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PHYSIOLOGY

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SPIROMETRIC PARAMETERS OF EXTERNAL RESPIRATORY FUNCTION IN CROSS-COUNTRY SKIERS AT DIFFERENT STAGES OF THE PREPARATORY PERIOD

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Abstract. ***Introduction.*** The study examines spirometric parameters of external respiratory function. ***Methods.*** The research involved two groups of athletes: “Leaders” (n=10) and “Reserve” (n=10). Parameters of pulmonary ventilation, forced vital capacity, and flow-volume characteristics were evaluated. ***Results.*** Athletes of the “Leaders” group demonstrated significantly higher values for minute ventilation, expiratory vital capacity, and maximum voluntary ventilation by the end of the preparatory period. Significant variability in respiratory parameters was identified, particularly during the initial stages of preparatory training. ***Conclusion.*** The observed intergroup differences highlight the importance of monitoring respiratory parameters to optimize the training process for cross-country skiers.

Keywords: external respiration function, respiratory reserves, spirometry, cross-country skiers, preparatory period.

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INFLUENCE OF SLEEP HYGIENE ON NIGHTTIME SLEEP QUALITY AND DAYTIME SLEEPINESS IN MEDICAL STUDENTS

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Abstract. ***Introduction.*** Sleep disturbances associated with high study load and irregular routines are not uncommon among medical students. This increases the risk of decreased cognitive performance and impaired general well-being. The aim of the present study was to identify the relationships between sleep hygiene disorders, nighttime sleep quality, and the severity of daytime sleepiness. ***Methods.*** A total of 792 students who completed a series of validated questionnaires were included in the study. Correlational and non-parametric statistical methods were used for analysis. ***Results.*** Significant positive correlations were found between sleep hygiene disturbances and decreased sleep quality (r=0.36), increased daytime sleepiness (r=0.27-0.35), and a negative correlation with morning chronotype (r=-0.20). ***Conclusion.*** The results of the study confirm the hypothesis about the influence of behavioral factors on sleep quality and can be used to develop preventive programs for insomnia.

Keywords: sleep hygiene, daytime sleepiness, nighttime sleep quality, insomnia, chronotype, medical students.

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FEATURES OF MORPHOLOGICAL AND FUNCTIONAL PARAMETERS OF ERYTHROCYTES WITH FETAL HEMOGLOBIN IN THE NEONATAL PERIOD AND THE FIRST MONTHS OF LIFE

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Abstract. ***Introduction.*** The article presents the results of identifying the dynamics of the structure of erythrocytes with fetal blood hemoglobin based on a set of morphological and functional changes in the perinatal period. Determination of the optical properties of erythrocytes, depending on adult or fetal hemoglobin content, makes it possible to visually differentiate them both in individual cells and in a group of erythrocytes during morphological studies. ***Methods.*** Adapted methods for studying fetal hemoglobin were developed based on BIOLAR PI PZO polarization interference microscopy and immunohistochemical studies with antibodies to the fetal hemoglobin gamma subunit. ***Results.*** Age-related values of HbF% and hemoglobin affinity to oxygen have been identified in children in the first three months of life (n=486), $p<0.05$. Dynamics of decrease in hemoglobin affinity to oxygen was recorded against the background of morphological data of depression of extramedullary erythropoiesis and substitution of hemoglobin fractions. ***Conclusion.*** Taking into account the research results makes it possible to determine the dynamics of hemoglobin fractions with different ability to transport O_2.
Keywords: fetal hemoglobin, oxygen transport, microscopy.

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THE IMPORTANCE OF RESTRUCTURING OF THE RHYTHM OF PERIODIC ELECTRICAL ACTIVITY OF THE SMALL INTESTINE DURING LONG-TERM FOOD DEPRIVATION

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Annotation. ***Introduction.*** The problem of hunger attracts the attention of researchers from the point of view of the adaptive restructuring of the body in response to food deprivation. ***Methods.*** On 12 male Wistar rats under conditions of 9-day food deprivation, the electrical activity of the small intestine was recorded from implanted electrodes and the body weight of the animals was monitored. Nonparametric criteria were used for statistical analysis. ***Results.*** Prolonged 9-day food deprivation leads to a decrease in body weight by 24 [20; 25] % of the initial weight. For the first time, we have established three stages of changes in the periodic electrical activity of the small intestine during prolonged food deprivation, characterized by different ratio of electrical activity patterns. ***Conclusion.*** The identified changes are adaptive in nature during the transition to endogenous nutrition.
Keywords: food deprivation, migrating motor complex, rats.

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INVOLVEMENT OF CHOLINERGIC AND NITRERGIC PATHWAYS IN THE EFFECTS OF γ-AMINOBUTYRIC ACID ON PERIODIC ELECTRICAL ACTIVITY OF THE SMALL INTESTINE

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Abstract. ***Introduction.*** The existing data on the effect of γ-aminobutyric acid on small intestinal motility do not allow us to judge the changes in the periodic electrical activity of the small intestine. ***Methods.*** In experiments on healthy rats (n=21) with electrodes implanted in the jejunum after 18 hours of food deprivation, changes in the periodic electrical activity of the small intestine were studied both after a single enteral administration of γ-aminobutyric acid (70 mg/kg) and after administration against the background of atropine (1 mg/kg) and nitroglycerin (0.8 mg/kg). ***Results.*** Depending on the previous exposure (against the background of atropine or nitroglycerin), the administration of γ-aminobutyric acid led to stimulation or suppression of various patterns of periodic interdigestive electrical activity of the small intestine. ***Conclusion.*** The modulating effect of γ-aminobutyric acid on interdigestive periodic electrical activity of the small intestine is associated with the effect on cholinergic and nitrergic pathways.
Keywords: γ-aminobutyric acid, migrating myoelectric complex, cholinergic pathways, nitrergic pathways, rats.

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CONJUGATION OF BIOMECHANICS OF PERICRANIAL AND CERVICAL MUSCULATURE AS A METHOD FOR CORRECTING MOVEMENT PATTERNS IN INDIVIDUALS AT RISK OF DEVELOPING MYOFASCIAL FACIAL DYSFUNCTIONS

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Abstract. ***Introduction.*** The article presents data on the application of conjugated biofeedback technique based on the conjugation of biomechanics of pericranial and cervical musculature in individuals at risk of developing myofascial facial dysfunctions. ***Methods.*** During the study, a classical assessment of biomechanics and electromyographic indices was conducted with the "TRUST-M" EMG BIOMECHANICS hardware system (Russia). ***Results.*** The testing of the myofascial imbalance correction complex was based on obtaining data on biomechanical and electromyographic patterns. The evaluation of the indices was performed according to the parameters of biomechanics of the craniocervical junction and the dynamics of electromyographic indices of pericranial and cervical musculature. ***Conclusion.*** The developed restorative and corrective complex, based on the biofeedback method, contributes to the optimization of muscle tone, increasing the range of active movement in the craniocervical junction, and promotes the formation of correct movement patterns.
Keywords: biomechanics, physiological model, muscle pattern, myofascial facial dysfunctions.

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COMPARATIVE ANALYSIS OF METHODS FOR ASSESSING THE BIOLOGICAL AGE OF COSMONAUTS AND SPACEFLIGHT INFLUENCE ON IT

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Abstract. ***Introduction.*** Estimation of biological age of cosmonauts has a great significance in terms of preserving their health and performance both in the process of preparing to spaceflight and after. Aim of the study – to conduct a comparative analysis of methods to identify biological age of cosmonauts and estimate the influence of spaceflight on it. ***Methods.*** Biological age was determined using three methods. The methods of L.M. Belozerova and A.G. Gorelkin are based on physical development indicators. The method developed at the N.I. Lobachevsky State University of Nizhny Novgorod is based on blood indicators. ***Results.*** The comparative analysis of the methods has shown that the methods based on physical development indicators are consistent with each other and complement each other, while these methods are poorly consistent with the method based on blood indicators. Before the spaceflight, the biological age of the cosmonauts was significantly ($p<0,05$) lower than the calendar age. It was revealed that after the spaceflight, the biological age of the cosmonauts, calculated according to the blood indicators, increased on the first day of readaptation and practically corresponded to the calendar age, and the biological age returned to its original values by the sixtieth day after the flight. ***Conclusion.*** Biological age, as an integral indicator of health, physical development and psychoemotional state, can be a marker of the professional longevity of cosmonauts and can be used during selection, at all stages of preparation for space missions and during the post-flight rehabilitation period.
Keywords: cosmonaut, professional longevity, biological age, spaceflight, readaptation, blood parameters, physical development.

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EFFECT OF WHEY PRODUCT ON AEROBIC PHYSICAL PERFORMANCE OF A WHITE RAT

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Abstract. ***Introduction.*** Currently, in order to replenish energy and plastic expenditure of athletes, biologically active supplements containing amino acids, glucose, vitamins and minerals are introduced into sports nutrition. “MDX Multicomplex” is a specially developed high-protein product intended for nutrition of athletes. The aim of the study – to examine effect of the “MDX Multicomplex” supplement on the physical performance of a white rat. ***Methods.*** To assess the effectiveness of the biological supplement’s effect on the physical performance of rats, the animals were orally administered “MDX Multicomplex” for 21 days. Evaluation of performance for endurance was carried out in the Porsolt forced swimming test with a load of different weights. ***Results.*** It was found that after the “MDX Multicomplex” intake, body mass has increased, and the greater the weight, the significantly greater the body mass. The growth of body mass was insignificant in the control group. In the control group, the swimming time has significantly increased with a weight of 5% of body mass. In the experimental group, the swimming time has significantly increased with a weight of 5%, 10%, and 15% of body mass. ***Conclusion.*** The use of “MDX Multicomplex” contributed to a significant increase in endurance, which was proven in the Porsolt forced swimming test.
Keywords: “MDX Multicomplex”, rats, physical activity, body weight, Porsolt forced swimming test.

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FEATURES OF AGE-RELATED CHANGES IN THE BODY OF THE ELDERLY (LITERATURE REVIEW)

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Annotation. ***Introduction.*** The purpose of this review article was to summarize and analyze the current literature on the body characteristics of the elderly. In the aging process, there is a natural decrease in physiological and cognitive functions in the elderly. All body systems are subject to involutional changes affecting nervous and mental processes. Methods. We have conducted a search of scientific publications dedicated to age-related features of the elderly in the eLIBRARY.RU, PubMed, Cyberleninka databases. ***Results.*** An analysis of the literature data has shown that, depending on genetic factors and the gerontogenicity of living conditions, the aging process can occur with varying intensity. ***Conclusion.*** Exposure to adverse environmental conditions can accelerate the process of physiological aging of the body. At the same time, it is important to take into account the biological characteristics of the body, the peculiarities of heredity and its natural resistance to adverse factors.
Keywords: elderly, old age, gerontology, healthy aging, active longevity.

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EFFECT OF Y5 RECEPTOR BLOCKADE ON REGULATION OF THE ATRIAL MYOCARDIUM'S SPONTANEOUS ACTIVITY IN NEWBORN RATS

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Abstract. ***Introduction.*** Neuropeptide Y is a neurotransmitter that is widely distributed in both the central and peripheral nervous systems, exerting a variety of effects on physiological processes, including regulation of the cardiovascular system. The aim of our study was to investigate the effect of the Y5 receptor blocker CGP 71683 on the frequency of spontaneous activity and amplitude-time parameters of isometric contraction of the atrial myocardium in rats during ontogenesis. ***Methods.*** The frequency of spontaneous activity and amplitude-time parameters of isometric contraction were recorded using the the PowerLab (ADInstruments) device. ***Results.*** The study shows that CGP 71683 significantly affects heart function in 7- and 100-day-old animals by changing the frequency of spontaneous activity and amplitude-time parameters of the atrial myocardium during ontogenesis. ***Conclusion.*** The obtained results clearly demonstrate the participation of these structures in the regulation of the frequency of spontaneous activity of rats at different stages of development and complement previously obtained data on multidisciplinary reactions involving this group of receptors.
Keywords: neuropeptide Y, heart, myocardium, isometric contraction, frequency of spontaneous activity.

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ELECTRICAL ACTIVITY OF WORKING CARDIOMYOCYTES OF THE RIGHT ATRIUM DURING SELECTIVE BLOCKADE OF α_{2C}-ADRENERGIC RECEPTORS IN RATS OF DIFFERENT AGES

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Abstract. ***Introduction.*** Despite the extensive information on α_2-adrenergic regulation of cardiac activity, the role of α_2-adrenergic receptor subtypes in the development of age-related changes in the cardiovascular system remains unclear. The aim of the study – to examine the parameters of the electrical activity of right atrial cardiomyocytes in rats of different ages with α_{2C}-adrenergic receptor blockage. ***Methods.*** We recorded intracellular action potentials using the standard microelectrode technique. ***Results.*** This study demonstrated that the α_{2C}-adrenergic receptor blocker JP1302-dihydrochloride reduced the frequency of spontaneous activity and prolonged the repolarization phase in 21- and 140-day-old rats. In 7-day-old animals, the drug did not induce any changes in the amplitude or time parameters of the action potential. ***Conclusion.*** The results obtained correspond with the previous data on negative chronotype effect of the α_2-adrenergic receptor blocker (yohimbine) and expand the knowledge on participation of α_{2C}-adrenergic receptors in realizing such response and determining electrical activity of cardiomyocytes of rats of different age.
Keywords: heart, myocardium, α_2-adrenergic receptors, action potential.

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HEMODYNAMIC EFFECTS OF ACTIVE AND PASSIVE ORTHOSTASIS IN WOMEN

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Annotation. ***Introduction.*** The study investigates peripheral hemodynamics in women during active and passive orthostasis, taking into account autonomic tone and menstrual cycle phase. The relevance of the research lies in the importance of understanding vascular adaptive shifts under postural changes. ***Methods.*** The study involved 50 female students divided into groups based on autonomic tone (normotonic, vagotonic, sympathotonic). Blood flow in the "shoulder-forearm" segment was assessed via rheovasography during the follicular and luteal phases of the menstrual cycle. ***Results.*** Orthostasis reduces vascular blood flow in the upper limbs, with active orthostasis inducing more pronounced changes than passive orthostasis. During the follicular phase, vagotonic individuals exhibited a lesser degree of blood flow reduction, whereas sympathotonic individuals showed similar resilience in the luteal phase. ***Conclusion.*** The study demonstrates that the hemodynamic effects of orthostasis depend on autonomic status and phase-specific hormonal fluctuations during the menstrual cycle.
Keywords: orthostasis, rheovasography, autonomic nervous system, menstrual cycle.

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BIOCHEMICAL AND PHYSIOLOGICAL MARKERS OF ATHLETIC PERFORMANCE UNDER HYPOXIC STIMULUS IN TRACK-AND-FIELD ATHLETES

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Abstract. ***Introduction.*** The purpose of this review article is to analyze and summarize the scientific literature on a comprehensive study of the effect of hypoxia on the biochemical and physiological factors of the body of elite track-and-field athletes. ***Methods.*** We have conducted a search in scientific sources in the eLIBRARY.RU, PubMed, Cyberleninka databases. A total of 21 sources were analyzed. ***Results.*** It has been shown that the increase in the performance of track-and-field athletes is associated not only with the intensification of aerobic and anaerobic capabilities, but also with the activation of biochemical mechanisms at the level of cells, tissues and organs. Hypoxic factor has both positive and negative body responses in response to oxygen starvation. ***Conclusion.*** The scientific literature analysis has demonstrated that athletes, especially in phases of high-intensity training, are recommended to alternate hypoxic training with periods of recovery in normoxic conditions, which reduces the risk of overtraining and ensures full recovery of the body between training sessions.
Keywords: hypoxia, track-and-field athletes, aerobic and anaerobic capabilities, hypoxic training, genetic factors, lactate level, growth factors.

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GENDER AND AGE DIFFERENCES IN METABOLIC RESPONSES TO HYPOXIA

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Abstract. ***Introduction.*** The objective of this review article – to analyze and summarize the scientific literature devoted to a comprehensive study of responses to hypoxic exposure in people of both genders and different ages. ***Methods.*** A search of scientific literature sources was conducted in the eLIBRARY.RU, PubMed, CyberLeninka databases. 20 publications were analyzed. ***Results.*** It has been shown that the physiological response to hypoxia in women differs from that in men and more pronounced hypoxemia is observed, which may be associated with reduced sensitivity to chemoreflexes and less ventilation compared to men under hypoxic conditions. In addition, it has been discovered that men have higher sympathetic activity in response to hypoxia, while women have a less pronounced response of the cardiovascular system. In older age groups, a decrease in the ventilatory response to hypoxia and hypercapnia has also been observed. ***Conclusion.*** Analysis of literature sources has shown that the body's response to hypoxic exposure may differ depending on gender and age.
Keywords: hypoxia, gender, age, women, men, cardiovascular, hormones, estrogens, neuroprotection, vasoconstriction.

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HYPOXIC FACTORS IN THE MODERN SYSTEM OF ELITE ATHLETES' TRAINING

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Annotation. ***Introduction.*** The purpose of this review article is to analyze and summarize the scientific literature on the effect of hypoxia on the functional capabilities of an athlete's body. ***Methods.*** We have conducted a search of scientific sources in the eLIBRARY.RU, PubMed, Cyberleninka databases. A total of 40 articles were analyzed. ***Results.*** Scientific works on this aspect confirm the positive effect of hypoxia on the physical performance of athletes. In the process of training with hypoxia, the most important factor is the hypoxic resistance of athletes. A different approach to hypoxic training is needed due to the different adaptive capabilities of the body of athletes. ***Conclusion.*** The literature analysis has shown that hypoxic training not only contributes to improving the physical form of athletes, but also increases their functional reserves, increasing resistance to hypoxia and accelerating the adaptive processes of the body.
Keywords: hypoxic factor, performance, female track-and-field athletes, training, aerobic, anaerobic.

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ADAPTATION OF A CHILD'S BODY TO VARIOUS CLIMATE-GEOGRAPHICAL REGIONS (LITERATURE REVIEW)

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Abstract. ***Introduction.*** Within scientific data systematization, we have examined effect of climate on physical development and functional capabilities of children from different climate-geographical regions. Objective – to analyze modern literature data on how the morphofunctional status of children from different regions of Russia adapts. ***Methods.*** The study involved an analysis of literature sources from the online databases CyberLeninka, eLibrary and Google Scholar. Twenty-eight sources were selected and analyzed. ***Results.*** As a result, we have found dependence of children's physical development indicators on climate-geographical, environmental and socio-economic factors. ***Conclusion.*** Thus, features of a child's body adaptation to conditions of the northern regions and Central Russia were thoroughly examined, while the data on the morphofunctional status of children in southern regions and high altitude are scarce.
Keywords: adaptation, children, climate, morphofunctional status.

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STUDY OF DELAYED EFFECTS OF ACUTE NORMOBARIC HYPOXIA ON THE DEVELOPMENT OF RATS IN THE OPEN FIELD AND ELEVATED PLUS MAZE TESTS

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Abstract. ***Introduction.*** Perinatal hypoxia is a condition in which the fetus experiences oxygen starvation during intrauterine development or labor. The objective – to study the delayed effects of acute normobaric hypoxia on the development of rat pups in the open field and elevated plus maze tests. ***Methods.*** The work was carried out on mature rats (20 females and 10 males). Group 1 was the control group, and the animals of group 2 were exposed to the state of premature human pregnancy: the effect of acute normobaric hypoxia on rat pups on the second postnatal day. ***Results.*** An increase in horizontal motor activity and suppression of exploratory behavior were found in animals of both sexes that underwent hypoxia. ***Conclusion.*** Acute normobaric hypoxia leads to behavioral disturbances in adolescent rats, which in the open field test is expressed by an increase in horizontal motor activity in animals of both sexes, in the elevated plus maze test – by suppression of exploratory behavior in rats of both sexes.
Keywords: perinatal hypoxia, rats, acute normobaric hypoxia, open field, elevated plus maze.

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SIMULATION MODEL OF RESPIRATORY PATTERN BIOMECHANICS IN AKINETIC RIGID SYNDROME

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Abstract. ***Introduction.*** Respiratory dysfunction is a frequent, poorly studied symptom of akinetic rigid syndrome. In the early signs of hypokinesia and muscle rigidity, respiratory complaints are combined with specific changes in the breathing biomechanics. ***Methods.*** Two groups of healthy individuals were examined (risk group – with early respiratory disorders, control group – without respiratory disorders), in whom biomechanical respiratory disorders typical of early signs of akinetic rigid syndrome were simulated in a physiological laboratory. The created model of the breathing pattern biomechanics was used to study the initial autonomic and respiratory parameters, the degree of the regulatory systems tension depending on the imposed load, and the nature of the changed parameters restoration. ***Results.*** At all stages of modeling, it was possible to reproduce the restrictive type of respiratory disorders due to parasympathetic autonomic predominance in the examined individuals. A more complete restoration of the parameters after the load test was noted in the control group. ***Conclusion.*** Early physiological changes in respiratory biomechanics have functional nature and can be corrected by restoring the correct breathing pattern.
Keywords: respiratory biomechanics, akinetic rigid syndrome, imitation of breathing pattern in restrictive respiratory disorders, chest excursion, autonomic nervous system.

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BEHAVIORAL ACTIVITY OF ICR (CD1) MICE ON A HIGH-FAT DIET AND A HIGH-FIBER DIET

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Abstract. ***Introduction.*** The study presents the results of the research on the effect of different types of diet on the behavioral activity of ICR (CD1) mice. ***Methods.*** Three groups of five mice each were formed: the first group – standard diet (fat content no more than 6%), the second group – high-fat diet (40% saturated fats), the third group – high-fiber diet (40% insoluble fiber). The assessment of motor and exploratory activity, emotional status, several innate reflexes, and the degree of neurological deficit in mice was conducted with the open field test, Garcia scale, and observation in the home cage. ***Results.*** In both experimental groups, we have registered reduced motor and exploratory activity, an increased anxious behavior, and neurological deficits by the third week of the study. By the sixth week, some indices recovered, but in case of the high-fat diet, the negative effects were most pronounced. ***Conclusion.*** Changes in diet composition affect the behavioral activity and psychoemotional state of mice, likely through modulation of the gut-brain axis.
Keywords: open field, home cage, the brain-intestine axis, Garcia scale, stress.

PSYCHOPHYSIOLOGY

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RARE WAYS TO MODEL SOME PSYCHOEMOTIONAL STATES IN ANIMALS IN BIOMEDICAL RESEARCH

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Abstract. ***Introduction.*** Traditional methods of modeling psychoemotional disorders in rodents are methods based on the formation of a conditioned reflex with negative reinforcement or on the use of stimuli that cause fear or anxiety. However, it should be noted that when studying mental and behavioral disorders, the variety of symptom manifestations of some conditions is so great that their comprehensive study requires the use of rarer models. The aim of this article is to review approaches of modeling some psychoemotional states in laboratory animals in biomedical research. ***Methods.*** The work used content analysis of literary sources. The search of sources was conducted in the RSCI and PubMed databases. ***Results.*** The article describes rare methods that allow modeling various types of stress, and also provides unconventional approaches that cause anxiety in laboratory animals. Models of post-traumatic stress disorder occupy a special place. ***Conclusion.*** Thus, a comprehensive review of modern approaches to modeling some psychoemotional states in animals in biomedical research has been conducted.
Keywords: post-traumatic stress disorder model, stress model, rodents, zebrafish, time-deficit stress, combat stress model.

BALNEOLOGY AND REHABILITATION

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A COMPREHENSIVE APPROACH TO REHABILITATION OF 25-35-YEAR-OLD MEN WITH CERVICAL OSTEOCHONDROSIS

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Abstract. ***Introduction.*** The article presents a comprehensive approach to the rehabilitation of patients with cervical osteochondrosis, which includes isometric exercises, a set of manual muscle techniques consisting of elements of classical massage, fascial distortion model therapy, post-isometric relaxation, and mobilizing techniques. ***Methods.*** To assess the functional state of the cervical spine, the following were conducted: a questionnaire on the well-being of individuals with cervical osteochondrosis, an assessment of pain intensity using a numerological pain assessment scale, an assessment of the mobility of the cervical spine in the direction of lateral bending, flexion, extension, and rotation, and the development of strength endurance in the neck muscles. ***Results.*** When analyzing the results of the study, statistically significant differences have been revealed in the following indicators: low pain sensations according to the numerical rating scale, an increase in the volume of active movements in the cervical spine, and an increase in the strength of the neck flexors. ***Conclusion.*** The combined use of manual muscle techniques by a specialist and the performance of isometric exercises independently allowed to strengthen the neck muscles and increase the range of movements. This comprehensive approach can be recommended for application in the rehabilitation support of patients with cervical osteochondrosis.

Keywords: cervical osteochondrosis, manual muscle techniques, therapeutic gymnastics, comprehensive approach.

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INNOVATIVE METHODS OF REHABILITATION OF PATIENTS WITH HYPERTROPHIC AND KELOID SCARS AFTER TRAUMATIC AMPUTATION OF THE HAND: AN INTERDISCIPLINARY APPROACH TO RESTORING FUNCTION

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Abstract. ***Introduction.*** The article is devoted to the study of methods of rehabilitation of patients after traumatic hand amputation, paying special attention to the formation of hypertrophic and keloid scars. ***Methods.*** The analysis of modern medical publications on methods of prevention and treatment of hypertrophic and keloid scars has been conducted in Russian and international databases. ***Results.*** Traditional methods of scar treatment and the latest prospects, including gene cell therapy, nanotechnology, and the use of mesenchymal stem cell exosomes, are considered. The key importance of neuroprosthetics for the restoration of motor skills and sensitivity is indicated. ***Conclusion.*** A comprehensive interdisciplinary approach can significantly improve the quality of life of patients after limb amputation.

Keywords: scars, hand amputation, keloids, rehabilitation, laser therapy.

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INDIBA THERAPY AS AN EFFECTIVE NON-INVASIVE PHYSIOTHERAPEUTIC METHOD FOR POSTOPERATIVE REHABILITATION (REVIEW AND ANALYTICAL STUDY)

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Abstract. ***Introduction.*** The aim of the work is to analyze the clinical and physiological potential of INDIBA therapy as a non-invasive method of postoperative rehabilitation in aesthetic medicine, including surgical interventions accompanied by the movement of soft tissues and skin flaps. ***Methods.*** Search and analysis of modern clinical data taking into account their evidence level on radiofrequency techniques (PubMed, PEDro, Cochrane Library, eLIBRARY.ru, INDIBA protocols), as well as systematization of international practical experience of their use in plastic surgeries. ***Results***. INDIBA therapy is a modern and physiologically sound method of postoperative rehabilitation. The frequency of 448 kHz used in the device and the mechanism of action of the Transfer of Proionic Energy technology provide a decrease in the severity of the inflammatory reaction, pain syndrome and edema, the risk of fibrous changes, and acceleration of regeneration processes. ***Conclusion***. The method is safe, physiologically sound, and can be recommended as one of the elements of complex postoperative rehabilitation in aesthetic surgery.
Keywords: INDIBA, TECAR therapy, RF technologies, plastic surgery, skin flaps, medical rehabilitation.

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CHANGES IN THE ELECTROENCEPHALOGRAM OF A HEALTHY ADULT UNDER THE INFLUENCE OF A SPELEOTHERAPY COURSE

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Abstract. ***Introduction.*** The effect of speleoclimate on the electroencephalogram of a healthy adult was investigated. ***Methods.*** The study involved 33 students of the Voronezh State Medical University, age – 18-20 years. The speleotherapy course consisted of 10 daily sessions of one hour in a speleological environment. The electroencephalogram was recorded in a state of functional rest with eyes closed (60 seconds), before and after the 10-day speleotherapy course (or rest – the comparison group) using the Encephalan-EEGR-19/26 electroencephalograph recorder (Medicom, Russia), in 19 standard leads according to the 10-20 system. The analysis of the data obtained was carried out in Excel 2016 and IBM SPSS Statistics 26.0 software. ***Results.*** It was revealed that under the influence of speleoclimate, the bioelectric activity of the brain of a healthy adult is slowed down, the metabolic activity of individual zones of the cerebral cortex changes. ***Conclusion.*** Significant changes in the alpha/theta electroencephalogram ratio in the R4, T6 and O2 leads were also revealed.
Keywords: electroencephalography, alpha/theta ratio, rhythm, speleoclimate, speleotherapy.

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TRANSCRANIAL ELECTRICAL STIMULATION IN CHRONIC PAIN SYNDROME AFTER MASTECTOMY: ANALGESIC AND ANTI-INFLAMMATORY EFFECTS

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Annotation. ***Introduction.*** Current pharmacological approaches to the treatment of postmastectomy pain syndrome are often accompanied by side effects, which indicates the need to search for alternative methods. ***Methods.*** The study included 90 outpatients with postmastectomy pain syndrome, who were randomized into two groups: in the main group (n=45), transcranial electrical stimulation was used as an alternative to venlafaxine, in the control group (n=45) – only the recommended rehabilitation algorithm. Comparative evaluation of effectiveness was carried out with the visual analogue scale, as well as dynamic assessment of TNF-α, IL-1β, IL-6 and IL-4 in blood plasma. Additionally, possible adverse events were recorded. ***Results.*** Inclusion of transcranial electrical stimulation in the complex rehabilitation algorithm provides a pronounced analgesic effect, is characterized by high safety and good tolerability, and also helps to reduce the levels of TNF-α and IL-6 and increase the level of IL-4 in patients with chronic pain syndrome. ***Conclusion.*** The obtained results allow us to consider transcranial electrical stimulation as an effective and safe alternative to antidepressant therapy in patients with postmastectomy pain syndrome.
Keywords: postmastectomy pain syndrome, transcranial electrical stimulation, pain intensity, TNF-α, IL-1β, IL-6 and IL-4.

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THERAPEUTIC POTENTIAL OF THE ESSENTUKI FEDERAL RESORT'S CLIMATE

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Abstract. ***Introduction.*** The article is dedicated to the study on therapeutic potential of the Essentuki federal resort's Climate. The aim – to identify therapeutic potential of the Essentuki resort's climate and its effect on recovery and health improving processes ***Methods.*** The practical part of the work conducted in July 2025 consisted of the identification of microclimate parameters. The work also included a content analysis of literature sources on application of climate therapy in rehabilitation and treatment of patients. ***Results.*** We have identified high level of light negative air ions and oxygen content, humidity, low level of carbon dioxide and aerosol particles in the studied territory's air. ***Conclusion.*** Bioclimatic potential of the Essentuki federal resort amounts to 2.15 points out of 2 according to the module technology, which corresponds with high category of medical and climatic conditions.
Keywords: climate, climate therapy, therapeutic potential, bioclimatic potential, bioclimate, therapeutic physical culture, Essentuki.

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THERAPEUTIC POTENTIAL OF THE SOUTHERN COAST OF CRIMEA

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Abstract. ***Introduction.*** In the process of scientific data systematization, we have examined climate and main directions of balneology on the Southern Coast of Crimea. The objective of the study – to substantiate therapeutic potential of the Southern Coast of Crimea. ***Methods.*** The study consisted of an analysis of literature sources in online databases. A total of 20 sources were selected and analyzed. The bioclimatic potential was calculated in accordance with methodological guidelines. ***Results.*** A number of works of domestic authors prove the effectiveness of climate therapy on the Southern Coast of Crimea for patients with different diseases. The bioclimatic potential of the Southern Coast of Crimea has scored 2.14 points out of 3 possible according to the module technology accepted in balneology. ***Conclusion.*** The effectiveness of applying climate therapy in sanatorium-resort treatment programs both independently and in combination with other therapeutic factors is confirmed by long-term research.
Keywords: Southern Coast of Crimea, climate, therapeutic potential, climate therapy.

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THE RELEVANCE OF EARLY PREVENTION OF SERIOUS CARDIOVASCULAR EVENTS IN PATIENTS WITH NEPHROLITHIASIS

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Abstract. ***Introduction.*** The high incidence and prevalence of nephrolithiasis among the population and the high rate of stone formation recurrence with an increased risk of serious cardiovascular events give high relevance to the early prevention of serious cardiovascular events in patients with nephrolithiasis. The objective – to study the pathogenesis of cardiovascular events in patients with nephrolithiasis based on a critical analysis of modern research, to identify the relevance of early prevention of these events. ***Methods.*** The publications were searched in the PubMed electronic database, as well as in the register of controlled Cochrane studies without language barriers. ***Results.*** Nephrolithiasis has high levels of morbidity, prevalence among the population, recurrence of stone formation and an increased risk of serious cardiovascular events. Nephrolithiasis risk factors are the first early risk factors for atherosclerosis. The occurrence of atherosclerosis in patients with nephrolithiasis increases their risk of developing serious cardiovascular events. ***Conclusion.*** Correction of early initial metabolic disorders (risk factors for nephrolithiasis) is of high relevance both for the prevention of recurrence of kidney stone formation and for the early prevention of serious cardiovascular events in patients with nephrolithiasis.
Keywords: cardiovascular diseases, nephrolithiasis, urolithiasis, atherosclerosis, metabolic disorders.

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MODERN APPROACHES TO REHABILITATION TREATMENT OF CHILDREN WITH OBESITY

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Abstract. ***Introduction.*** The work includes an analytical review of modern domestic and foreign studies on the issue of rehabilitation treatment of children with obesity. ***Methods.*** We have conducted a search for domestic and foreign sources in the PubMed, Google Scholar, eLibrary and other databases. ***Results.*** The main tasks of rehabilitation treatment of obesity are: gradual reduction of body weight and normalizing metabolism. Climate therapy, health physical culture, physio-, hydro- and balneotherapy, as well as their combined application deem to be an effective method according to researchers. ***Conclusion.*** The presented data indicate a need to include comprehensive methods to prevent and combat obesity among children of Karachay-Cherkessia, considering acting clinical guidelines, as well as to develop new effective methods.
Keywords: children obesity, epidemiology, incidence growth, complications among children, principles of rehabilitation treatment.

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NETWORK META-ANALYSIS OF THE EFFECTS OF DIFFERENT EXERCISE REGIMENS ON SKELETAL MUSCLE METABOLISM AND INFLAMMATION IN TYPE 2 DIABETES

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Abstract. ***Introduction.*** This study aimed to evaluate the effectiveness of different types of physical exercise in improving metabolism and reducing inflammation in the skeletal muscles of mice with type 2 diabetes. ***Methods.*** Studies were selected from databases, including Web of Science. Statistical data processing was performed using Stata software version 16.0. The analysis included data from 27 studies. ***Results.*** It was found that swimming and resistance training had a positive effect on various indicators of metabolism and inflammation. ***Conclusion.*** Physical activity contributes to the improvement of metabolic processes and the reduction of inflammatory markers in mice with diabetes. Swimming showed the best performance across most evaluated parameters.
Keywords: type 2 diabetes, skeletal muscle, physical activity, inflammatory response, metabolism, meta-analysis.

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CLINICAL EFFICACY OF SPA TREATMENT OF VARIOUS DURATION IN PATIENTS WITH ARTERIAL HYPERTENSION (PILOT STUDY)

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Abstract. ***Introduction.*** One of the important issues at the present stage of development is the scientific substantiation of the optimal duration of spa treatment. The aim of the study was to compare the clinical efficacy of 7-, 14-, 18- and 21-day spa treatment in patients with arterial hypertension. ***Methods.*** An open multicenter prospective randomized clinical trial of 47 patients with arterial hypertension was conducted. ***Results.*** A statistically significant decrease in blood pressure and heart rate was noted with a treatment duration of 7 days, an increase in triglycerides, urea and creatinine – on the 7th day of the treatment. A statistically significant increase in exercise tolerance was found in patients of 4 groups and in quality of life in groups with spa treatment for 7, 14 and 18 days. In case of the 18- and 21-day treatment period, the total cholesterol, low-density lipoprotein cholesterol, triglycerides, blood glucose and C-reactive protein levels significantly decreased, while the high-density lipoprotein cholesterol level increased. ***Conclusion.*** The revealed changes of clinical indicators at different treatment periods, continuation of the study and evaluation of remote results after a year will create a basis for determining the optimal duration of spa treatment for arterial hypertension.
Keywords: blood pressure, arterial hypertension, duration of therapy.

SPORTS MEDICINE

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HORMONAL MARKERS OF SKELETAL MUSCLE ADAPTATION TO EXERCISE WITH DIFFERENT METABOLIC ORIENTATIONS IN ATHLETES

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Annotation. ***Introduction.*** To maintain the health of athletes, a balance between training loads and recovery is important. The anabolic testosterone/cortisol index is highly informative for assessing the functional state. Therefore, the aim of the study was to determine differences in serum concentrations of cortisol and testosterone and their ratio (anabolic index) in athletes during the process of adapting to loads of different metabolic direction. ***Methods.*** All participants (n=192) were divided into 3 groups depending on the competition distance. The monitoring of serum concentrations of cortisol and testosterone was carried out in the preparatory and competitive periods. Statistical processing was performed using the licensed software package ISB SPSS version 22.0. ***Results.*** An intergroup analysis has revealed significant differences in the studied parameters among athletes, depending on the metabolic orientation of training, as well as on athletic qualifications. ***Conclusion.*** Biochemical monitoring has carried out at different stages of the training cycle revealed the hormonal features of athletes' adaptation to competitive loads of different metabolic orientation.
Keywords: athlete, short-, middle- and long-distance running, adaptation, testosterone, cortisol, anabolic index.

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DEVELOPING THE TECHNOLOGY OF IMMEDIATE RECOVERY OF TOTAL PSYCHOFUNCTIONAL STATE OF ATHLETES USING CENTRAL AND PERIPHERAL EXPOSURE FACTORS

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Abstract. ***Introduction.*** The previous studies show effectiveness of the transcranial electrical stimulation course for the recovery of the functional state of the nervous, cardiovascular and respiratory systems of athletes. The aim is to develop a technology of immediate recovery of total psychofunctional state of athletes using central and peripheral exposure factors. ***Methods.*** To test the effectiveness of the developed technology, the study involved 43 elite athletes (21 men, 22 women). The technology included a 14-day course of transcranial electrical stimulation, lymphatic drainage of the lower limbs and underwater shower massage. ***Results.*** Appliance of the developed program in athletes resulted in optimization of the body's functional state, activated recovery processes after training activity, which was shown in improved indices of the central nervous system and neuromuscular system, psychophysiological functions, mental capacity and stability, normalized cerebral and peripheral hemodynamics. ***Conclusion.*** As a result, we have developed the effective technology of immediate recovery of total psychofunctional state of athletes using central and peripheral exposure factors.
Keywords: athletes, recovery, functional state, physiotherapy, hydrotherapy.

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APPLICATION OF PERIPHERAL MAGNETIC STIMULATION FOR IMPROVEMENT OF FUNCTIONAL CAPABILITIES OF THE MUSCULOSKELETAL SYSTEM OF FEMALE ATHLETES

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Abstract. ***Introduction.*** Broad spectrum of positive therapeutic effects of the rhythmic peripheral magnetic stimulation makes its application promising in sports practice. Objective of the work – to study possibilities of applying peripheral magnetic stimulation to improve functional capabilities of the musculoskeletal system and muscle strength in female athletes. ***Methods.*** The study involved 33 female athletes. The stimulation area was the posterior surface of the left and right hip. Before, after the 1st session and after the 8-session course we identified the indices of electroneuromyography, rheovasography and lower limb dynamometry. ***Results.*** We have identified positive effects of peripheral magnetic stimulation, firstly in terms of functional capabilities of the musculoskeletal system according to electromyography and muscle strength, which was shown primarily in increased amplitude and M-response area, as well as strength of hip flexors and extensors. Different modes of frequency and modulation had a different effect on hemodynamics of the lower limb vessels. ***Conclusion.*** We have discovered positive effects of applying peripheral magnetic stimulation on improvement of functional capabilities and lower limb muscle strength of female athletes.
Keywords: female athletes, functional capabilities, musculoskeletal system, neuromuscular system, peripheral magnetic stimulation, physiotherapy, electroneuromyography, hemodynamics, muscle strength.

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PATENT-PROTECTED TECHNOLOGIES OF BETA-RHYTHM NEUROFEEDBACK FOR ATHLETE RECOVERY

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Annotation. ***Introduction.*** Despite the proven high efficiency, application of beta-rhythm neurofeedback in recovery of athletes' psychofunctional state is unfairly limited. The present studies are fragmentary, and they consider a narrow field. Objective – to analyze technical level and received results of patent-protected technologies of applying beta-rhythm neurofeedback for athlete recovery. ***Methods.*** A search for patent data was carried out in the database of the Federal Service of Intellectual Property, Yandex patents and Google patents, online databases of the European Patent Office etc. The depth of the search was not limited. ***Results. Conclusion.*** We have found 127 protected documents corresponding to the search criteria, among them 4 were found by the keyword "neurofeedback", 44 – "correction of the beta rhythm of the brain", 9 – "brain rhythm biofeedback", 4 – "mental performance of athletes", 7 – "attention of athletes". ***Conclusion.*** Patent analysis did not reveal patent-protected technologies of beta-rhythm neurofeedback for athlete's nervous system recovery.
Keywords: patent, neurofeedback, correction of beta rhythm of the brain, brain rhythm biofeedback, mental performance of athletes, attention of athletes.

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METHODS OF ASSESSING ACTUAL NUTRITION AND THEIR APPLICATION IN CHILDREN'S AND YOUTH SPORTS

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Abstract. ***Introduction.*** The aim was to review existing methods of studying actual nutrition and assess the possibility of their application in children's and youth sports. ***Methods.*** The article considers the main methods of direct and retrospective registration of nutrition, describes the advantages and limitations of each method. The article considers methodological documents and positions of international associations on nutrition of athletes of different age groups. ***Results.*** An analysis of the applicability of methods for assessing actual nutrition in children's and youth sports is carried out, key aspects of conducting research are noted, taking into account specific factors that are important in assessing the nutrition of young athletes. ***Conclusion.*** The importance of conducting events to assess the diet of young athletes, as well as the need to implement educational programs that allow for the assessment and correction of diet independently, taking into account the basic principles of nutrition and recommendations of specialized organizations, was noted.
Keywords: methods of nutrition assessment, children, athletes.

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REVIEW OF PROGRAMS FOR ASSESSING ACTUAL NUTRITION IN YOUTH SPORTS

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Abstract. ***Introduction.*** Software for nutrition assessment in youth sports allows creating personal nutrition plans taking into account individual features of young athletes and analyzing effect of a diet on physical indicators and health. ***Methods.*** This article includes a review of the Scientific Nutrition Analysis Tool, the PC Individual Diet 5.0 professional version, as well as other available software for diet analysis and correction both for nutrition specialists and for independent use by athletes. ***Results.*** We have found functional features of the software and applications for nutrition analysis, which will simplify the search corresponding with the users' goals. ***Conclusion.*** Nutrition plays a key role for young athletes, due to intense physiological processes combined with high physical activity. Modern technologies and software for processing nutrition data are important tools for dietitians, nutritionists, coaches, young athletes and their parents in optimizing the diet.
Keywords: children, adolescents, athletes, nutrition analysis, data processing, digital nutrition.

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THE INFLUENCE OF PROFESSIONAL SKATING SPORTS ON THE DEVELOPMENT OF FLAT FEET IN ADOLESCENTS

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Abstract. ***Introduction.*** This study aims to assess the impact of professional skating sports (figure skating and ice hockey) on the morphofunctional condition of the bone and ligament system of the foot in teenagers. The relevance is related to the growing popularity of these sports among children, as well as the high load on the foot during such training. ***Methods.*** The study took place in educational institutions of Krasnoyarsk. A total of 120 adolescents participated in the study, including 60 athletes and 60 individuals in a control group. Condition of the foot was assessed with plantography using the Shtriter and Godunov-Potikhanova methods. ***The results*** have shown that longitudinal flat feet were detected in 66.7% of athletes and only 3.3% of the control group. The majority of athletes have morphofunctional abnormalities in the structure of the foot, which may be related to the peculiarities of the training process and the specifics of sports equipment. ***Conclusion.*** Despite the absence of statistically significant differences between the groups in a number of parameters, the identified trends indicate the need for regular medical monitoring and individual correction of the foot condition in young athletes. It is necessary to introduce an early screening system and develop unified methods for the prevention and correction of flat feet in youth sports.
Keywords: flat feet, figure skating, hockey, sports, teenagers.

PHYSICAL CULTURE AND PROFESSIONAL PHYSICAL TRAINING

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FORMATION OF PSYCHOPHYSICAL QUALITIES AND EMOTIONAL-VOLITIONAL SPHERE OF SENIOR PRESCHOOL CHILDREN WITH FITNESS TECHNOLOGIES

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Abstract. ***Introduction.*** In conditions of increased emotional lability of senior preschool children, physical activity plays a key role in stabilizing the emotional-volitional sphere and reducing intensity of negative emotional states. The objective of the study – to substantiate the effectiveness of classes with fitness technologies in learning psychophysical qualities and stabilizing the emotional-volitional sphere in senior preschool children. ***Methods.*** For 9 months, senior preschool children were engaged in the developed program with the following fitness technologies 3 times a week: basic aerobics, exercise ball gymnastics, stretching and developing classes additionally two times a week. ***Results.*** The final test of psychophysical fitness has revealed statistically significant changes in both girls and boys of both groups. However, boys of the control group did not have reliable results in five tests, girls – in four. ***Conclusion.*** Assessment of emotional-volitional sphere has shown reduced level of aggression and anxiety among children. Indices of girls were higher than those in boys, which may be caused by sex dimorphism.
Keywords: senior preschool age, psychophysical qualities, emotional-volitional sphere, fitness.

THEORY AND METHODS IN SPORTS

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COMPARATIVE ANALYSIS OF THE STRENGTH OF VARIOUS MUSCLE GROUPS IN ATHLETES ENGAGED IN VARIOUS TYPES OF COMBAT SPORTS (BOXING, JUDO, TAEKWONDO)

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Abstract. ***Introduction.*** Combat sports, boxing, judo, karate and taekwondo in particular, are characterized by high demands on the strength abilities of those involved. The aim of the work was a comparative analysis of the strength of various muscle groups in elite athletes involved in various types of combat sports (boxing, judo, taekwondo). ***Methods.*** The study involved 49 male martial artists. The strength of different muscle groups was registered with dynamometry on the Dr. Wolff Back-Check system. ***Results.*** Comparative analysis has demonstrated greater strength indicators for the largest muscle groups (back, thigh, chest) in judokas compared to boxers and taekwondo athletes. The strength of the adductor and abductor muscles of the limbs in male martial artists is virtually identical. ***Conclusion.*** The obtained data on the strength of various muscle groups, the developed model characteristics and strength profiles may be used to assess strength capabilities at different training stages of sports training and in the sports selection system.
Keywords: combat sports, strength capabilities, boxing, judo, taekwondo, dynamometry.

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STRENGTH ABILITIES OF 15-16-YEAR-OLD WRESTLERS OF WITHIN THE TRAINING MACROCYCLE PERIODIZATION

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Abstract. ***Introduction.*** Improving the strength of freestyle wrestlers is most promising in adolescence, and achieving high sports potential requires an effective solution of training tasks at the training stages. ***Methods.*** In 22 15-16-year-old freestyle wrestlers, we studied general and specific strength abilities in periods of a one-year training cycle using the tests presented in the Federal Standard for this sport. ***Results.*** Positive dynamics of indices with the largest percentage of growth in relation to strength, speed-strength ability and strength endurance, dependence of effective performance of specific motor tasks on the level of general power preparedness were revealed. ***Conclusion.*** Testing of strength abilities within the training macrocycle periodization contributes to objective assessment of adaptation capabilities of adolescent freestyle wrestlers.
Keywords: freestyle wrestlers, 15-16 years old, general and specific strength abilities, periods of sports training.

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TRAINING LOAD PARAMETERS IN ENDURANCE SPORTS (LITERATURE REVIEW)

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Abstract. ***Introduction.*** The article presents a review of scientific literature on the problem of planning the training process. The aim of the study is to analyze the theoretical and practical aspects of planning a training program in endurance sports. ***Methods.*** A theoretical analysis of publications of Russian and Foreign scientists in the PubMed, Scopus, eLibrary, Google scholar, Cyberleninka online databases. ***Results.*** Best practices show that training in the mixed zone and high-power zone are key to achieving success. At the same time, in the annual training cycle, the volume of low-intensity training is significantly higher than the volume of high-intensity training in all sports. ***Conclusion.*** A significant share of all high-intensity training in the competitive period is the volume of competitive exercises, while in training activities, most of this work is carried out in the form of intervals. The increase in intensity in such training is ensured by reducing rest intervals and increasing the intensity of interval performance.
Keywords: endurance, training parameters, load intensity, training load volume, Olympic sports.

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IMPROVING THE PSYCHOLOGICAL STABILITY OF SKI RACERS WITH PSYCHOLOGICAL AND PEDAGOGICAL TOOLS

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Abstract. ***Introduction.*** In the practice of cross-country skiers, mistakes are often noted in technical and tactical actions, especially in conditions of increased mental tension of competitive activities, which indicates insufficient mental stability of athletes. The purpose of this study is to improve the mental stability of cross-country skiers as a factor in the success of technical and tactical actions. ***Methods.*** Analysis of scientific and methodological literature; expert assessment; testing; survey; formative pedagogical experiment; math-and-stats methods. ***Results.*** In the course of the study, with the participation of 14-15-year-old skiers, mistakes in baton passing and leaving the starting line were revealed, the number of which increased during competition. In the course of the study, individual mental properties were revealed, which determine mental stability of athletes. ***Conclusion.*** The inclusion of a complex of psychological and pedagogical tools in the process of sports training allowed for the improvement of mental stability, which contributed to the increased effectiveness of athletes' competitive activities.
Keywords: cross-country skiers, mistakes, passing the baton, leaving the starting line, psychological stability.