keywords: preschoolers, upward jump, allometric scaling, sports specialization.

HEALTH AND ADAPTIVE PHYSICAL CULTURE

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HEALTH PHYSICAL CULTURE WITH MEANS OF ALTERNATIVE RESPIRATORY GYMNASTICS IN REHABILITATION AFTER PNEUMONIA

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Abstract. Objective of the study – to develop and scientifically substantiate a set of breathing exercises aimed at improving the functional status of the respiratory system of patients with pneumonia in a hospital setting. Effectiveness of the health measures was monitored with the methods of assessing the patient's tolerance to physical activity (6-minute walk test), identifying the level of activity (Borg scale), identifying the blood oxygen saturation level (pulse oximetry) and functional status of the respiratory system (vital capacity/body mass index ratio, respiratory tests on inhale and exhale). A set of breathing exercises is presented, developed on the basis of alternative health technologies for use in exercise therapy classes. The rationale for the selection of the means and the possibility of their implementation in the rehabilitation of the pulmonary patients is given. The status of the respiratory and cardiovascular systems during rehabilitation procedure was shown and the effectiveness of exercise therapy classes combined with a developed set of breathing exercises on indices of external respiration function in the patients of the pulmonology department was established.

Keywords: patients, pneumonia, functional status of the respiratory system, set of breathing exercises, alternative health technologies, exercise tolerance.

BIOMECHANICS AND BIOENGINEERING

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BIOIMPEDANCE PARAMETERS OF PATIENTS WITH RESPIRATORY DISEASES

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Abstract. The aim of the study was to determine the bioimpedance characteristics of patients of the pulmonological department (Republican Hospital No 1 – National Center of Medicine). 26 patients who were on hospital treatment, diagnosed with community-acquired pneumonia, exacerbation of chronic obstructive pulmonary disease, were examined. All the subjects were Yakuts of elderly age. The anthropometric and bioimpedance parameters of the patients were identified. Bioimpedance measurement revealed a decrease in the phase angle parameter in 46.2% of the examined individuals. According to the absolute value of fat mass, a high level of adipose tissue development was observed in 38.4% of the subjects. According to the relative value of active muscle mass, 53.8% of patients had a significantly low percentage of active cell tissue. Identification of bioimpedance parameters in the clinic is a prognostic criterion of the outcome of various clinical conditions.

Keywords: bioimpedance, phase angle, men, respiratory diseases, Yakutia.