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## PHYSIOLOGY

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### THE INFLUENCE OF ESPORTS ACTIVITY ON THE FORMATION OF A PHENOTYPE SIMILAR TO ATTENTION DEFICIT HYPERACTIVITY DISORDER: PSYCHOPHYSIOLOGICAL ASPECTS

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**Abstract.** ***Introduction.*** A phenotype similar to attention deficit hyperactivity disorder is a complex of symptoms resembling the aforementioned disorder but forming under the influence of the digital environment. In esports, extreme cognitive activity and stress create special conditions for its development: high concentration during gameplay is combined with reduced self-regulation outside it. The insufficient study of this phenomenon's mechanisms in relation to esports justifies the relevance of this work. ***Methods.*** Systematic analysis of scientific sources with an interdisciplinary approach (sports medicine, physiology, neurobiology, psychology); systematization of the phenotype formation mechanisms, their causes, symptoms, and correction methods. ***Results.*** Five mechanisms have been identified: dopamine dysregulation syndrome, sleep deprivation, attention fragmentation, emotional dysregulation, and autonomic imbalance. For each mechanism, symptoms and correction strategies have been determined (digital hygiene, sleep hygiene, biofeedback training, breathing practices, and physical exercise). ***Conclusion.*** The phenotype similar to attention deficit hyperactivity disorder in esports athletes is the result of the combined action of interrelated mechanisms. The data obtained are useful for structuring the training process and recovery programs.

**Keywords:** phenotype similar to attention deficit hyperactivity disorder, esports, virtual environment, psychophysiological mechanisms, neurobiology, sports medicine, dopamine system, attention fragmentation, emotional regulation, autonomic nervous system, digital hygiene, functional state correction.

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### THE INFLUENCE OF BODY-ORIENTED PRACTICES ON THE PSYCHOPHYSIOLOGICAL STATE OF STUDENTS, TAKING INTO ACCOUNT HEART RATE VARIABILITY TYPOLOGICAL FEATURES

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**Abstract.** ***Introduction.*** The article discusses the characteristics of the psychophysiological state of students who practice body-oriented techniques. ***Methods.*** The study involved 15 girls aged 18-19. To complete the objective, the methods included heart rate variability measurement and psychodiagnostic testing. ***Results.*** The heart rate variability analysis has revealed the predominance of the autonomous regulation at the ascertaining stage of the study. Additionally, the psychophysiological state assessment, taking into account the predominant type of autonomic regulation, has shown the uniformity of the subjects' nervous system characteristics. ***Conclusion.*** At the control stage of the research, a change in the ratio of subjects with the predominant type of autonomic regulation has been identified. At the same time, the features of psychophysiological characteristics of students have been demonstrated.

**Keywords:** heart rate variability, psychophysiological state, students, body-oriented practices.

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## TRANSFORMATION OF THE METROLOGICAL STATUS OF OPERATIONAL CONTROL MARKERS: A METHODOLOGICAL CONFLICT IN USING HEART RATE TO ASSESS CHRONIC ADAPTATION

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**Abstract.** ***Introduction.*** Heart rate is widely used as an operational control marker; however, its application for assessing chronic adaptations remains methodologically controversial. Aim: to theoretically substantiate the possibility of transforming heart rate from an operational marker into a quasi-staged indicator. ***Methods.*** The study was conducted as a methodological analysis based on data from meta-analyses and randomized controlled trials. ***Results.*** Four conditions for the transition were formulated. A step-by-step algorithm for staged assessment was developed. The proposed algorithm enables the transformation of heart rate from an operational control marker into a quasi-staged indicator. The algorithm is accessible, requires no complex equipment, and can be adapted for other physiological signals. ***Conclusion.*** Provided the formulated conditions are met, the boundary between operational and staged control becomes flexible. This opens up new opportunities for using available markers in long-term monitoring without a proportional increase in costs.
**Keywords:** heart rate, sports metrology, operational control, staged control, long-term monitoring, sports testing, diagnostics.

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## FUNCTIONAL STATUS OF THE NEUROMUSCULAR SYSTEM AND HEMODYNAMICS OF THE UPPER LIMBS OF FEMALE POWERLIFTERS AND CROSS-COUNTRY SKIERS

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**Abstract.** ***Introduction.*** The different focus of physical activity for female powerlifters and cross-country skiers may affect the characteristics of the neuromuscular system and the hemodynamics of the upper limbs. Aim – to study parameters of the functional status of the neuromuscular system and hemodynamics of the upper limbs of female powerlifters and cross-country skiers. ***Methods.*** The study involved 18 female cross-country skiers and powerlifters. Indicators of electroneuromyography and rheovasography were registered. ***Results.*** The electroneuromyography data have shown that the motor response parameters (latency, residual latency, motor response duration) were statistically better among the skiers compared to the powerlifters. The rheovasography parameters have demonstrated a disturbance in peripheral blood flow among athletes of both groups (values of the rheovasographic and diastolic index as well as Alpha2 were not within the reference interval). At the same time, the arterial blood flow and microcirculation parameters in powerlifters are lower than those in female cross-country skiers. ***Conclusion.*** Based on the conducted research, it has been revealed that the parameters of the functional state of the neuromuscular system and hemodynamics of the upper limbs are related to the focus of the training process of female athletes. Analyzing the obtained hemodynamic data, we can conclude that additional means of restoring the functional state of the upper limbs of female powerlifters are required.
**Keywords:** neuromuscular system, hemodynamics, upper limbs, powerlifting, cross-country skiing.

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## EXTRACORPOREAL SHOCK WAVE THERAPY FOR DELAYED-HEALING FRACTURES IN CHILDREN: A LITERATURE ANALYSIS

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**Abstract.** ***Introduction.*** Objective: to conduct an analytical review to determine the potential for using extracorporeal shock wave therapy for delayed-healing fractures in children. ***Methods.*** A theoretical review of Russian and international studies was conducted. The search for sources was carried out in the E-Library, Google Scholar, and PubMed databases. ***Results.*** Extracorporeal shock wave therapy demonstrates high efficacy in the treatment of delayed-healing fractures, particularly in cases where conservative treatment is ineffective or surgery is contraindicated. Its noninvasive nature and stimulation of reparative processes make it a valuable addition to traditional approaches. The choice of treatment method should be based on a comprehensive assessment of the patient's condition, fracture type, age, and comorbidities. Complex cases may require a combination of methods. ***Conclusion.*** Further research in this area can be aimed at developing standardized extracorporeal shock wave therapy protocols and healing monitoring tailored to the age and pathological characteristics of patients. Although data on the use of extracorporeal shock wave therapy for delayed-healing fractures in children are still limited, existing studies demonstrate the potential of this method.
**Keywords:** extracorporeal shock wave therapy, delayed healing, pediatric fractures, osteogenesis, functional rehabilitation.

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## COMPREHENSIVE ASSESSMENT OF THE THERAPEUTIC, CLIMATIC, LANDSCAPE AND RECREATIONAL POTENTIAL OF THE TERRITORY OF THE VASILYEVSKOYE CHILDREN'S SANATORIUM IN THE MOSCOW REGION

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**Abstract.** ***Introduction.*** Climatic and landscape factors are the key elements of sanatorium resort treatment. Therefore, a comprehensive assessment of a territory's conditions for the application of climate therapy is necessary. Aim: to assess the therapeutic, climatic, landscape and recreational potential of the territory of the Vasilyevskoye Children's Sanatorium (Moscow Region), to justify the use of natural factors in rehabilitation. ***Methods.*** The study was carried out on an area of 421 600 m² (altitude – 184-195 m, moderate continental climate). Climate data was analyzed, and the bioclimatic potential was identified, taking into account measurements of microclimate indicators, air ions, PM2.5/PM10, and gamma radiation. ***Results.*** Bioclimatic potential – 1.7 points out of 3 (favorable conditions). Average indicators: temperature – 30.0 °C, humidity – 45.8%, pressure – 746,1 mm of Hg, $O_2$ – 20.2%, $CO_2$ – 471 ppm, PM2.5 – 10.2 μg/m³, PM10 – 16,4 μg/m³, gamma radiation ambient dose equivalent rate – 0,04-0,05 μSv/h, ratio of greenery – 70%. ***Conclusion.*** The area is suitable for open-air treatment, air baths, light and landscape therapy, as well as physical activity. Seasonal monitoring is required to assess the indicators' stability.
**Keywords:** climate therapy, therapeutic climate, bioclimatic potential, open-air treatment, light therapy, landscape therapy, air ionization, PM2.5, PM10, Moscow Region.

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## PROSPECTS OF INTEGRATING GAMIFIED SYSTEMS IN BIOMEDICAL SUPPORT OF ELITE ATHLETES

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**Abstract.** ***Introduction.*** The aim of this study is to analyze the scientific literature on the possibilities and prospects of using gamified systems for musculoskeletal system recovery and rehabilitation. ***Methods.*** We conducted an analysis of Russian and foreign scientific literature using the eLibrary, PubMed, and Google Scholar databases. ***Results.*** The analysis has revealed that the use of virtual reality technology and gamification in restorative and sports medicine has a positive impact, as well as several advantages compared to traditional therapy, such as reduced pain syndrome and improved patient engagement. ***Conclusion.*** A wide range of applications and equipment variability allow adapting the process to specific issues and tasks in elite sports, including the recovery of the functional upper limb state.
**Keywords:** virtual reality, gamification, recovery, rehabilitation, restorative medicine, sports medicine, biofeedback.

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## RECOVERING THE FUNCTIONAL STATE OF THE CENTRAL NERVOUS OF FEMALE SITUATIONAL SPORTS ATHLETES AFTER BETA-STIMULATING TRAINING, PELO- AND BALNEOTHERAPY

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**Abstract.** ***Introduction.*** The studies show that beta wave neurofeedback technology allows influencing functional systems of the body and mental state of athletes. Objective – to study the influence of a course including beta-stimulating training, pelo- and balneotherapy treatment on the functional state of the central nervous system of female situational sports athletes. ***Methods.*** Eighteen elite female athletes participated in the study. The recovery course included beta-stimulating training, pelotherapy for the cervical-collar area and a dry carbonic acid gas bath. Before and after the course, we recorded electroencephalogram parameters and performed psychophysiological testing. ***Results.*** The application of the recovery course has contributed to an improvement in the functional state of the central nervous system of the athletes, which manifested itself in the optimized brain's bioelectric activity, reduced levels of anxiety, increased speed of simple and complex sensorimotor reactions, and improved mental performance. ***Conclusion.*** The course application of beta-stimulating training, pelo-and balneotherapy improves the functional state of the central nervous system in female situational sports athletes in during periods of intense physical activity in middle mountains.
**Keywords:** athletes, middle mountains, intense training activity, functional state, performance, anxiety.