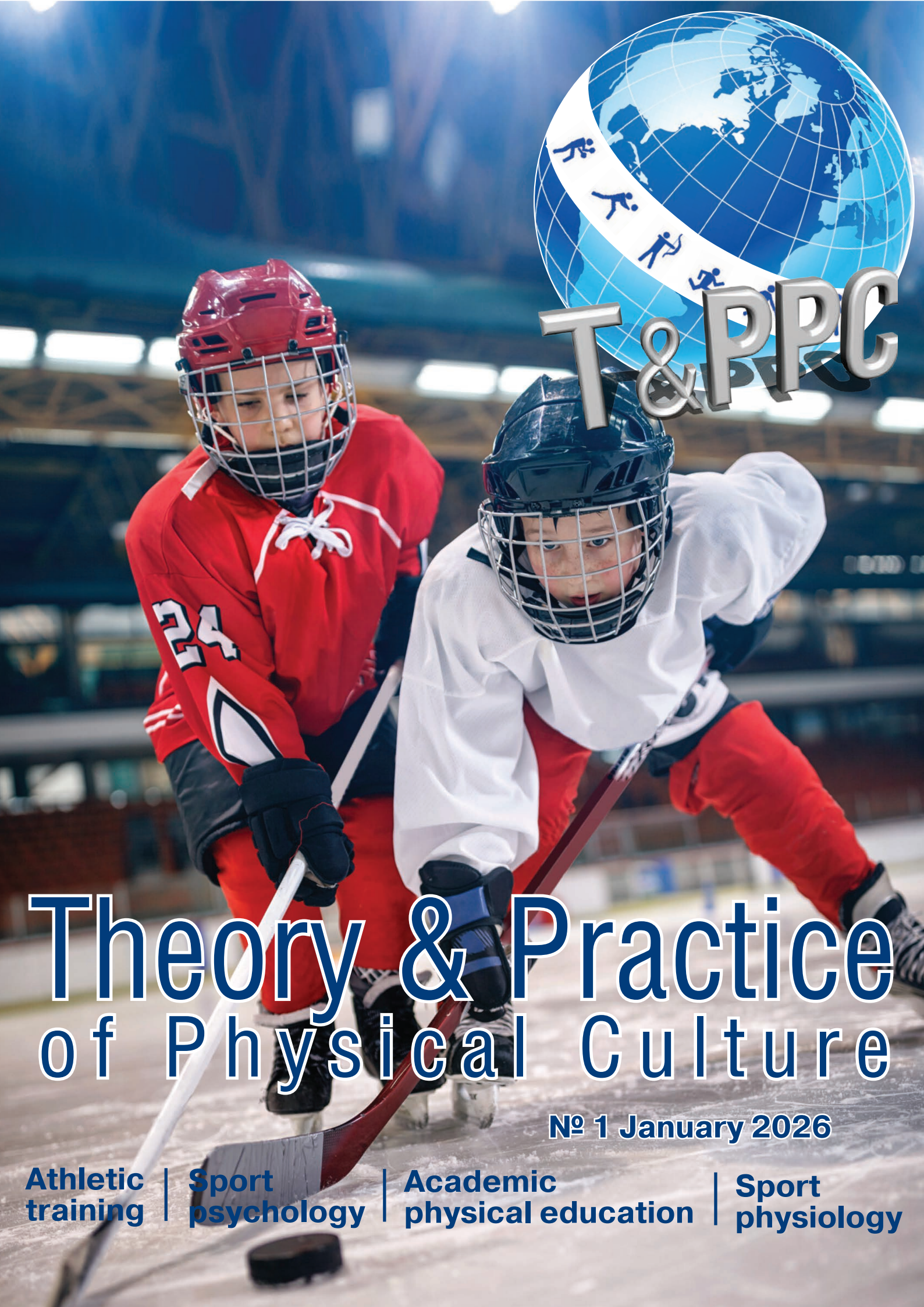

Theory & Practice of Physical Culture

№ 1 January 2026

Athletic training | Sport psychology | Academic physical education | Sport physiology

Educational Investments in Health in the Information Society

Modern life is characterized by the integration of the physical and digital worlds, creating a fundamentally new sociocultural environment with unique opportunities and challenges for human development and health.

Numerous studies have shown that virtual environments often have a negative impact on the physical health of individuals, particularly the younger generation. Prolonged use of computers or other electronic devices leads to physical inactivity, vision problems, poor posture, and other health problems. The constant flow of information, social media addiction, cyberbullying, and virtual isolation are all factors that can lead to stress, anxiety, depression, and other mental health disorders. At the same time, the nature of social interaction among young people is changing. While virtual communication expands opportunities for communication, it can also lead to a decline in social skills, difficulties establishing real-life connections, and a deterioration in interpersonal relationships. Furthermore, the abundance of information online, including unreliable and contradictory information, can lead to disorientation and dependence on the opinions of others.

At the same time, many scientists have noted that virtual environments can be used to achieve health-promoting goals in educational institutions. Online educational platforms for healthy lifestyles, fitness apps, virtual exercise machines, and online consultations with doctors, trainers, and psychologists offer innovative resources that can be integrated into health-promoting pedagogical technologies. Therefore, a rethinking of the approaches, principles, and resources of health-promoting pedagogy is required today.

The guiding idea of pedagogical investment is the development of motivation and a culture of health, which aligns with one of the main goals of education and requires systematic work and conscious investment. Digital technologies are a relevant tool in the information society that enhances pedagogical investment in health-promoting education.

If these investments are viewed as a project, digital technologies play a key role at all stages of its implementation. The role of technology can be structured by its functions in the pedagogical process: educational, communication, and management.

It should be noted that the inappropriate implementation of digital technologies can be detrimental, so investments must be comprehensive, aimed at eliminating the digital divide, organizing educational workflows, overcoming digital literacy deficits, and simultaneously supporting the emotional connection between teacher and student.

Pedagogical investment in health promotion, like any investment, requires planning for long-term results. In this regard, the use of digital technologies allows for a transition from general recommendations to individualized health pathways for each student. Health management will be based not on subjective assessments, but on specific, objective monitoring data. Telecommunications and online platforms blur the boundaries between the educational environment and everyday life, providing health support at any time and regardless of location. Through interactive formats and prompt feedback, digital tools help students develop a conscious attitude toward their health. Investments in modern health-promoting pedagogy should be aimed at ensuring a balanced life for young people in both real and virtual environments. Successful implementation of health-promoting technologies requires adapting traditional approaches to new conditions, as well as harnessing the potential of digital tools to improve and maintain health. A key aspect of health promotion is fostering a culture of health in students, based on a conscious attitude toward their physical, mental, and social well-being in the digital world.

We invite scientists to publish the results of scientific research aimed at finding and studying the value meanings of physical culture and sports.

Editor-in-Chief of TPPC, Honored Worker of Physical Culture of the Russian Federation
Dr. Hab., Professor L.I. Lubysheva

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Theory and Practice of Physical Culture

Contents

The dynamics of biochemical indicators and the principle of unity between physical and technical training for high-level biathletes

UDC 796.012

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Abstract

Objective of the study is to identify trends in biochemical homeostasis and kinematic parameters in high-level biathletes.

Methods and structure of the study. The testing was carried out with the participation of biathletes – members of the Russian national team. It was assumed that at the stages of the preparatory period, there is a relationship between the nature of training loads, the current condition of athletes, assessed by biochemical blood markers, and the kinematic characteristics of simultaneous single-step skating. The informative value of all the indicators used has been substantiated in previous studies.

Results and conclusions. Trends in changes in biochemical homeostasis have been identified, reflecting the stress response of the body to stress and changes in the kinematics of skating. The different stages of the preparatory period are characterized by specific biochemical and kinematic adaptations, indicating the importance of optimal chronologization of physical activity for effective improvement of running technique. A promising area is the study of neuromotor mechanisms for controlling motor actions, taking into account changes in biochemical homeostasis in athletes.

Keywords: *biochemical indicators, biathletes, supreme athletic skill, principle of unity.*

Introduction. The training process for biathletes, including at the highest level of athletic performance, is based on a number of fundamental principles, one of which is the principle of unity and interconnection between the physical and technical training of athletes. According to this principle, physical training should create a morphofunctional 'base' for mastering and improving competitive techniques, and technique, in turn, should allow the athlete to realise their functional potential as effectively as possible.

In practice, there is an objective contradiction between the processes of physical and technical training. Thus, physical training is aimed at expanding the functional capabilities of the body, which is accompanied by the formation of a 'metabolic trace' and a violation of homeostasis, to which the nervous system reacts with changes in the motor programming of the kinematic variables of specialised locomotion, which are the object of training and improvement within the framework of technical training.

The solution to the problem can be simplified by taking into account the relationships between the biochemical parameters of blood and the kinematic variables of technique (stride length and frequency, joint angles, range of motion, stride length).

Objective of the study is to identify trends in biochemical homeostasis and kinematic parameters in high-level biathletes.

Methods and structure of the study. The proposed hypothesis was tested as part of a multi-year comprehensive study involving biathletes who are members of the Russian national team. It was assumed that during the preparatory period, there is a correlation between the nature of training loads, the current condition of athletes, as assessed by blood biochemical markers, and the kinematic characteristics of simultaneous single-step skating. The informa-

tive value of all the indicators used was substantiated in previous studies [1].

Results of the study and discussion. During the general preparatory stage (GPS), biathletes predominantly used low-intensity cyclic exercises (running, cycling, roller skiing), as well as strength training aimed at developing muscle hypertrophy and strength endurance. Biochemical markers in the blood of biathletes at the GPS reflected low stress levels, characterised by: low creatine phosphokinase (CPK) activity – minimal muscle damage; high testosterone levels – high anabolic capacity; moderate cortisol concentration – the body coped with the load, stress was controlled; low urea content – work intensity and protein breakdown were not high, recovery was successful; stable glucose and insulin levels, confirming balanced energy supply.

Changes in physical fitness indicators were maximal, relative to other stages of training, in terms of aerobic muscle capacity and heart function. Indicators of muscle speed and strength did not change significantly.

Against the backdrop of a low level of stress response in the body and the low-speed nature of strength and cyclic exercises, changes in kinematics were characterised by the following: inefficient organisation of movements in the phase of active pressure on the support, but a more rational technique in the phase of free sliding; a decrease in cycle speed due to a reduction in stride length at a stable frequency; a decrease in the amplitude of movements in the knee, hip and ankle joints; stagnation in the time of push-off with the arms and legs.

Conclusions based on GPS: a) insignificant fluctuations in biochemical stress markers presumably allow the nervous system to be maintained in a state conducive to motor learning and retraining; b) a decrease in kinematic indicators, in particular, stride length, joint range of motion, and push-off time with the hands and feet, is likely caused by a lack of improvement in the level of development of muscle speed and strength capabilities.

During the special preparatory stage (SPS), the proportion of high-speed specific and non-specific exercises increased, while strength training shifted towards the development of maximum strength. Biochemical markers reflected increased stress levels: a) increased CPK activity; b) decreased testosterone levels; c) increased cortisol and urea concentrations; d) imbalance in glucose and insulin levels. At the same time, an increase in haemoglobin content was recorded, probably as a result of adaptation to hypoxia under increased but adequate stress. Indicators of the functional capabilities of the cardiovascular system show a downward trend, while speed and strength indicators, on the contrary, increase slightly.

Kinematic: in the first half of the SPS, there was an increase in cycle speed due to an increase in the length of the free roll with a reduction in the push-off phase; in the second half of the stage, the speed decreased due to a reduction in the length of the roll in the active and passive phases of the cycle with an increase in the frequency of movements. In terms of coordination, there was an excessive shift of the centre of mass (CM) beyond the support area at the moment of placing the ski poles, an increase in the forward tilt of the lower leg during the push-off, and a decrease in the amplitude of movements in the knee joint, which reduced the vertical oscillations of the CM.

Thus, at the SPS: a) the intensification of loads and increased biochemical stress at the beginning of the stage had a stimulating effect, which was expressed in an increase in speed due to the frequency of steps and the length of the stride as a result of increased push-off power; b) in the second half of the stage, 'fatigue accumulated,' which was expressed in a decrease in cycle speed while maintaining phase times, indicating a decrease in push-off power; c) accumulated fatigue and muscle tension prevented the consolidation of the optimal movement structure at high speed, which was expressed in the appearance of new kinematic errors.

During the (summer) pre-competition stage (PCS), there was a decrease in the total load volume with a simultaneous increase in its intensity and the proportion of specific speed loads on roller skis. Strength loads were aimed at developing explosive power. Biochemical blood markers indicated high specific stress: CPK activity decreased, indicating muscle adaptation and increased resistance to damage; testosterone levels decreased significantly, while cortisol concentration increased, indicating maximum tension in the anabolic and stress systems; urea content decreased, indicating sufficient recovery processes despite stress; haemoglobin content decreased slightly, compensated by a decrease in blood viscosity; glucose levels decreased against a background of increased insulin efficiency, indicating stable energy supply.

Kinematic: speed increased due to a simultaneous increase in stride length and frequency; the push-off with the foot increased, but the duration of the push-

off with the arms decreased; the power of the push-off increased, as can be judged by the greater length of the single-support slide. However, the increase in speed was mainly due to improved physical condition rather than technical efficiency, as evidenced by a number of errors: 1) excessive verticalisation of the torso when placing the poles on the support; 2) lack of rear flexion in the ankle joint; 3) excessive backward displacement of the centre of mass when leaning on the poles and extending the shoulder joint; 4) inefficient knee extension during the gliding phase on one ski, and a number of others.

Physical fitness indicators improved as expected: maximum oxygen con-sumption, anaerobic threshold, explosive and power indicators increased, but strength indicators for the leg and shoulder girdle muscles did not. Stroke volume and minute blood flow tended to decrease against the background of an increase in the proportion of fat.

Thus, at the PCS, an increase in the intensity and proportion of specific loads against a background of high training stress led to an increase in the speed of the movement cycle due to an improvement in physical fitness, rather than the effectiveness of technique. It is quite possible that the short preparation time for the summer competitions did not allow the nervous system to translate the correct, but still 'transitional' technique into a movement pattern that was resistant to disruptive factors.

Conclusions.

1. An inverse relationship has been established between the level of biochemical stress and the ability to perform fine motor coordination tasks. Low stress (GPS) is conducive to technique correction, while high stress (SPS and PCS) acts as a limiting factor.

2. Kinematic parameters are an external indicator of changes in the state of homeostasis – the internal environment of the body. It can be assumed that the nervous system first determines the current state of the internal environment of the body and then selects the appropriate kinematics of movement for it.

3. At different stages of the preparatory period, different trends in biochemical shifts and rearrangements of kinematic variables of specialised locomotion are observed.

GPS: low stress levels are conducive to motor learning/relearning, but the dominant low-speed mode of operation does not ensure stable reproduction of the achieved learning results when performing exercises at high speed.

SPS: high stress levels hinder the reproduction of improved kinematics achieved in the previous stage, especially in conditions of cumulative fatigue.

PCS: peak stress levels provoke the manifestation of 'old' mistakes, but the achieved level of functional capabilities allows technical errors to be compensated for in order to achieve high speed of movement.

4. The key problem in training biathletes is the need to chronologise the processes of developing physical qualities and improving technique in such a way that homeostatic shifts induced by physical exertion do not limit work on kinematic parameters during technical training and ensure a systematic transition from improved 'transitional' technique to a movement design that is resistant to disruptive factors.

5. A promising direction for further research is the study of neuromotor mechanisms for controlling movement according to leading kinematic variables depending on the specifics of homeostatic shifts in the athletes' bodies.

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References

1. Myakinchenko, E.B. et al. Periodizatsiya trenirovochnogo protsessa dinamika fizicheskoy podgotovlennosti kinematicheskih parametrov tekhniki i sportivnogo rezultata u lyzhnikov i biatlonistov vysokogo klassa. Moskva: Pero, 2024. 364 p.

Statokinetic stability of athletes under the influence of physical loads

UDC 796.925

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Abstract

Objective of the study is to determine the relationship between the type of sport, the level of athletic skill, and the statokinetic stability of athletes during physical exertion.

Methods and structure of the study. 214 men who are actively involved in sports and have at least 9 years of experience were examined. The sports qualifications of the subjects range from the second adult category to the Master of Sports of the Russian Federation. Sports: cycling (middle- and long-distance running, cross-country skiing, swimming and rowing), sighting (bench shooting) and situational (basketball, badminton, volleyball, football, tennis, hockey and wrestling) sports. The control group of 70 people consisted of non-athletes. Statokinetic stability was assessed using a biofeedback stability platform at relative rest, as well as after vestibular and physical exertion.

Results and conclusions. Regular sports training increases statokinetic stability and reduces differences between groups, which contributes to the relative homogeneity of athletes in terms of statokinetic parameters, regardless of the sport. Gradually increasing physical and vestibular loads have a differentiated effect on the dynamics of pressure centre dispersion indicators in athletes of different sports.

Keywords: *athletes of different categories, sports, statokinetic stability, vestibular loads, physical loads.*

Introduction. The problem of maintaining statokinetic stability is relevant in sports, where the ability to maintain balance in various conditions plays an important role in achieving high results [4]. Many scientific works are devoted to studying the characteristics of statokinetic stability in athletes of various specialisations. The main conclusions reached by researchers are that statokinetic stability indicators are associated with the level of athletic skill and the specifics of the sport, and that the ability to maintain postural balance in athletes of all sports is enhanced and has its own specifics [2, 3]. Thus, with eyes open, the posture regulation system is least tense in athletes who play games, and with eyes closed, posture regulation is most perfect in wrestlers [2]. The specificity of postural control due to sporting activity has also been noted in another study, which showed that athletes engaged in complex coordination sports demonstrate a pronounced asymmetry in maintaining a vertical posture with a shift of the centre of gravity to the left, especially in the absence of visual control [1].

Currently, there are few comparative studies in the scientific literature analysing how the type of sporting activity and level of skill affect changes in statokinetic stability under the influence of dosed physical and vestibular load, since any sporting activity is a combined influence of both physical and vestibular stimuli.

Objective of the study is to determine the relationship between the type of sport, the level of athletic skill, and the statokinetic stability of athletes during physical exertion.

Methods and structure of the study. The research was conducted in the morning at the Research Institute of Physical Culture and Sports of the Volga Region State University of Physical Culture, Sport and Tourism (Kazan). A total of 214 men who

had been actively involved in sports for at least nine years were examined. The sports qualifications of the subjects ranged from II adult category to Master of Sports of the Russian Federation. Sports included cyclic sports (middle- and long-distance running, cross-country skiing, swimming, and rowing), target sports (shooting), and situational sports (basketball, badminton, volleyball, football, tennis, hockey, and wrestling). The control group of 70 people consisted of non-athletes.

Static-kinetic stability was assessed using the Stabilan-01 biological feedback stabiliser from the Ritm special design bureau (Taganrog). For this scientific work, only the values of the amplitude of pressure centre oscillations in the frontal and sagittal planes were used.

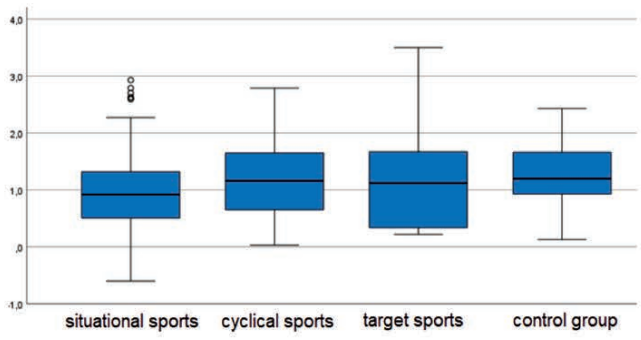
The physical load used was a cyclic stepwise increasing load on a bicycle ergometer (at the first stage, which lasted 3 minutes, the load was 50 W, then the power was increased by 30 W at each subsequent stage (duration 1 min) up to a heart rate of 170 beats per minute). Vestibular load was presented in the form of Voyacek's otolith test. These types of loads were used in the following order: assessment of statokinetic stability on a stabilisation platform in a state of relative rest, then the effect of vestibular load on statokinetic function, then the effect of cyclic stepwise increasing load on a bicycle ergometer on balance function. There was a 30-minute rest period between the vestibular and physical loads.

The data were processed using SPSS 27 software. The normality of the data distribution was assessed, and based on the results obtained, parametric and non-parametric research methods were used to assess the statistical significance of the differences.

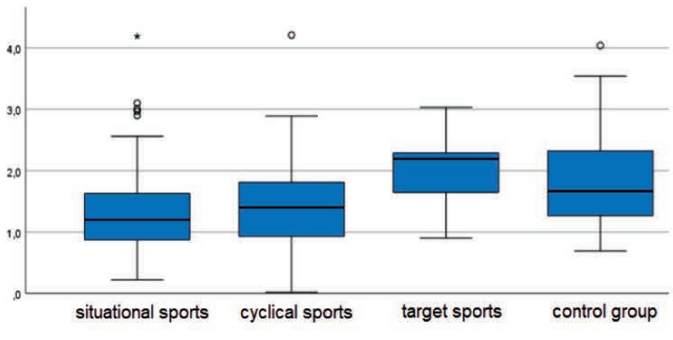
Results of the study and discussion. When performing a stabilographic test in a state of relative rest, athletes successfully maintain their body balance, with insignificant fluctuations of the centre of pressure (CP) from the vertical axis, and stabilographic indicators of the speed of fluctuation of the centre of pressure in the frontal and sagittal planes did not differ among athletes of different sports. In individuals who do not engage in sports, the effectiveness of maintaining body balance is significantly lower ($p<0.01$) compared to athletes, and the speed of the centre of pressure oscillation in the frontal and sagittal planes is more pronounced, indicating a lower level of postural control.

In response to vestibular load, the main differences were recorded in the amplitude of pressure centre oscillations in the sagittal plane (Fig. 1). Thus, statistically significant indicators were observed in representatives of situational sports compared to the control group ($p<0.001$) and the group of athletes in target sports ($p<0.001$), as well as in athletes engaged in cyclic sports compared to the control group ($p=0.036$). In the frontal plane, only the values obtained for representatives of situational sports and the control group were statistically significant ($p=0.024$).

The frontal and sagittal indicators in response to vestibular load between the study groups, divided by skill level, were less pronounced (Fig. 2): statistically significant differences in frontal CP amplitude indicators were noted only between the indicators of masters of sport and the control group ($p=0.019$), and in CP amplitude between the control group and first-class athletes ($p=0.008$) and the master of sports group ($p=0.018$).

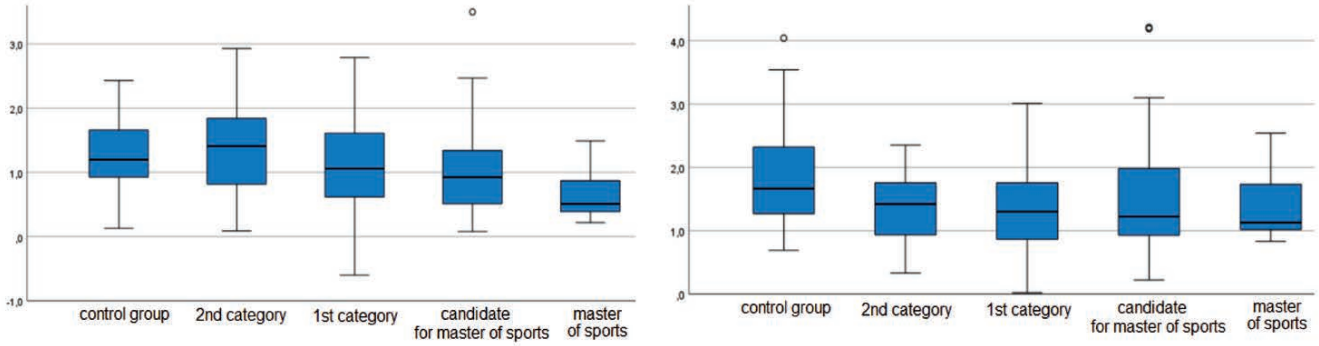


Frontal oscillation amplitude, mm



Sagittal oscillation amplitude, mm

Fig. 1. Dynamics of changes in the amplitude of pressure centre oscillations after vestibular loading



Frontal oscillation amplitude, mm **Sagittal oscillation amplitude, mm**

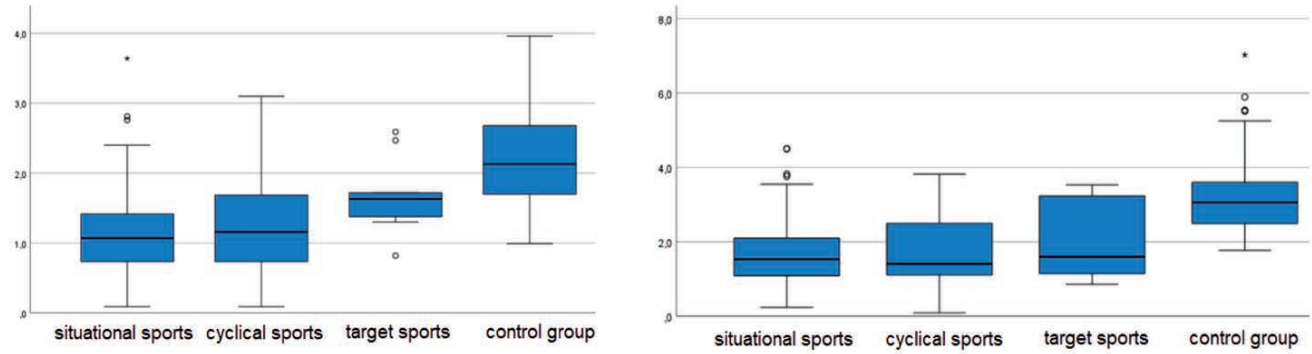
Fig. 2. Dynamics of changes in the amplitude of pressure centre oscillations after vestibular loading

After performing stepwise increasing physical exercise, athletes from different sports showed statistically significant differences in the dynamics of pressure centre dispersion (Fig. 3). The lowest values of the dynamics of the centre of pressure amplitude in the frontal plane were observed in athletes of situational sports, compared with the control group ($p<0.001$) and target sports ($p=0.035$), and in terms of dynamics in the sagittal plane – only with the control group ($p<0.001$). At the same time, regardless of the groups, the greatest changes were observed in the sagittal plane.

Assessment of changes depending on the level of athletic skill, without taking into account the type of sport, showed that after physical exertion, there were no statistically significant differences between the study groups in terms of centre displacement in the frontal plane, whereas in the sagittal plane, these changes were more pronounced and statistically significant (Fig. 4). At the same time, the group of non-athletes differed statistically significantly from all other groups ($p<0.05$).

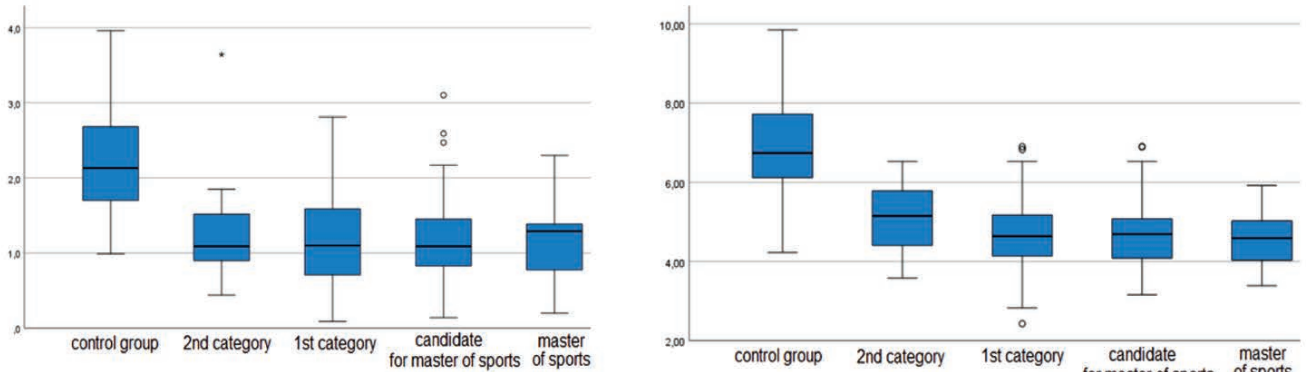
Perhaps this similarity among athletes, regardless of their level of athletic skill, can be explained by the fact that regular training is a sufficient factor in improving statokinetic stability, regardless of the specific sport, which makes the group of athletes homogeneous.

Conclusions. Regular sports training increases statokinetic stability and reduces differences between groups, which contributes to the relative homogeneity of athletes in terms of statokinetic parameters, regardless of the sport. Gradually increasing physical and vestibular loads have a differentiated effect on the dynamics of the centre of pressure dispersion in athletes of different sports. Regardless of the type of sport and functional test, the greatest changes in the amplitude of the centre of pressure in athletes are



Frontal oscillation amplitude, mm **Sagittal oscillation amplitude, mm**

Fig. 3. Dynamics of changes in the amplitude of pressure centre oscillations after stepwise increasing physical exertion depending on the type of sport



Frontal oscillation amplitude, mm

Sagittal oscillation amplitude, mm

Fig. 4. Dynamics of changes in the amplitude of pressure centre oscillations after stepwise increasing physical exertion depending on the level of athletic skill

observed in the sagittal plane. Compared to stepwise increasing load, vestibular load differentiates athletes less strongly by skill level, but reveals significant differences between athletes and the control group.

The work was carried out with the help of a grant provided by the Academy of Sciences of the Republic of Tatarstan to higher education institutions, scientific and other organisations to support plans for developing human resources in terms of encouraging their scientific and scientific-pedagogical workers to defend doctoral dissertations and carry out scientific research work.

References

1. Zamchiy T.P., Lozhkina-Gametskaya N.I., Spataeva M.H. Asimmetriya v podderzhanii vertikalnoy pozy u sportsmenov raznyh spetsializatsiy. Sovremennye problemy nauki i obrazovaniya. 2014. No. 3. Pp. 610-615.
2. Melnikov A.A. Sravnenie posturalnoy ustoychivosti u sportsmenov s raznoy napravlennostyu trenirovochnogo protsessa. Fizicheskoe vospitanie i sportivnaya trenirovka. 2019. No. 2. Pp. 60-71.
3. Nazarenko A.S., Mavliev F.A. Podderzhanie ravnovesiya tela na fone fizicheskogo utomleniya myshts plechevogo poyasa u sportsmenov raznyh spetsializatsiy. Nauka i sport: sovremennye tendentsii. 2015. V. 9. No. 4(9). Pp. 21-25.
4. Paillard T., No F., Rostagno C. Postural control is affected by sensorimotor fatigue induced by an intense treadmill run. J. Appl Physiol. 2006. V. 100. No. 5. Pp. 1659-1665.

Statistical model of kinematic indicators of performing an element on the parallel bars in gymnastics

UDC 796.412.2:531.7

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Abstract

Objective of the study is to develop a statistical model of the kinematic parameters of the elements with a large swing forward on uneven bars of different heights based on the identification of differences in the structure of the element performed by gymnasts of the Russian national team and the world's leading gymnasts at competitions of various ranks (2020-2024).

Results and conclusions. The conducted research shows that the technique of performing the 360° rotation element performed by the world's leading gymnasts creates favorable conditions for transferring the skill to performing the 540° rotation element (Russian gymnasts performed the element at competitions of various ranks – 0 times, gymnasts from other countries – 34 times). In this regard, the kinematic parameters of the whole 360° rotation element performed by foreign gymnasts can be considered as a model.

Keywords: *g ymnast, technique, gymnastic bars, model.*

Introduction. In his scientific works, Professor Yu.K. Gaverovsky wrote that in artistic gymnastics, there has been a shift towards structural content and diversity in competition programmes, and that it is necessary to focus on studying and including in combinations elements with a large forward swing with varying degrees of rotation on bars of different heights, which undoubtedly requires an increase in athletic skill and, accordingly, the search for new ways to train high-class athletes [1-3].

The relevance of this issue is determined by the complexity of training gymnasts, based on the need for biomechanical analysis of the structure of performing a large forward swing with a 360° turn on bars of different heights, due to the insufficient volume of research data and methodological recommendations on the issue under study.

Objective of the study is to develop a statistical model of the kinematic parameters of the elements with a large swing forward on uneven bars of different heights based on the identification of differences in the structure of the element performed by gymnasts of the Russian national team and the world's leading gymnasts at competitions of various ranks (2020-2024).

Results of the study and discussion. In modern artistic gymnastics, according to FIG rules, a compulsory element of the competition programme on the uneven bars is a large forward swing with a turn.

An analysis of the competitive activities of the Russian national team and the world's leading gymnasts for the period 2020-2024 showed that Russian athletes perform the element with a 360° turn 52 times at competitions of various levels, while the world's leading athletes perform it 301 times.

The results obtained served as the basis for conducting a kinematic analysis of exercises with a 360° turn and identifying the kinematic features of performing the element in question.

To analyse the technique of performing the element with a turn, the following phases were identified

(Fig. 1): Phase 1 – the beginning of the movement with a turn around the vertical axis; Phase 2 – the end of a 180° turn around the vertical axis; Phase 3 – the end of a 360° turn around the vertical axis;

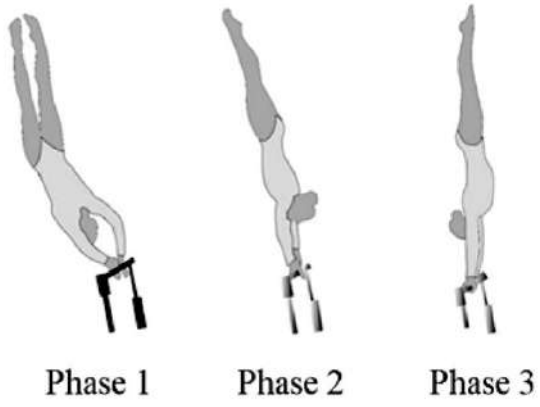

Fig. 1. Graphical representation of the phase composition of an element performed with a large forward swing and a 360° turn

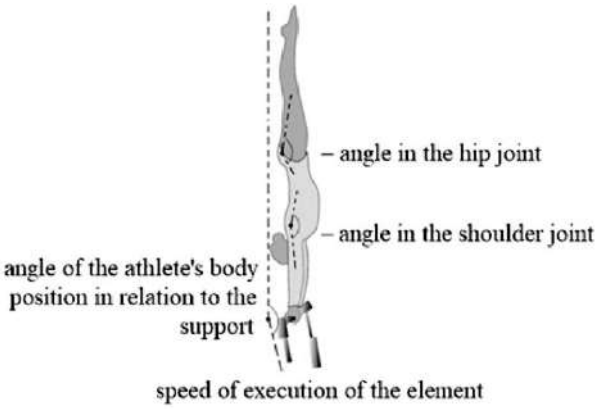

Fig. 2. Kinematic characteristics used to analyse the technique of performing elements with rotation

The following kinematic indicators were selected for comparative analysis (Fig. 2): – angle in the hip joint (degrees), – angle in the shoulder joint (degrees), – angle of the athlete's body position relative to the support (degrees); – time taken to perform the element (ms).

Analysis of video footage of the element being performed by leading athletes from around the world and members of the Russian national team at major international competitions – the Olympic Games, World Championships, World Cup stages, European Championships, Russian Championships and Russian Cup – allowed us to identify two groups of athletes, each consisting of 25 people. The first group included the world's leading athletes, while the second group included athletes from the Russian national team.

An independent test was used to calculate the reliability of the differences – a two-sample t-test with equal variances. The table 1 shows the results of the statistical analysis of the data.

The analysis of the first phase revealed significant differences in the following indicators: hip joint angle: in the first group – 179.68° ± 12.02, in the second group – 165.12° ± 15.19, and shoulder joint angle: first group – 168.16° ± 8.53, second group – 149.04° ± 10.32.

The kinematic analysis of phase 2 revealed the following differences: angle in the shoulder joint: first group – 174.52° ± 7.84, the second group – 170.04° ± 6.58, the angle of the body position in relation to the support: the first group – 167.88° ± 12.05, the second group – 173.96° ± 3.03, the time taken to complete a 180° turn: first group – 25.36 ms ± 9.34, second – 49.52 ms ± 7.24.

In the third phase, significant differences were obtained for all indicators: hip joint angle: first group – 176.88° ± 5.46, second group – 172.56° ± 9.35, angle in the shoulder joint: first group – 177.48° ± 5.76, second group – 165.44° ± 13.66, angle of the body po-

Table 1. Arithmetic means, standard deviations and significance levels (p) of intergroup differences in the kinematic parameters of an element performed with a large forward swing with a 360° turn on bars of different heights by gymnasts in groups 1 and 2.

Phase	Phase 1		Phase 2		Phase 3	
No. of group	Group 1	Group 2	Group 1	Group 2	Group 1	Group 2
Kinematic indicators	X ± σ	X ±σ	X ± σ	X ± σ	X ± σ	X ± σ
∠ in the hip joint	179,68±12,02	165,12 *±15,19	176,28±5,16	173,28±7,97	176,88±5,46	172,56 *±9,35
∠ in the shoulder joint	168,16±8,53	149,04 *±10,32	174,52±7,84	170,04 *±6,58	177,48±5,76	165,44 *±13,66
∠ in relation to the support	155,76±15,89	153,56±13,95	167,88±12,05	173,96 *±3,03	177,72±4,57	157,6 *±32,24
t (phase time), ms	62,8±8,05	60,4±8,36	25,36±9,34	45,52 *±7,24	46,72±8,12	57,08 *±22,99

Note – * differences are significant at p <0.05

sition in relation to the support: first group – 177.72° ± 4.57, second group – 157.6° ± 32.24, time taken to complete a turn from 180° to 360°: first group – 46.72 ms ± 8.12, second group – 57.08 ms ± 22.99.

Based on the data obtained, it can be concluded that there are significant differences in the performance of this element by the two groups of gymnasts. In the first phase, it can be seen that, compared to athletes from other countries, athletes from Russia perform the element with a smaller angle in both the hip and shoulder joints. In the second phase, significant differences are observed in the time taken to perform a 180° turn; athletes from the second group perform the turn twice as slowly as athletes from the first group. Also, athletes from Russia demonstrate a smaller angle in the shoulder joint and in the position of the body in relation to the apparatus. In the third phase, the differences correspond to the discrepancies in the second phase, which indicates the transfer of errors from an earlier phase to a later one.

Conclusions. The study suggests that the technique used by the world's leading gymnasts to perform a 360° turn creates favourable conditions for transferring the skill to a 540° turn (the element has been performed by Russian gymnasts in competitions of various levels 0 times, by gymnasts from other countries – 34 times). In this regard, the kinematic parameters of the 360° turn performed by foreign gymnasts can be considered as a model.

References

1. Gaverdovskiy Yu.K. Obuchenie v sportivnoy gimnastike s tochki zreniya biomekhanicheskoy samoorganizatsii dvizheniya. Yubileynyy sbornik nauchno-metodicheskih trudov sotrudnikov kafedry teorii i metodiki gimnastiki, posvyashchennyy 85-letiyu so dnya ee osnovaniya, Moskva, 22 fevralya 2017 goda. Moskva: Federalnoe gosudarstvennoe byudzhetnoe obrazovatelnoe uchrezhdenie vysshego professionalnogo obrazovaniya 'Rossiyskiy gosudarstvennyy universitet fizicheskoy kultury, sporta, molodezhi i turizma «GTSOLIFK»', 2017. Pp. 18-24.
2. Gaverdovskiy Yu.K. Teoriya i metodika sportivnoy gimnastiki. T. 1. Moskva: OOO Torgovyy dom 'Sovetskiy sport', 2021. 368 p.
3. Gaverdovskiy Yu.K. Teoriya i metodika sportivnoy gimnastiki. T. 2. Moskva: OOO Torgovyy dom 'Sovetskiy sport', 2021. 232 p.

Criteria for assessing children's abilities when selecting them for hockey

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Abstract

Objective of the study is to identify technical movements with the ball that carry a high risk of losing the object. To develop and justify the effectiveness of ball exercises in group rhythmic gymnastics exercises.

Methods and structure of the study. Analysis of literature, video material of competitive programmes of group gymnasts, pedagogical observation of the training process, pedagogical testing of technical preparedness with a ball, mathematical and statistical data processing.

The study involved gymnasts performing group exercises as part of the candidate master of sports and master of sports programmes (n=20).

As a result of the conducted research, structural groups of movements with the ball have been identified, the performance of which is associated with a high risk of object loss. The causes of errors in these structural groups are analyzed. Exercises have been developed aimed at improving the reliability of individual components of subject training with a ball in group exercises of rhythmic gymnastics.

Keywords: *structural groups, group exercises, artistic gymnastics, ball exercises, analysis.*

Introduction. Subject training in artistic gymnastics is carried out at all stages of long-term training [3, 4]. In group exercises, working with the subject is interrelated with the actions of gymnasts on command and consists of the collective performance of elements of varying complexity. The presence of difficulties in exchanging the apparatus is a distinctive feature of group exercises, which consist of throwing actions and subsequent catching with the application of complexity criteria that give an additional bonus for risk [1, 2]. Risk is determined by the greater probability of losing the apparatus. Object exchanges and cooperation in competitive compositions are logically thought out and synchronised, taking into account the rearrangements and further movements of the gymnasts and the object.

The most difficult object to master in terms of movement is the ball. This object is tricky not only because of its round and sloping shape, but also because of the peculiarities of performing motor actions. When performing technical movements, it is important to hold the ball in the palm of the hand with slightly spread fingers, the fingers only slightly touching the ball, not pressing into it. The technical regulations prohibit pressing the ball against the wrist; this error is penalised with a deduction for execution (E).

Characteristic technical movements with the ball are:

- rolls over 1, 2, 3 body links;
- rolls (on the floor);
- deflections (rhythmic and single);
- figure movements (‘eights’, enveloping);
- ‘balance’ on different parts of the body;
- passes;
- throws and catches of various types.

The ball is considered the heaviest object used in artistic gymnastics (400 g), with a diameter of 18-20

cm. Mastering the basic technical movement of 'balance' (holding the ball) is considered a technically difficult action, since the centre of gravity of the ball must not go beyond the projection of the hand. A shift in the centre of gravity immediately leads to the loss of the object.

When performing throwing actions with the ball, technical competence comes first. The preparatory position (swing) is performed by moving the ball behind the pelvis line; it is important that the free hand moves synchronously with the hand performing the throw. From a half-squat position, the gymnast performs the throw in such a way that the ball 'hangs' in flight at the moment of reaching its highest point. This action is the main link in the throwing technique. The gymnast's inability to perform the technical movement often leads to the loss of the object, as it moves along an uncontrolled trajectory. The catch is performed with a straight arm, at head level, moving the ball into the preparatory position (swing).

Objective of the study is to identify technical movements with the ball that carry a high risk of losing the object. To develop and justify the effectiveness of ball exercises in group rhythmic gymnastics exercises.

Methods and structure of the study. In the first stage of the study, video analysis was conducted of gymnasts' performances in compositions with 3 balls + 2 hoops during the competitive season (2024-2025). The study identified structural groups of movements with the ball, the execution of which is associated with a gross (loss of the object) or significant error in the performance at competitions (Figure 1).

Based on the results obtained, coaches (n=17) were asked to complete a questionnaire to identify the causes of errors in structural ball movement groups

Table 1 – Errors and their causes in structural ball movement groups according to the results of the respondent survey

Structural groups of movements with the ball	Reasons for errors
Throwing and catching objects	- different levels of technical proficiency of gymnasts with the apparatus; - poor technical execution, failure to reach the highest point of flight of the apparatus; - absence of all phases of the throwing motion; - low flight height of the apparatus; - throwing or catching in an inaccurate formation; - psychological instability of athletes; - catching the object with both hands; - different times of throwing the object, resulting in asynchronous work; - collision of objects in the flight phase.
Rolls and rolls over	Rolls: - performing a roll with bent arms or legs; - performing a roll with intentional creation of inertia; - widely spread fingers; - frantic movements during the roll; - asynchronous work; - lack of 'feel for the object'; - inattentiveness of the gymnast; - high or low roll speed. Rolls over: - presence of jerky movements; - roll from an inaccurate position; - collision of the gymnast or object; - high or low speed of the roll.
Deflections	- lack of rhythm in the performance; - too strong or too weak hits on the ball; - lack of a 'conducting' movement; - collision of the gymnast or object; - asynchronous performance.
Passes	- gymnast's inattention; - passing with bent arms; - collision of the gymnast or an object; - asynchrony of performance.
Figure movements	- initial lack of technical skills to perform movements; - performing a technical movement with bent arms; - asynchrony of performance; - gymnast's inattention.

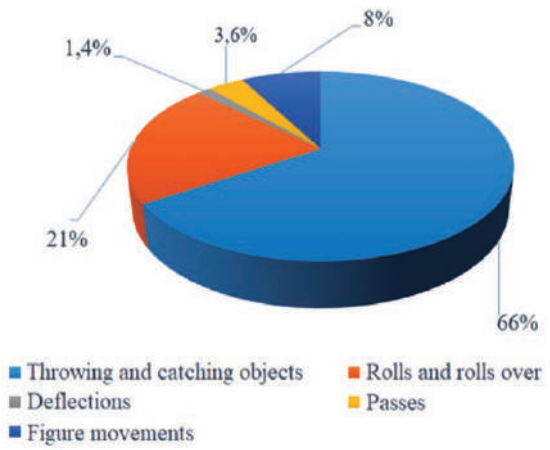

Fig. 1. Structural groups of movements with the highest percentage of errors in competitions

(Table 1). The questionnaire consisted of questions about the technique of working with the object in order to study the practical experience of specialists, as well as to improve the system of subject training in group exercises.

In order to optimise the technical preparation of gymnasts with a ball, exercises were developed in the second stage of the study to improve the reliability of performing structural groups of movements. The main focus was on performing throwing actions with the ball and subsequent catching. The gymnasts performed the proposed exercises during the preparatory period of the annual sports training cycle.

The following methods were used:

- basic technical movements with the object ('balance', figure movements, passes, deflections, rolls);
- throwing actions of various variability (individually and in subgroups);
- throws and catches of various types associated with the risk of losing the object, in accordance with the technical regulations for the sport of artistic gymnastics;
- individual throwing exercises using weights and various types of resistance in conditions of increased difficulty;
- throwing movements for accuracy;
- exercises using external irritants.

The second stage of the study also involved assessing the technical preparedness of gymnasts performing in the candidate master of sports and master of sports programmes. Two randomised groups were formed, a control group (CG) and an experimental group (EG). Pedagogical testing was conducted before and after the application of the developed exercises, which increase the reliability of performing structural groups of movements with the ball.

No. 1. A special combination of exercises for 32 counts was developed for basic technical movements. No stops or loss of the object were allowed during the performance. To evaluate the combinations, deductions were applied for execution (E). The evaluation was carried out by a group of experts with the appropriate qualifications.

For throwing actions with an object and subsequent catching, control exercises were developed individually, in pairs and in groups using complexity criteria. Gymnasts were asked to perform throwing actions 5 times, with only successful attempts being counted.

No. 2 individually. Performing throwing movements from the right hand to the left and vice versa.

The series is counted as one attempt. The height of the ball's flight is at least 7-8 metres. It is important to perform the throwing movements in succession and without moving from the spot. No. 3 in pairs. Performing throwing movements in pairs, with two balls, at a distance of 6 metres from each other.

The height of the flight of the object is at least 7-8 metres. The throw is performed synchronously, throwing from the right hand to the left and vice versa. The series is counted as one time. It is important to perform the throwing movements in succession without moving from the spot.

No. 4 in the group. Performing throwing movements in a group. The throw is performed in an 'envelope' formation, at a distance of 6 metres from each other, synchronously. The height of the flight of the object is at least 7-8 metres. Throw from the right hand to the right, without moving from the spot.

All control exercises were easily measurable and visual. The technical movements are variable and can

Table 2. The experiment results

Control exercises with the ball		Control group	Experimental group	P - value
No. 1 Basic movements with the ball (point)	Before	2,30±0,06	2,26±0,11	p>0,05
	After	2,10±0,04	1,1±0,02	p<0,05
No. 2 Individual throwing movements (number of times)	Before	1,02±0,06	2,46±0,82	p>0,05
	After	1,06±0,05	4,87±1,10	p<0,05
No. 3 Throwing movements in pairs (number of times)	Before	2,28±0,19	1,16±0,45	p>0,05
	After	2,48±0,20	4,50±0,24	p<0,05
No. 4 Throwing movements in a group (number of times)	Before	1,69±0,12	2,11±0,20	p>0,05
	After	1,32±0,10	5,16±1,38	p<0,05

be used by gymnasts with different levels of training.

In the third stage of the study, mathematical and statistical data processing was carried out. The reliability of the differences was determined between the means of two samples using Student's t-test at a significance level of $p<0.05$.

Results of the study and discussion. The pedagogical experiment was conducted with the aim of testing the developed exercises that contribute to improving the reliability of performing structural groups of movements with the ball. The methods and techniques used were based on the results of theoretical analysis, including competition rules, video analysis of gymnasts' competitive routines, and pedagogical observation of training and competition activities. The experiment revealed the comparative superiority of the experimental group of gymnasts over the control group, at a significance level of $p<0.05$ (Table 2).

After applying the developed exercises, the gymnasts in the experimental group showed an increase in the effectiveness of their competitive performance, which manifested itself in a reduction in the number of gross errors, in particular, loss of the object. The frequency and speed of movement execution increased. The technical difficulty of the competitive content increased. Thus, the use of exercises that contribute to improving the reliability of structural groups of movements with the ball confirmed their high effectiveness in all evaluation parameters.

Conclusions. The study identified structural groups of movements with the ball, the performance of which is associated with a high risk of losing the object. The causes of errors in these structural groups were analysed. A set of assessment tools was developed to quickly evaluate the preparedness of gymnasts with the object, which takes the problem of improving the level of training to a new level. Exercises aimed at improving the reliability of individual components of object training with the ball have been developed and their high effectiveness has been proven.

References

1. Morozova L.V., Bystrova I.V., Ponimasov O.E. Ekzogennye faktory razvitiya hudozhestvennoy gimnastiki v sovremennyh usloviyah. Teoriya i praktika fizicheskoy kultury. 2023. No. 7. Pp. 13-15. EDN: KKXEAZ.
2. Udalova M.A., Zyukin A.V., Kiryanova L.A., Bystrova I.V. Povyshenie urovnya pryzhkovoy podgotovlennosti po reglamentu trudnostey tela v hudozhestvennoy gimnastike. Teoriya i praktika fizicheskoy kultury. 2025. No. 7. Pp. 19-20. EDN: WDAOQK.
3. Udalova M.A. Otsenka fizicheskoy podgotovlennosti gimnastok, spetsializiruyushchihsya v gruppovyh uprazhneniyah. Teoriya i praktika fizicheskoy kultury. 2025. No. 1. Pp. 15-16. EDN: VBJWIY.
4. Udalova M.A. Primenenie sredstv ravnovesno-vrashchatelnoy podgotovki v trenirovochnom protsesse gimnastok. Physical culture and health. 2025. No. 1(93). Pp. 406-409. DOI: 10.47438/1999-3455_2025_1_406. EDN: CYTKYP.

The principle of establishing relationships between the results of non-specific and specific test exercises performed by hockey players

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Abstract

Objective of the study is to establish the relationship between the results of speed test exercises performed by young hockey players and the frequency of their use in training microcycles.

Methods and structure of the study. Young hockey players of various age groups participated in the study. During the study, team coaches were surveyed, pedagogical observations of the training process were conducted, and hockey players were tested. The results of selected speed test exercises and the frequency of their combined use in training microcycles were evaluated. Correlation coefficients between the results of these test exercises were calculated.

Results and conclusions. Significant differences were found in the frequency of combined use of selected exercises in training microcycles and in the correlation coefficients of test exercise results. It was established that the levels of correlation between the results of speed test exercises performed by hockey players are determined by the frequency of combined use of these exercises in training microcycles.

Keywords: *hockey, microcycles, correlation, physical exercises, sports training.*

Introduction. The theory and methodology of physical education is based on the idea that humans possess general physical qualities and that it is the prior development of these qualities that determines the subsequent development of specific motor abilities [1-4, 8-10]. As evidence of these ideas, some researchers [1], ignoring the results obtained by other researchers [5, 6], cite data on positive correlations between the results of non-specific and special (in relation to the chosen sport) exercises. Given the significant differences in the data [1, 2, 5, 6, 8, 9] provided by different researchers, a hypothesis was put forward that the basis for the formation of correlations between the results of athletes performing various exercises lies in the mechanisms of systemic integration by each athlete's body of the effects of various training influences [5-7].

Objective of the study is to establish the relationship between the results of speed test exercises performed by young hockey players and the frequency of their use in training microcycles.

Methods and structure of the study. Hockey players from the following age groups participated in the study: 9–10 years (n = 47), 12 years (n = 24), 14 years (n = 22) and 16 years (n = 23). The following exercises were used in testing the hockey players: 'Running at maximum speed from the start on an athletics track for a distance of 30 metres' and 'Running at maximum speed on ice skates from the start for a distance of 36 metres'. The degrees of correlation (Brave-Pearson method) between the results of the hockey players' performance of these exercises were calculated. The method of questioning team coaches and the method of pedagogical observation made it possible to assess the frequency of use of these exercises in training microcycles. The results were analysed, on the basis of which conclusions were drawn.

Table 1. Frequency of joint use of selected speed exercises in training microcycles and indicators of correlation between the results of these exercises in tests

Exercises	Periods of annual cycles of preparation	
	Preparatory	Competitive
Age group 9–10 years (n=47)		
Combined use of exercises in microcycles	5 times	3 times
r	0,70	0,48
Age group 12 years (n=24)		
Combined use of exercises in microcycles	2 times	1 time
r	0,43	0,23
Age group 14 years (n=22)		
Combined use of exercises in microcycles	5 times	4 times
r	0,70	0,61
Age group 16 years (n=23)		
Combined use of exercises in microcycles	3 times	1 time
r	0,47	0,36

Results of the study and discussion. The study found significant differences in the frequency with which hockey players of different age groups selected for the study used the exercises in training microcycles during the preparatory and competitive periods, as well as significant differences in the correlation coefficients between the results of these exercises in different age groups of hockey players (Table 1).

Figure 1 shows the average correlation coefficients between the results of selected exercises performed by hockey players, grouped according to the frequency with which hockey players used these exercises in training microcycles. The data presented indicate the principle of forming interrelationships between the results of non-specific and specific exercises used in hockey players' training sessions. One of the determining factors in the formation of such interrelationships is the frequency with which hockey players use different exercises together in training microcycles.

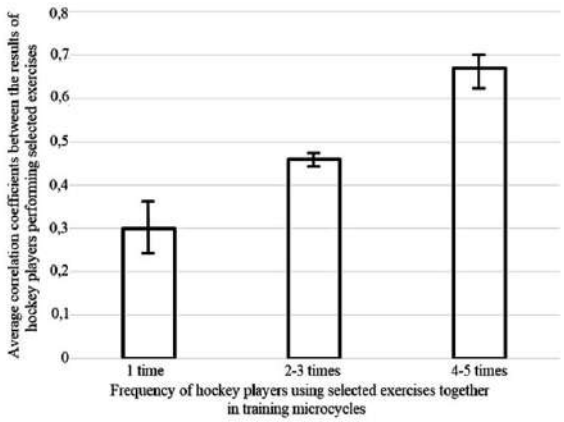

Figure 1. Average correlation coefficients between the results of hockey players performing selected speed exercises, grouped according to the frequency with which hockey players used these exercises in training microcycles

Conclusions. The levels of correlation between the results of hockey players performing non-specific and specific speed exercises are determined primarily by the frequency of the combined use of these exercises in training microcycles during periods of athletic training. The presented results indirectly confirm the hypothesis about systemic integrative mechanisms of adaptation of the human body to multidirectional training loads.

References

1. Zankovets V.E., Popov V.P. Vzaimosvyaz skorostnyh, silovyh i skorostno-silovyh sposobnostey hokkeistov-professionalov na ldu i vne lda. Pedagogicheskie, psyhologicheskie i mediko-biologicheskie problemy fizicheskogo obrazovaniya i sporta. 2015. No. 9. Pp. 12-19.
2. Zatsiorsky V.M. Fizicheskie kachestva sportsmena: osnovy teorii i metodiki vospitaniya. 4-e izd. Moskva: Sport, 2019. 200 p.
3. Matveev L.P. Obshchaya teoriya sporta i ee prikladnye aspekty: uchebnik dlya vuzov

fizicheskoy kultury. 5-e izd., ispr. i dop. Moskva: Sovetskiy Sport, 2010. 340 p.
4. Nikonov Yu.V. Podgotovka kvalifitsirovannyh hokkeistov. Kiev: Olimpiyskaya Literatura, 2008. 215 p.
5. Pavlov A.S. Hokkey. Osnovy teorii i metodiki. Moskva, 2023. 148 p.
6. Pavlov A.S., Maksimov A.K. Analiz korrelyatsionnyh vzaimosvyazey mezhdu rezultatami vypolnennyh hokkeistami skorostnyh testovyh uprazhneniy. Globalnyy nauchnyy potentsial. 2025 No. 1(166). Pp. 135-140.
7. Pavlov S.E., Pavlov A.S., Pavlova T.N. Sovremennye tekhnologii podgotovki sportsmenov vysokoy kvalifikatsii. 2-e izd., dorab. i dop. Moskva: Izd-vo OntoPrint, 2020. 300 p.
8. Savin V.P. Issledovanie tekhniki bega hokkeista na konkah. Metodicheskie razrabotki dlya studentov, slushateley FPK i vysshey shkoly trenerov GTSOLIFKa, Moskva, 1985. 34 p.
9. Savin V.P. Teoriya i metodika hokkeya: uchebnik dlya stud. vyssh. ucheb. zavedeniy. Moskva: Alyans, 2018. 400 p.
10. Uryupin N.N., Savostyanov V.V., Alekhnovich A.V. Obshchaya i spetsialnaya podgotovlennost hokkeistov (metodicheskoe rukovodstvo dlya trenerov natsionalnyh sbornyh komand) pod obshchey redaktsiey V.A. Tretyaka. Moskva, 2014. 34 p.

Regulation of the training process in the athletic preparation of Greco-Roman wrestlers

UDC 796.82

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Abstract

Objective of the study is to develop an algorithm for substantiating management decisions on training load planning, taking into account operational and current control indicators and criteria for the functional condition of Greco-Roman wrestlers.

Methods and structure of the study. The following methods were used in the scientific work: accelerometry, pulsometry, cardiointervalometry, lactometry, questioning, pedagogical testing, pedagogical experiment, as well as methods of mathematical statistics.

Results and conclusions. Criteria for operational control (daily use) have been identified, including biomechanical and medical-biological markers: time taken to perform 10 throws, throwing power, stability of applied force and rotation when performing a series of throws, subjective assessment of load on the Borg scale, heart rate during sleep, regulatory system stress index. Criteria for ongoing monitoring (within the microcycle) have also been established: lactate level dynamics, regulatory system activity index (PSAI), and rotation efficiency when performing a series of dummy throws.

Keywords: *algorithm, training process, sports training, Greco-Roman wrestling, high qualification.*

Introduction. The modern system for monitoring the condition of highly skilled wrestlers is a multi-level structure based on the principles of comprehensiveness, regularity and individualisation [3]. It includes three interrelated time levels of control, providing information for operational, ongoing and stage management of the training process [2]. For operational planning in the management of the training process, it is necessary to study the criteria for the medical, biological and physical condition of athletes' immediate and delayed training effects.

The development and implementation of new technologies and methods in the sports training system, based on the use of objective indicators of athletes' preparedness [4] and modern scientific knowledge about the patterns of formation and development of athletic form [1], is of great importance for the growth of athletic skill. Pedagogical influences should be adequate to the planned changes in the state of the athletes' bodily functions, which ultimately determines the effectiveness of the training process and the success of competitive activity. The basis for operational planning of pedagogical influences and programming of the training process is information [2] obtained in the process of control [4] using methods of timely information [5, 6].

Objective of the study is to develop an algorithm for substantiating management decisions on training load planning, taking into account operational and current control indicators and criteria for the functional condition of Greco-Roman wrestlers.

Methods and structure of the study. In order to identify the most significant criteria for the medical, biological and physical condition of wrestlers, an experiment was conducted over three 3-week microcycles, during which Greco-Roman wrestlers performed technical and tactical training exercises. The first week was an introductory week (introductory microcycle) with one training session lasting 2.5 hours. The subsequent microcycles were characterised by a steady increase in training loads, a significant volume, but not an extreme level of intensity (week 2, or-

dinary microcycle) and high volumes and intensity of loads (week 3, shock microcycle). Heart rate variability, lactate levels, and pulse rates during sleep were assessed daily, and athletes were asked to perform single and serial throws of a dummy using a 'bend' technique. Acceleration and angular velocity were recorded during a specific test, and medical and biological indicators (pulse, lactate) were recorded, and subjective feelings of exertion after testing were noted. These measurements were taken before the main part of the training session. A three-week experiment with comprehensive daily assessment without data loss was carried out on six athletes with the title of Master of Sports of Russia, with an average age of 21.2±2.0.

Results of the study and discussion. To assess the residual effects after each microcycle, it was decided to evaluate the average indicators between weekly microcycles. This task was carried out by calculating the average indicators obtained for all training sessions of the microcycle. Thus, the indicators of three microcycles were analysed according to the criteria of biomechanical and medical-biological control presented in Tables 1 and 2.

Table 1 shows the biomechanical indicators for a series of throws. The highest average force (F) is observed in the introductory microcycle, while the lowest is observed in the shock microcycle. The differences between weeks are statistically significant ($p<0.001$), which indicates a pronounced change in strength performance depending on the nature of the microcycle. The throwing efficiency indicator ( ) did not show statistically significant differences between weeks ($p = 0.125$). This suggests that the ratio between speed and strength increases remains relatively stable regardless of the microcycle.

Table 1 shows the average power produced during the throwing test. The W indicator is significantly higher in the introductory microcycle and lower in the shock microcycle. Based on the data obtained when evaluating W (W) depending on the week, statistically significant differences ($p<0.001$) were established using the Kraskel-Wallis reliability assessment criterion.

An analysis of the averaged data for the t_{10} (s) indicator depending on the type of microcycle was also carried out. The total time for performing 10 throws gradually increases from the introductory microcycle to the shock microcycle. The differences are statistically significant ($p<0.001$). This confirms a decrease in the pace of throws as the load increases. The dynamics of the change in the time of 10 throws is presented graphically in Fig. 1.

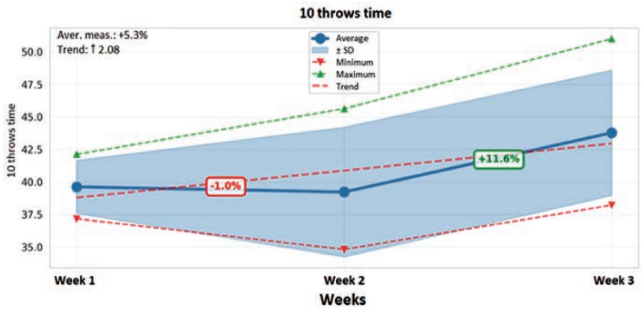

Fig. 1. Analysis of t_{10} (s) depending on the type of microcycle

Table 1. Analysis of biomechanical indicators in microcycles

Indicator	Microcycles	Me	$Q_1 - Q_3$	p
Average force during a series of throws, F̄(N)	Introductory	2501,20	2412,30 – 2670,65	< 0,001* $p_{week\ 2 - week\ 1}$ $p_{week\ 3 - week\ 1}$ $p_{week\ 3 - week\ 2 = 0,018}$
	Ordinary	2055,60	1820,02 – 2233,85	
	Shock	1806,75	1524,45 – 2040,22	
Average power during the throwing test, W (W)	Introductory	417,2	371,8 – 462,6	< 0,001* $p_{week\ 2 - week\ 1}$ $p_{week\ 3 - week\ 1}$ $p_{week\ 3 - week\ 2}$
	Ordinary	452,0	413,5 – 490,4	
	Shock	324,3	295,3 – 353,2	
Throwing efficiency indicator	Introductory	7,90	7,90 – 8,00	0,125
	Ordinary	8,15	7,80 – 8,93	
	Shock	7,40	5,97 – 9,65	

* – statistically significant differences in indicators ($p < 0,05$)

Table 2. Analysis of medical and biological indicators in microcycles

Indicator	Microcycles	M ± SD	n	p< 0,001*
Resting HR (bpm)	Introductory	59,92 ± 2,83	36	$P_{week\ 1-week\ 2} = 0,003$
	Ordinary	61,83 ± 1,70	36	$p_{week\ 1-week3} < 0,001$
	Shock	66,06 ± 1,41	35	$p_{week\ 2-week\ 3} < 0,001$
Lactate (mmol/l)	Introductory	9,90 ± 1,03	36	$p_{week\ 1-week\ 2} = 0,006$
	Ordinary	8,83 ± 0,78	36	$p_{week\ 1-week\ 3} < 0,001$
	Shock	8,28 ± 0,53	35	$p_{week\ 2-week\ 3} < 0,001$
Indicator	Microcycles	Me	$Q_1 - Q_3$	
SDNN (ms)	Introductory	49,40	47,60 – 52,15	$p_{week\ 2-week\ 1} < 0,001$
	Ordinary	59,45	57,42 – 62,38	$p_{week\ 3-week\ 1} < 0,001$
	Shock	63,95	58,75 – 68,88	
RMSSD (ms)	Introductory	61,80	59,85 – 64,65	$p_{week\ 2-week\ 1} < 0,001$
	Ordinary	71,85	69,72 – 75,28	$p_{week\ 3-week\ 1} < 0,001$
	Shock	77,00	71,65 – 82,67	$p_{week\ 3-week\ 2} = 0,024$

* – statistically significant differences in indicators (p < 0,05)

In addition to biomechanical parameters, medical and biological control criteria were studied. We analysed medical and biological indicators in various types of weekly microcycles; the results of some of these are presented in Table 2.

When comparing resting HR (bpm) depending on the week, we found statistically significant differences (p<0.001) using Welch's F-test. According to the table presented, when comparing RMSSD (ms) and SDNN (ms) depending on the type of microcycle, statistically significant differences (p<0.001) were established using the Kruskal–Wallis test.

After exercise, the lactate level was highest in the introductory microcycle (9.90 mmol/L), lower in the ordinary microcycle (8.83 mmol/L), and lowest in the shock microcycle (8.28 mmol/L). Statistically significant differences between all weeks were confirmed by the Kruskal–Wallis test (p<0.001). The dynamics of lactate changes are presented graphically in Fig. 2. The decrease in post-exercise lactate from the introductory week to the shock week may be associated with the development of fatigue and a decrease in the intensity of the test.

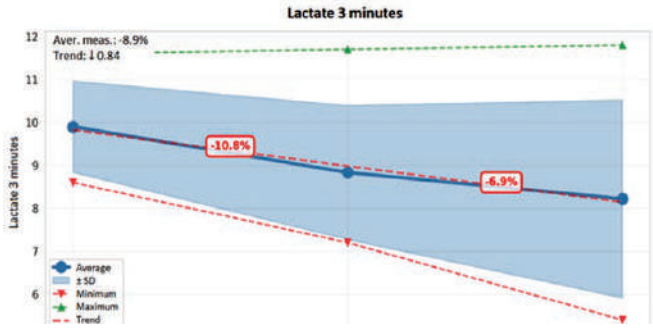

Fig. 2. Analysis of lactate level dynamics (mmol/l) after performing a specialised test at 3 minutes of recovery in weekly microcycles

Table 3. Decision-making algorithm for planning training loads, taking into account the operational and ongoing monitoring of highly skilled Greco-Roman wrestlers

Athlete's condition	Biomechanical control	Medical and biological control	Decision
Optimal readiness	W is stable, throw time ↓	Borg < 5, HR at night < 53	Plan the shock load
Compensated fatigue	Throw time ↑ 5-10%, ∂F ↑	Borg = 6-7, SI = 120-180	Reduce the load by 20-30%
Decompensation	Throw time ↑ >15%, W ↓ >15%	Borg > 8, PSAI > 3, HR at night > 55	Cancel intensive training, recovery microcycle
Overwork	Sharp decline in ∑F, increase in throw time >20%	PSAI = 4-5, lactate ↓ when performance deteriorates	Complete rest for 1-3 days, medical examination

Based on the pedagogical experiment, data for managing the training process was obtained. We proposed an algorithm for decision-making in the operational planning of the training process.

Integral criteria for decision-making in planning training loads, taking into account operational and ongoing control, are correlated with the research results and systematised in Table 3.

Thus, these indicators allow real-time assessment of an athlete's condition and prompt adjustment of training load, preventing overexertion and optimising preparation.

Conclusions. Based on the analysis of biomechanical and medical-biological control data, key criteria can be identified for the operational management of the training process in the sports training of Greco-Roman wrestlers.

The criteria for operational control (daily use) included biomechanical and medical-biological markers:

a) time to complete 10 throws, the most sensitive indicator of fatigue; an increase in time indicates a decrease in speed endurance; an increase of >10% from the baseline is a signal to reduce the load;

b) throwing power (W). Reflects the effectiveness of explosive work. A decrease in power is a sign of fatigue of the neuromuscular system. A drop of >15% requires a correction in load;

c) stability of force (∂F) and rotation ($\partial \omega$). An increase in values indicates a deterioration in technical control due to fatigue. An increase of >20% is a sign of technically incorrect movement;

d) subjective assessment of load (Borg scale), ahead of objective indicators, an increase in subjective severity when performing a standard load (10 throws of a dummy at maximum speed), an increase to 7-8 points is a warning of overwork. 7+ points – reduce intensity;

e) stress index (SI). Shows the stress of regulatory systems. A sharp increase indicates a stress reaction. >150 conventional units – risk of overexertion.

The following criteria for ongoing monitoring have been identified:

a) lactate dynamics, decrease in lactate with an increase in subjective fatigue = metabolic exhaustion. Switch to aerobic exercise.

b) PSAI indicator, when reaching a level of 4-5 points, high stress → urgent reduction in load;

c) rotation efficiency (η). A decrease indicates irrational technique during fatigue and the need to reduce the volume and focus on technique.

The implementation of the developed algorithm and the identified criteria for managing the training process allows for increased accuracy and objectivity in monitoring the condition of athletes, resulting in a reduced risk of overtraining and sports injuries, which leads to savings in resources for recovery measures, as well as increased efficiency in planning the training process through personalised adjustment of loads based on the principles of consistency, adaptability and individualisation.

References

1. Danko G.V. Osobennosti kontrolya za sostoyaniem spetsialnoy rabotosposobnosti bortsov na etape neposredstvennoy podgotovki k sorevnovaniyam. Fizicheskoe vospitanie studentov tvorcheskih spetsialnostey. 2004. No. 3. Pp. 3-8.
2. Konovalov V.N., Tabakov A.I., Shalaev O.S. Sistema kompleksnogo kontrolya v podgotovke kvalifitsirovannyh gandbolistov. Teoriya i praktika fizicheskoy kultury. 2025. No. 1. Pp. 102.
3. Krikuha Yu.Yu., Koryagina Yu.V. Kompleksnyy kontrol v greko-rimskoy borbe. Omsk: Federalnoe gosudarstvennoe byudzhetnoe obrazovatelnoe uchrezhdenie vysshego professionalnogo obrazovaniya «Sibirskiy gosudarstvennyy universitet fizicheskoy kultury i sporta», 2013. 150 p.
4. Laptev A.I., Shevtsov A.V. Modelnye harakteristiki podgotovlennosti bortsov v upravlenii trenirovochnym protsessom na razlichnyh etapah mnogoletney podgotovki. Teoriya i praktika fizicheskoy kultury. 2024. No. 11. Pp. 18-20. EDN: HRZVYY.
5. Furaev A.N., Elevich S.N. Instrumentalnye sistemy operativnogo kontrolya i otsenki tekhniki vypolneniya sportivnyh uprazhneniy. Uchenye zapiski universiteta im. P.F. Lesgafta. 2019. No. 1(167). Pp. 302-307.
6. Esfandiarian-Nasab K. et al. Systematic Review of Wrestling Techniques: Biomechanical Foundations, Performance Fitness, Physiological Outcomes, and Key Strategies for Success. Journal of Applied Exercise Physiology. 2025. V. 20. No. 39. Pp. 73-90.

The role of electromagnetic muscle stimulation in improving the strength and speed-strength abilities of sambo wrestlers

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Abstract

Objective of the study is to investigate the effect of electromagnetic stimulation on the development of strength and speed-strength abilities in skilled sambo wrestlers.

Methods and structure of the study. The study was conducted between 2018 and 2020 at the country's leading sports university, the Russian University of Sport «GTSOLIFK». 20 qualified sambo wrestlers aged 19 to 23 took part in the study and were divided into a control group and an experimental group of 10 people each. The athletic level of the wrestlers in both groups was comparable. Strength indicators were recorded in a sitting position using the Biodex System Pro-4 hardware and software complex (Figure 1) in isometric muscle contraction mode with parallel recording of the electromyogram of the working muscles.

Results and conclusions. The results of the analysis of the data obtained showed that performing exercises on the Biodex System Pro-4 hardware and software complex in isokinetic muscle contraction mode during a short training period increases strength and speed-strength abilities. In the group where electromagnetic stimulation was not used, the increase in strength indicators was 14.8% and 14.1%, and in speed-strength indicators – 11.6%. In the group where the exercise was accompanied by electromagnetic muscle stimulation, the increase in strength indicators was 32.3% and 34.1%, and in speed-strength indicators – 54.2%.

Keywords: *muscle stimulation, electromyography, strength and speed-strength indicators, sambo.*

Introduction. Modern methods of sports training are actively developing. Specialists in the field of physical culture and sports are constantly looking for new opportunities to improve the physical qualities and technical and tactical actions of athletes. To this end, in the 1970s and 1980s and at the beginning of the 21st century, scientists conducted numerous experiments using various stimulation methods in the training of athletes [2].

For a sambo wrestler, strength and speed-strength qualities are among the most important. In combat, it is necessary to constantly counteract the opponent's efforts, both in standing combat (breaking holds, pushing, pulling, pulling the opponent off their feet, etc.) and in ground combat (applying holds and painful techniques, escaping from holds and painful techniques). At the same time, improving technical and tactical actions cannot happen without improving physical abilities. Therefore, in our study, we used electromagnetic stimulation of the neuromuscular system as an auxiliary method in the general physical training of qualified sambo wrestlers.

Objective of the study is to investigate the effect of electromagnetic stimulation on the development of strength and speed-strength abilities in skilled sambo wrestlers.

Methods and structure of the study. The study was conducted from 2018 to 2020 at the country's leading sports university, the Russian University of Sport «GTSOLIFK». 20 qualified sambo wrestlers aged

19 to 23 were divided into a control group and an experimental group of 10 people each. The athletic level of the wrestlers in each group was the same. The weight categories of the athletes also did not differ significantly. Each of the wrestlers gave written informed consent to participate in this study.

When performing technical actions in sambo wrestling, activity is observed in almost all muscle groups of the athlete. However, we studied the strength and speed-strength abilities of only the quadriceps muscles of the thighs, since according to the analysis of scientific and methodological literature [1, 3-7], these muscles are the leading ones when performing techniques that are most often encountered in sports competitions [3].

The study began with the determination of the strength and speed-strength indicators of the extensor muscles of the lower leg. Strength indicators were recorded from a sitting position using the Biodex System Pro-4 hardware and software complex (Fig. 1) in isometric muscle contraction mode with parallel recording of the electromyogram of the working muscles. The subjects were seated in a chair according to the operating instructions for this complex. The force developed was recorded on a computer monitor using feedback. The electromyogram was recorded using a 16-channel ME 6000 Professional electromyograph (Fig. 2).

Speed and strength indicators were recorded on an AMTI dynamometric platform during a jump without arm swing. The following were determined: maximum push-off force, time to reach maximum force, and rate of force development.

After the control tests, athletes from both groups performed a special exercise to improve the strength and speed-strength abilities of the quadriceps muscles on the Biodex System Pro-4 hardware and software complex in isokinetic muscle contraction mode. The training method included 10 sets of 10 seconds of flexion-extension of the lower leg with a rest interval of 60 to 104 seconds (in the control group, the rest interval was 82 seconds) at a speed of 150 degrees per second. It was determined that this speed pro-

Fig. 1. Biodex System Pro-4 hardware and software complex

Figure 2. ME 6000 professional electromyograph

Table. Average results of strength and speed-strength abilities of the control (CG) and experimental (EG) groups before and after the experiment

Indicator	Before		p	After		p
	CG	EG		CG	EG	
	M±σ			M±σ		
Peak torque of the left leg, N×m	310±32	318±73	>0,05	356±30	421±64	<0,05
Peak torque of the right leg, N×m	290±35	284±66	>0,05	331±30	381±55	<0,05
Maximum push-off force, N	1866±158	1863±195	>0,05	1999±155	2271±219	<0,05
Time to reach maximum force, s	0,55±0,02	0,54±0,04	>0,05	0,53±0,02	0,43±0,02	<0,05
Force increase rate, N/s	3367±429	3449±556	>0,05	3760±433	5320±762	<0,05

duced the greatest power output, which was recorded on a monitor screen. While performing the exercise, the quadriceps muscles of the wrestlers in the experimental group were subjected to magnetic stimulation. It is worth noting that the rest period between sets for the members of this group was set automatically on the magnetic stimulator depending on the stimulation frequency, which was calculated individually for each athlete using electromyogram recordings. At the end of the study, control tests were also performed.

Results of the study and discussion. The table shows the results of the study. The peak torque of the right and left legs indicates the strength capabilities of the quadriceps muscles of the thighs. The rate of force development indicates the speed-strength capabilities of this muscle group. This parameter depends on the maximum push-off force and the time it takes to reach maximum force.

STATISTICA 10 software was used to process the research results. The indicators of the two groups were compared using the non-parametric Mann–Whitney U test. At the beginning of the study, the indicators of the control and experimental groups did not differ statistically. At the end of the study, the indicators of the experimental group were significantly higher than those of the control group. Thus, the strength indicators for leg extension in the wrestlers of the control group increased by 14.8% and 14.1%, while in the wrestlers of the experimental group, the increase was 32.3% and 34.1%. The speed-strength indicators for upward jumps in the control group increased by 11.6%, while in the experimental group the increase was 54.2%.

It was also decided to compare the indicators of the control group at the beginning and end of the study using Wilcoxon's non-parametric T-test. It was found that at a significance level of 0.05, there were statistically significant differences between all parameters.

Thus, based on the data obtained, it can be concluded that special equipment (in particular, the Biodex System Pro-4 hardware and software complex) set to isokinetic muscle contraction mode allows for an increase in muscle strength and speed-strength abilities in a short training cycle. At the same time, it has been experimentally proven that the additional use of electromagnetic stimulation of working muscles significantly increases these abilities. This is due to the involvement of a larger number of high-threshold motor units and an increase in their impulse frequency [2].

Conclusions. The study found that the additional use of electromagnetic stimulation during speed-strength exercises on the Biodex System Pro-4 hardware and software complex in isokinetic muscle contraction mode at a speed of 150 degrees per second allows for a several-fold increase in the strength and speed-strength indicators of the working muscles compared to without the use of this method. Thus, in the group where electromagnetic stimulation was not used, the increase in strength indicators was 14.8% and 14.1%, and in speed-strength indicators – 11.6%. In the group where the exercise was accompanied by electromagnetic muscle stimulation, the increase in strength indicators was 32.3% and 34.1%, and in speed-strength indicators – 54.2%.

References

1. Gorodnichev R.M., Shlyahtov V.N. Fiziologiya sily: monografiya. Moskva: Sport, 2016. 232 p.
2. Ivanov-Katanskiy S.A. Tekhnika borby v odezhde [Wrestling Techniques in Clothing]. Moskva: FAIR-PRESS, 2000. 368 p.
3. Levitsky A.G., Matveyev D.A., Potsipun A.A., Nerobeeva O.V. Biomekhanicheskiy analiz broska cherez bedro v sportivnoy borbe. Teoriya i praktika fizicheskoy kultury. 2018. No. 8. Pp. 89-91.
4. Sviridov B.A., Popov G.I., Tarhanov I.V. Biomekhanicheskiy analiz struktury broskov cherez tulovishche u kvalifitsirovannyh bortsov sambistov. Uchenye zapiski universiteta im. P. F. Lesgafta. 2019. No. 5(171). Pp. 277-281.
5. Sviridov B.A., Popov G.I., Pastuhov I.S. Sravnitelnyy analiz biomekhanicheskih harakteristik tekhniki vypolneniya broska cherez grud u bortsov sambistov raznoy kvalifikatsii. Fizicheskaya kultura: vospitanie, obrazovanie, trenirovka. 2019. No. 6. Pp. 14-16.
6. Tumanyan G.S. Sportivnaya borba: teoriya, metodika, organizatsiya trenirovki: uchebnoe posobie. Moskva: Sovetskiy sport, 1998. 278 p.
7. Eliphanov S.B. Aktivnost myshts pri vypolnenii broska cherez bedro vysokokvalifitsirovannymi dzyudoistkami. Uchenye zapiski universiteta im. P. F. Lesgafta. 2012. No. 11(93). Pp. 142-149.

Improvement of physical qualities during sensitive periods in middle-distance track and field athletes

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Abstract

Objective of the study is to provide theoretical and experimental justification for an integrated training method for middle-distance runners aged 14–17, which involves a rational combination of volume-aerobic and interval-speed training methods in the structure of mesocycles, taking into account sensitive periods of physical development.

Methods and structure of the study. 28 students from the Russian State Agrarian University - Moscow Timiryazev Agricultural Academy who were involved in athletics took part in the experiment. In the first, volume-aerobic system, the weekly training volume was 35–40 km at an intensity of 65–75% of the maximum heart rate (HR), and in the second system, it was 20–25 km with intervals at 85–90% of the maximum HR.

Results and conclusions. The use of volume-aerobic methods ensures more stable development of endurance and functional indicators of the body, while the interval-speed approach contributes to accelerated growth of speed-strength abilities and improved coordination. The first system builds a solid aerobic foundation and improves the economy of movement, while the second stimulates neuromuscular responses and develops the ability to quickly change running pace. The most pronounced training effect is achieved by combining both methods, which ensures the harmonious development of both endurance and speed.

Keywords: *athletes, sensitive period, endurance, older adolescents, physical qualities.*

Introduction. The problem of developing physical qualities in adolescents engaged in athletics remains one of the central issues in sports science and practice. Performance in middle-distance running is determined by the interaction of aerobic and anaerobic mechanisms that provide energy to the body, as well as the athlete's level of technical, speed-strength and coordination training [2, 5]. Between the ages of 14 and 17, the body undergoes active morphofunctional changes: muscle mass increases, the cardiovascular and respiratory systems improve, and neuromuscular regulation processes accelerate. These age-related characteristics create favourable conditions for the targeted development of physical qualities, but at the same time increase the body's sensitivity to stress, which requires strict control over its volume and intensity. Modern domestic and foreign methods of training adolescents demonstrate differences in approaches to the formation of the training process, the structure of cycles, and the means of influence [8]. In this regard, there is a need to develop a scientifically based methodology that takes into account the age-related physiological characteristics of young runners and the specifics of training activities at middle distances.

Objective of the study is to provide theoretical and experimental justification for an integrated training method for middle-distance runners aged 14–17, which involves a rational combination of volume-aerobic and interval-speed training methods in the structure of mesocycles, taking into account sensitive periods of physical development.

Methods and structure of the study. The empirical basis of the study was formed on the basis of observations of 28 students of the college at the Russian State Agrarian University - Moscow Timiryazev Agricultural Academy, who are engaged in athletics at the sports section level. The participants were aged between 15 and 17. For the analysis, two subgroups of fourteen people were selected: the first trained using a volume-aerobic method, while the second adhered

to an interval-speed method. The duration of the observations was 16 weeks. In the volume-aerobic system, the weekly training volume was 35-40 km at an intensity of 65-75% of the maximum heart rate, and in the second system, it was 20-25 km with intervals at 85-90% of the maximum heart rate.

The dynamics were recorded three times: at the start of the study, after 8 weeks, and at the end of the experiment. The following indicators were recorded: time taken to run 1 and 3 km, maximum oxygen consumption (MOC), vital capacity of the lungs (VC), stroke volume (SV), resting heart rate (RHR), as well as the results of a standing jump and a coordination test '3 10 m shuttle run'. The study was organised into three blocks. The first was an analysis of the age characteristics of adolescents in the context of sports training. The second was the systematisation of the dynamics of indicators depending on the training model. The third was the identification of the advantages and limitations of both methods, taking into account the sensitive periods of physical development. In order to increase the reliability of the data, methods of pedagogical observation, recording of indicators and their statistical comparison were used.

Results of the study and discussion. A comparative analysis revealed clear specifics of the influence of two training methods on the development of key physical qualities. The results of the experiment clearly demonstrate that the volume-aerobic method had a more pronounced and systematic effect on the growth of general endurance and aerobic performance indicators. At the same time, the interval-speed training system proved to be highly effective for the rapid development of speed-strength qualities and coordination.

Statistical data clearly illustrate this difference. The group that trained using the volume-aerobic method showed a significant improvement in the 3 km run: the average time decreased from 12 minutes 21 seconds to 11 minutes 34 seconds, which corresponds to a 6.3% decrease. By comparison, the interval-speed group improved their results over this distance by only 4.4% (from 12:25 to 11:52). Even more telling is the trend in maximum oxygen consumption (MOC), a key marker of aerobic endurance. In the first group of athletes, MOC increased by 11.2% (from 52.0 to 57.8 ml/kg/min), while in the second group, the increase was only 7.5% (from 51.7 to 55.6 ml/kg/min). A similar trend was observed in the increase in stroke volume: +8.4 ml versus +4.9 ml in favour of volume-aerobic training.

However, the advantage of the interval-speed method was evident in another area. In terms of indicators characterising explosive strength and agility, the second group showed impressive progress. The standing long jump result increased by 9.2% (from 228 to 249 cm), which significantly exceeded the modest increase of 3.9% in the first group (from 230 to 239 cm). In the coordination test — a 3 10 m shuttle run — the time also decreased more significantly: by 4.8% compared to 2.3% for those who adhered to volume training.

The empirical data obtained are in full accordance with the theoretical propositions put forward by the authoritative specialist V.N. Platonov, who noted that 'the development of coordination abilities in runners at the initial stage lays the foundation for improving running technique and increasing its stability' [4]. The study allows us to specify this thesis: if volume-aerobic training contributes to a greater extent to the consolidation of a sense of rhythm and overall economy of movement, then interval exercises purposefully develop tempo variability and the critically important ability to quickly adjust the rhythmic structure of running under changing load conditions. Thus, each of these methods makes a unique contribution to the comprehensive training of a runner, affecting different components of their athletic skill (Table 1).

Thus, practice has confirmed the thesis of Bompa and Buzzichelli (2015) that 'The integration of aerobic

Table 1. Dynamics of indicators during the study

Indicator	Volume-aerobic method (n=14)	Interval-speed method (n=14)
Time for 1000 m (s)	3:34 → 3:23 (–5,1 %)	3:35 → 3:21 (–6,9 %)
Time for 3000 m (min:s)	12:21 → 11:34 (–6,3 %)	12:25 → 11:52 (–4,4 %)
MOC (ml/kg/min)	52,0 → 57,8 (+11,2 %)	51,7 → 55,6 (+7,5 %)
VC (ml)	+310	+240
SV (ml)	+8,4	+4,9
Standing long jump (cm)	230 → 239 (+3,9 %)	228 → 249 (+9,2 %)
3×10 m shuttle run (s)	–2,3 %	–4,8 %
RHR (bpm)	69 → 63	70 → 66

and anaerobic training methods is essential for developing endurance and speed in middle-distance runners' [6]. Translation: " The integration of aerobic and anaerobic training methods is essential for developing endurance and speed in middle-distance runners."

The results of the study confirmed that the age period of 14-17 years is a key stage for the targeted development of aerobic and speed-strength qualities in middle-distance runners. Athletes who trained using the volume-aerobic method demonstrated more pronounced improvements in indicators related to general and specific endurance (an 11.2% increase in maximum oxygen consumption reduction in 3 km running time by 6.3%), confirming the sensitivity of this age group to the development of aerobic capacity. These results indicate that systematic performance of uniform loads contributes to strengthening the functional base of the body and increasing resistance to fatigue.

At the same time, the interval-speed method ensured more intensive development of speed-strength and coordination abilities. The 9.2% increase in standing jump length and 4.8% reduction in shuttle run time reflect the activation of neuromuscular adaptation processes and improvement in acceleration technique [3]. These observations confirm the conclusion of V.N. Platonov (2015) that the development of coordination abilities in the early stages of training forms the basis for improving running technique and increasing its stability [4].

A comparison of the two approaches showed that their effects are complementary. The volume-aerobic system provides the foundation for a steady improvement in athletic performance, but without the inclusion of speed-interval exercises, progress in specific competitive qualities is limited. The interval-speed method, on the contrary, accelerates the growth of special abilities, but requires strict control of intensity due to a possible increase in the load on the cardiovascular system, which is confirmed by differences in the reduction of heart rate at rest (6 bpm vs. 4 bpm). This pattern is consistent with the conclusions of Bompa and Buzzichelli (2019), who noted that the application of periodisation principles allows for the harmonious development of all biomotor abilities — strength, speed and endurance — in a single training system [7].

Thus, the results obtained and the data of A.I. Zhilkin (1984) indicate that the greatest effectiveness of training athletes is achieved with a rational combination of volume-aerobic and interval-speed techniques [1].

The systematic and consistent combination of these methods creates conditions for the harmonious and balanced development of the body's functional capabilities and basic motor qualities. Such an integrated approach allows overcoming the limitations inherent in each of the methods separately and lays a solid foundation for consistent athletic progress in adolescence, which is a sensitive period for the formation of key physical skills.

Conclusions. It has been established that volume-aerobic and interval-speed training methods have distinct specific effects and, accordingly, different strengths and limitations. The volume-aerobic system demonstrates high efficiency in the formation of stable aerobic endurance and leads to a significant improvement in key functional indicators of the cardiorespiratory system (MOC, SV). At the same time, interval-speed training is a powerful tool for the accelerated development of speed-strength qualities and coordination abilities.

References

1. Zhilkin A.I., Kuzmin V.S., Sidorchuk E.V. Legkaya atletika: uchebnoe posobie dlya studentov vysshih pedagogicheskih uchebnyh. Moskva: Fizkultura i sport, 1984. 320 p.
2. Kots Ya.M. Sportivnaya fiziologiya: uchebnik dlya in-tov fiz. kultury. Pod obshch. red. Ya.M. Kotsa. Moskva: Fizkultura i sport. 1986.
3. Krikunov G.A. Fizicheskie kachestva u begunov na 800 i 1500 metrov. Globalnyy nauchnyy potentsial. 2021. No. 6(123). Pp. 99-101. EDN: CQEMXZ.
4. Platonov V.N. Teoriya i metodika sportivnoy trenirovki. Moskva: Fizkultura i sport, 2015.
5. Sorokin D.V. Individualnyy podhod k razvitiyu fizicheskih kachestv u begunov-legkoatletov v sensitivnye vozrastnye periody. Vysshee obrazovanie segodnya. 2025. No. 2. Pp. 130-134. EDN: UHCMOZ.
6. Bompa T. O., Buzzichelli C. Periodization Training for Sports (3rd ed.). Human Kinetics. 2015.
7. Bompa T. O., Buzzichelli C. Periodization: Theory and Methodology of Training (6th ed.). Human Kinetics. 2019.
8. Mironina A.Y., Porchesku G.V. Euphemism as a linguistic strategy of evasion in political media discourse. Research Result. Theoretical and Applied Linguistics. 2023. V. 9. No. 2. Pp. 4-18. EDN: QHNLCR.

Programme for stage-by-stage monitoring of young hockey players' motor skills

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Abstract

Objective of the study is to develop a programme for stage-by-stage monitoring of the motor skills of young hockey players.

Methods and structure of the study. The rationale for the stage-by-stage monitoring programme was developed with the participation of 135 hockey players aged 9-19 years of varying skill levels and positions.

Results and conclusions. The programme for phased monitoring included special tests performed on ice and tests performed off ice. The article presents a list of tests selected in the course of many years of research, as well as informative indicators for each test. The assessment system includes standards developed for different age groups in accordance with the stages of sports training for hockey players. The proposed stage control programme is recommended for use in the training process at the beginning and end of each academic year (season), and, if necessary, additionally during the year.

Keywords: *tests, athletic fitness, hockey, testing, examination, athletic performance, stage control, standards.*

Introduction. Pedagogical monitoring of hockey players' preparedness is carried out for various purposes: to objectively justify the transfer of an athlete to the next stage of training, to assess the dynamics of athletes' preparedness, to check the effectiveness of pedagogical technology or a separately considered pedagogical method. The need for stage-by-stage monitoring of hockey players' preparedness is beyond doubt. However, it should be borne in mind that not every control exercise can be a test. Moreover, not every test is suitable for use in stage control. Based on the results of our previous studies of the training of hockey players of different age groups, a stage control programme was developed, including tests of special and general training, which underwent metrological verification of informativeness and reliability, and based on the results of regression analysis, only those tests that are suitable for long-term monitoring of the fitness level of hockey players were selected [1, 2, 3, 4, 5].

Objective of the study is to develop a programme for stage-by-stage monitoring of the motor skills of young hockey players.

Methods and structure of the study. The rationale for the stage-based readiness assessment programme was developed with the participation of 135 hockey players aged 9–19 with varying levels of skill and positions. The informative value of the tests included in the stage control programme was assessed based on the statistical significance of the correlation coefficient between the test results and the performance indicators of hockey players in competition conditions ($p \leq 0.05$). The reliability of the tests was assessed by calculating the reliability coefficient (test-retest). The suitability of the tests for long-term monitoring was assessed based on the statistical significance of the regression equations for the dependence of test results on the age of the hockey players ($p \leq 0.05$).

Results of the study and discussion. The programme for assessing the readiness of young hockey players includes tests conducted on the ice (Figures 1-3) and tests conducted off the ice (Figure 4).

Table 1. Standards based on the results of special and general fitness tests for hockey players

Test	Indicator	Age, years			
		8	11	15	17
Special readiness tests (on ice)					
Puck reception until complete control (between end throw-in points – 14 m), 10 pucks	Puck reception duration (speed) (average value), s (maximum)	2,1	1,9	1,7	1,5
	Puck reception duration variation coefficient, % (maximum)	95	85	72	65
Running 16 m	Running duration (speed), s (maximum)	3,17	3,08	2,96	2,90
Puck control straight 16 m	Duration of puck control (speed), s (maximum)	3,27	3,19	3,07	3,01
Puck control with a dribble on a 16 m section	Duration of puck control with a dribble (speed), s (maximum)	3,84	3,70	3,51	3,41
Shots into the target area (0.6×0.4 m²) – into the goal from a line passing through the end face-off points, 10 pucks	Puck shooting probability speed), %/s (minimum)	17	23	31	35
General fitness tests (off ice)					
Simple visual-motor reaction test	Duration (speed), s (maximum)	0,319	0,302	0,280	0,269
Standing jump without arm swing (on a dynamometric platform)	Jump height, m (minimum)	0,17	0,23	0,31	0,35
	Peak push-off power, W (minimum)	240	804	1557	1933
	Push-off power (relative), W/kg (minimum)	14	18	24	26
	Push-off force, N (minimum)	608	948	1402	1629

Fig. 1. Test 'Receiving the puck until complete control' between the end face-off points

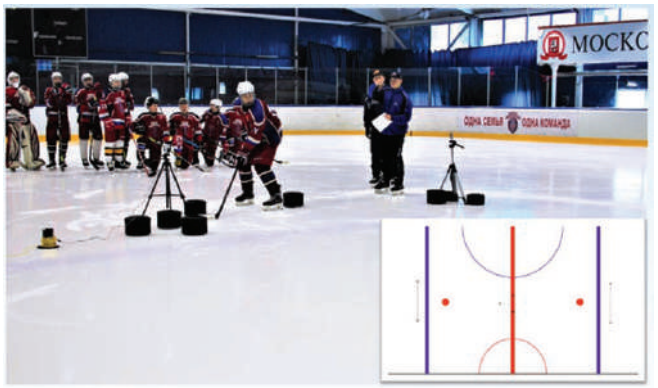

Fig. 2. Quickness tests on a 16-metre section in the middle zone of the ice rink: running, puck control, 'dribbling'

Fig. 3. Throw test (into the target area of the goal)

Special training tests performed on ice:

– receiving the puck until complete control (between the end face-off points – 14 m), 10 pucks;

– running 16 m;

– carrying the puck straight for 16 m;

– carrying the puck with a deke on a 16 m section;

Fig. 4. Off-ice tests: simple visual-motor reaction test, jump test on a dynamometric platform

– shots into the target area (0.6×0.4 m²) – into the goal from a line passing through the end face-off points, 10 pucks.

General fitness tests performed off the ice:

– simple visual-motor reaction test;

– standing jump without arm swing (on a dynamometric platform).

A detailed description of the tests is given in previous publications [1, 2, 3, 4, 5].

Recommended equipment:

– mirror camera with video recording mode no worse than HD, 50 Hz;

– tripod;

– lighting equipment;

– measuring tape (20 m tape measure);

– obstacles (cones, tyres);

– marking paint;

– computer;

– dynamometric platform.

To speed up the preparation process for testing, it is recommended to mark the positions of the pucks, equipment and obstacles in advance. On training ice rinks, these markings can be made permanent for repeated use.

Table 1 shows the fitness standards for hockey players in four age groups according to their age at the start of each stage of sports training: initial training stage (8 years old), training stage (11 years old), sports skills improvement stage (15 years old), and advanced sports skills stage (17 years old).

Conclusions. The proposed programme for phased monitoring of hockey players' readiness is recommended for use in the training process at the beginning and end of each academic year (season) and, if necessary, additionally throughout the year.

References

1. Medvedev V.G., Medvedeva E.M., Davydov A.P., Napalkov K.S. Informativnye pokazateli dvigatelnoy podgotovlennosti yunyh hokkeistov. Teoriya i praktika fizicheskoy kultury. 2023. No. 1. Pp. 8-10. ISSN: 0040-3601.
2. Medvedev V.G., Medvedeva E.M., Davydov A.P. Regressionnaya model spetsialnoy dvigatelnoy podgotovlennosti hokkeistov razlichnyh vozrastnyh grupp. Teoriya i praktika fizicheskoy kultury. 2024. No. 1. Pp. 14-16.
3. Medvedev V.G. Skorost veroyatnosti zabrasyvaniya shayby kak pokazatel spetsialnoy podgotovlennosti hokkeistov pri vypolnenii broskov. Sport – doroga k miru mezhdu narodami: materialy VI Mezhdunarodnoy nauchno-prakticheskoy konferentsii 26-28 oktyabrya 2022 g. M.: RUS «GTSOLIFK», 2022. Pp. 140-143. ISBN: 978-5-6047464-7-9.
4. Medvedev V.G., Davydov A.P. Kontrolno perevodnye normativy spetsialnoy podgotovlennosti hokkeistov, prohodyashchih sportivnuyu podgotovku. Teoriya i praktika fizicheskoy kultury. 2024. No. 12. Pp. 94-95.
5. Medvedev V.G., Medvedeva E.M., Davydov A.P., Shalmanov A.A. Regressionnaya model obshchey dvigatelnoy podgotovlennosti hokkeistov razlichnyh polovozrastnyh grupp. Teoriya i praktika fizicheskoy kultury. 2023. No. 2. Pp. 18-20. ISSN: 0040-3601.

A systematic observation method for evaluating the effectiveness of defensive actions in volleyball

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Abstract

Objective of the study is to identify the factors influencing the effectiveness of the defensive actions of volleyball among students and to develop recommendations for optimizing the training process.

Methods and structure of the study. The sample consisted of 60 second-year Volleyball students (30 males and 30 females) aged 19-21 years. The following methods were used in the course of the study: systematic structured observation, video analysis using Dartfish software, and pedagogical testing.

Results and conclusions. The effectiveness of the actions of volleyball students in defense is determined by the level of development of physical, technical and tactical readiness, gender, as well as individual psychological characteristics. The most common errors were identified: incorrect starting position, premature/late movement, mismatch of ball reception technique and incorrect position selection when blocking.

Keywords: *student volleyball, effectiveness, training, method, sports training.*

Introduction. Volleyball, as one of the most popular sports, is characterised by high intensity and dynamic game situations, where a comprehensive approach plays a key role in achieving success [4]. Today, volleyball places increasingly high demands on the technical and tactical training of teams, but in recent decades, priority has been given to developing the skills of attacking players during training. The effectiveness of competitive activity is determined by a complex of technical and tactical indicators of player preparedness [2]. Shifting the focus to improving defensive actions as an equally important element of training allows teams to gain an advantage and improve their athletic performance.

Contemporary foreign and domestic researchers note that the qualitative development of defensive actions in volleyball allows for the levelling of the opponent's attacking advantages and also contributes to the more flexible formation of tactical schemes that are implemented in a dynamic playing environment. The development of defensive skills improves both individual and team performance.

Despite the importance of analysing defensive actions in volleyball, there is a lack of research devoted to student volleyball players that would allow for a comparison of the effectiveness of different types of defensive actions in the context of student team play. Regardless of limited sports and game experience, student volleyball is an important subject for scientific study, as it serves as a transitional stage to professional sport.

Objective of the study is to identify the factors influencing the effectiveness of the defensive actions of volleyball among students and to develop recommendations for optimizing the training process.

Methods and structure of the study. The study was conducted at the Lesgaft National State University of Physical Education, Sport and Health (St. Petersburg). The sample consisted of 60 second-year students majoring in volleyball (30 males and 30 fe-

males) aged 19-21. The young people's qualifications ranged from second-class athletes to candidates for master of sports. The subjects were selected at random from the total number of students who had been playing volleyball for at least six years.

A set of complementary methods was used to achieve the set goal. The basis was systematic structured observation, for which a specialised chart was developed to record the type of defensive action (serve reception, block, defensive play), playing position, player's starting position, result of the action (successful/unsuccessful), quality of execution on a five-point scale, as well as the tactical situation and the opponent's actions. The observation was carried out over two years during training sessions and official student matches (2023-2025). In addition to systematic observation, video analysis was used with Dartfish software. This technology made it possible to detail the data obtained, systematise the main errors and technical characteristics of defensive actions, including player movement and ball trajectory tracking.

Pedagogical testing allowed us to assess the physical and technical preparedness of the students. Measurements were taken of jump endurance, reaction speed (simple and complex), passing accuracy, a test of mobility in defence (a 30-second test of movements along a line) and a count of successful blocks during 5 minutes of play. To study the subjective assessments of sports training participants on the most effective methods of mastering defensive actions in volleyball, as well as to identify the reasons for failures, a semi-structured interview was conducted with students and coaches.

The data obtained during the study were statistically processed. Student's t-test, which allows comparing mean values, and correlation analysis were used. The significance level was $p<0.05$. The reliability and objectivity of the data obtained indicate the interrelationship of the factors under study.

Results of the study and discussion. Analysis of the data obtained during systematic observation allowed us to establish patterns characteristic of student volleyball players when performing defensive actions (Table 1).

A comprehensive assessment of defensive actions is presented through subjective quality indicators (scores) and objective criteria expressed as a percentage of unsuccessful attempts. The data presented demonstrates gender differentiation. At the same time, gender differences are most evident in a particularly difficult defensive element – blocking (3.9±0.4 male/ 3.4±0.5 female; 22.9% males/ 29.1% females).

The study established a correlation between the development of a harmonious physique and regular training, which, in turn, determines the positive dynamics of players' athletic performance. The results obtained are positively correlated with domestic studies [1]. Correlation analysis also demonstrated a significant relationship between the level of jump endurance and the effectiveness of blocking. The speed of complex reactions has a greater impact on the success of defensive play. In addition, statistically significant differences were found between males and females in terms of reaction speed and passing accuracy.

The recorded indicators are fundamental to the study, as they reflect existing differences in the effectiveness of defensive actions, which in subsequent analysis are determined by physiological, technical, and tactical factors.

A positive correlation was established between the results of specific tests determining reaction speed and jumping endurance and the effectiveness of defensive actions, in particular blocking on the playing field. This fact emphasises the need to develop physical fitness in order to achieve a higher level of defence. At the same time, gender differences in the average observation indicators show a predominance of positive results in men, which is associated not only with the level of physical fitness, but also with the specifics of mental stability and technical mastery of techniques.

Analysis of video recordings of competitions and training sessions made it possible to systematise the

Table 1. Comparative effectiveness of defensive actions among student volleyball players by gender

Type of protective action	Average score for quality of execution (males)	Average score for quality of execution (females)	Percentage of unsuccessful attempts, % (males)	Percentage of unsuccessful attempts, % (females)
Receiving	4,2 ± 0,3	3,8 ± 0,4	18,3	24,7
Blocking	3,9 ± 0,4	3,4 ± 0,5	22,9	29,1
Defence in the field	4,1 ± 0,2	3,9 ± 0,3	15,2	17,8

most common mistakes, namely incorrect starting position of the body (37%), untimely movement (22%), error in ball reception technique (19%), and choice of position on the block that is inappropriate for the game process (17%).

According to the results of the questionnaire and interviews, 86% of the coaches participating in the survey associate the improvement of defensive actions with game situational exercises, as well as with the use of video training [5]. The high demand for situational training exercises is confirmed by modern scientific publications. This fact correlates with the results of domestic researchers, who note the reliability of the tactical and technical actions of players of various positions through the simulation of game situations and disruptive factors [3].

A comparative analysis of training methods demonstrated a 12-16% improvement in the quality of defence over 6 months when regular tactical exercises and individualised adjustments were integrated into the training cycle. At the same time, gender differentiation is mainly manifested in the specifics of technical errors and the effectiveness of the serve.

The study revealed gender differences in the effectiveness of students' defensive actions, correlating with physical fitness and final performance in the game process. The systematisation of the most common errors and a survey of the coaching staff reveal the need to integrate game situational exercises to develop defensive skills.

Based on the results of the study, a comprehensive approach to organising the training process for student volleyball players is recommended in order to increase the effectiveness of defensive actions.

To implement this approach, the following should be included:

Simulation of game situations, focusing on defensive actions that neutralise the advantage in attack. This will allow volleyball players to adapt to different playing styles and improve their decision-making skills in match conditions.

Use of video training and feedback for detailed analysis of mistakes and their correction, tracking progress in the implementation of technical and tactical elements.

Exercises aimed at developing the physical qualities of athletes, taking into account individual characteristics. This will optimise the training load and achieve maximum effectiveness of defensive actions.

Systematic monitoring of effectiveness using developed diagnostic charts and pedagogical tests.

Thus, the results of the study indicate the possibility of purposefully improving game efficiency (defensive actions) through comprehensive optimisation of the training process, including the use of modern methods for assessing and correcting erroneous actions.

Conclusions. The results of the study demonstrated that the effectiveness of volleyball players' defensive actions is determined by their level of physical and technical-tactical training, gender, and individual psychological characteristics. The most common mistakes were identified: incorrect starting position, premature/late movement, inconsistent ball reception technique, and incorrect positioning when blocking.

A comprehensive training system based on the integration of structured systematic observation, video analysis, and pedagogical testing creates conditions for objective assessment of performance and identification of areas for improvement with subsequent targeted correction.

References

1. Alenurov E.A., Kumantsova E.S., Fayzullina I.I. Vozdeystvie voleybolnyh nagruzok na fizicheskie vozmozhnosti podrostkov. Teoriya i praktika fizicheskoy kultury. 2023. No. 6. Pp. 81.
2. Gamaliy V.V., Shlenskaya O.L. Otsenka i interpretatsiya napadayushchih deystviy v voleybole. Izvestiya TulGU. Fizicheskaya kultura. Sport. 2015. No. 4. Pp. 87-93.
3. Lutkova N.V., Makarov Yu.M., Lutkov V.F., Egorenko L.A. Povyshenie effektivnosti atakuyushchih deystviy igroka s amplua «doigrovshchik» v voleybole. Teoriya i praktika fizicheskoy kultury. 2023. No. 2. Pp. 92-94.
4. Tretyakov A.S., Loginov D.V., Lozovoy A.A., Lozovaya M.A. Sovershenstvovanie tekhniki igry v voleybol u obuchayushchihsya 15-17 let na urokah po fizicheskoy kulture. Teoriya i praktika fizicheskoy kultury. 2023. No. 7. Pp. 69-70.
5. Hilchenko A.D., Lutkova N.V. Mnenie sportsmenov kak sostavnaya chast kontrolya ih gotovnosti k vypolneniyu zashchitnyh deystviy. Sportivnye igry: nastoyashchee i budushchee. Kompleksnyy kontrol v sportivnyh igrah: Materialy 14-y nauchno-prakticheskoy konferentsii s mezhdunarodnym uchastiem kafedry teorii i metodiki sportivnyh igr NGU im. P.F. Lesgafta, Sankt-Peterburg, 26-27 maya 2025 goda. Sankt Peterburg: Natsionalnyy gosudarstvennyy universitet fizicheskoy kultury sporta i zdorovya im. P.F. Lesgafta Sankt Peterburg, 2025. Pp. 72-76.

Training process in rhythmic gymnastics using clubs

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Abstract

Objective of the study is to develop and introduce into the educational and training process a methodology based on the principles of sensory integration, strict rhythmic organization and variability of exercise conditions, which makes it possible to improve the quality of performing small club throws among gymnasts aged 10-11 years.

Methods and structure of the study. A 12-week pedagogical experiment was conducted at the Prestige Rhythmic Gymnastics Center. The study involved 30 gymnasts of the training stage of training, who, taking into account the initial level of technical readiness, age and athletic experience, were divided into two representative groups: control (CG, n=15) and experimental (EG, n=15). A detailed analysis of the requirements for the execution of throwing elements with maces has been carried out, key factors contributing to the occurrence of errors have been identified.

Results and conclusions. The developed methodology for improving the technique of small club throws among gymnasts aged 10-11 years at the training stage consists of five target blocks aimed at developing kinesthetic control, rhythmic abilities, proprioception, dynamic balance and technical accuracy. The results of a 12-week pedagogical experiment confirmed the high effectiveness of the developed methodology. In the experimental group, a statistically significant ($p<0.05$) decrease in allowances for technical errors was recorded.

Keywords: *training process, artistic gymnastics, clubs, technical skill, mastery of gymnastic apparatus.*

Introduction. In rhythmic gymnastics, competitive results are largely determined by the athletes' technical skill in handling the apparatus. Among all the apparatus, clubs are a unique tool that requires a high level of bimanual coordination, spatial-temporal accuracy, and a developed proprioceptive sense from the gymnast [1, 2]. The rules of rhythmic gymnastics competitions emphasise the purity of execution of basic work with the apparatus, which includes small club throws [6]. It is this aspect that served as the basis for the present study, the aim of which was to identify effective methods for improving the technique of performing small club throws at the training stage.

An analysis of scientific and methodological literature [3, 5] and training practice shows that traditional training methods often do not fully take into account the psychophysiological characteristics of 10-11-year-old gymnasts, who are characterised by a highly plastic nervous system, but have not yet developed stable concentration and muscle control. This leads to persistent technical errors: asynchronous arm movements, inaccurate trajectory of the clubs, insufficient fixation when catching, loss of balance.

Objective of the study is to develop and introduce into the educational and training process a methodology based on the principles of sensory integration, strict rhythmic organization and variability of exercise conditions, which makes it possible to improve the quality of performing small club throws among gymnasts aged 10-11 years.

Methods and structure of the study. A 12-week pedagogical experiment was conducted at the Prestige Rhythmic Gymnastics Center. The study involved 30 gymnasts of the training stage of training, who, taking into account the initial level of technical readiness, age and athletic experience, were divided into

two representative groups: control (CG, n=15) and experimental (EG, n=15). A detailed analysis of the requirements for the execution of throwing elements with maces has been carried out, key factors contributing to the occurrence of errors have been identified.

Results of the study and discussion. In the control group, work with clubs was integrated into the general training process without emphasis on specialised means of developing specific components of small throw techniques.

For the experimental group, a methodology was developed that was implemented as part of a specialised block of the main part of the training session (the duration of the block was 15-20 minutes). The methodology included five interrelated blocks of exercises, structured according to the principle of 'from simple to complex' and aimed at solving specific pedagogical tasks:

1. Block of kinesthetic modelling and ideomotor training. Task: formation of an accurate motor image of the element. Performing throwing movements at a slow pace with an emphasis on the sensation of the forearm and hand muscles working; mental representation of the ideal trajectory of movement without using objects and with eyes closed.

2. Block of rhythmic organisation of movements. Task: to develop the ability to accurately organise the timing of a movement. Performing a series of small throws to the sound of a metronome with a gradual increase and decrease in tempo; synchronising throws with musical accents.

3. Block for the development of proprioception and sensory control. Task: to increase the independence of the motor skill from the visual analyser. Performing throws and catching pins with partial exclusion of visual control (for example, by fixing the gaze at one point, using darkened glasses); exercises to feel the weight and balance of the pins.

4. Stabilometric training block. Task: to increase the dynamic stability of the body when performing throws in changing positions. Performing elements on an unstable support (e.g., on an Airex balance cushion); performing throws in combination with movements (steps, turns) and lunges.

5. Standardisation block. Task: performing small throws in accordance with FIG rules. Video recording of the execution of elements with subsequent analysis and comparison with reference samples; execution of throws with an emphasis on height, symmetry and catching.

At the end of the pedagogical experiment, technical errors were recorded in the control and experimental groups of gymnasts when performing small throws with clubs (Table 1).

Significant differences in indicators between gymnasts in the control and experimental groups at the second stage of the study according to the Mann-Whitney U test were obtained when performing all test and control tasks and ranged from 39.21% to 63.33%.

In the control group, some positive dynamics were observed during the experiment, but they did not reach statistical significance ($p>0.05$). The improvement in the control group can be explained by the natural process of adaptation to training loads.

In the experimental group, significant improvements were recorded for all evaluated parameters

Table 1. Difference in penalty points for technical errors made by EG and CG gymnasts when performing control tasks after the pedagogical experiment (penalty points)

No.	Test assignments	EG	CG	Abs.	Rel. в %	U, p<0,05
1	Juggling	0,12	0,24	0,12	50	27, p<0,05
2	Small throws towards yourself on the pass	0,15	0,30	0,15	50	20, p<0,05
3	Small throws towards yourself in 10 seconds	0,22	0,56	0,34	60,71	14, p<0,05
4	Small throws away from yourself in 10 seconds	0,23	0,51	0,28	54,9	28,5, p<0,05
5	Multi-directional throws with catching on the chene	0,45	0,91	0,46	50,55	41, p<0,05
6	Throws of two pins under the shoulder	0,33	0,90	0,57	63,33	29,5, p<0,05
7	Throws with catching with the foot	0,31	0,51	0,2	39,21	46, p<0,05

($p<0.05$), and the reduction for technical errors decreased by more than half.

The results obtained allow us to conclude that the developed methodology has a pronounced pedagogical effect, which is explained by its comprehensive impact on the key factors that determine the quality of technique:

1. Formation of a strong kinesthetic image. The block of kinesthetic modelling and ideomotor training contributed to the creation of clear neural traces, which reduced the number of 'random' errors associated with inaccurate motor programming [4].

2. Optimisation of neuromuscular control. Exercises under a metronome and with partial exclusion of visual control directly affected proprioceptive sensitivity and rhythmic abilities, which is the basis for synchronous work with two objects [6].

3. The stabilometric block and exercises in modified conditions formed the gymnasts' ability to consistently perform elements despite the influence of external and internal disruptive factors (fatigue, changes in balance, competitive stress).

Conclusions. As a result of the study, a method for improving the technique of small throws with clubs for gymnasts aged 10-11 at the training stage was developed and scientifically substantiated. It consists of five target blocks aimed at developing kinesthetic control, rhythmic abilities, proprioception, dynamic balance, and technical accuracy.

The results of a 12-week pedagogical experiment confirmed the high effectiveness of the developed methodology. In the experimental group, a statistically significant ($p<0.05$) decrease in deductions for technical errors was recorded.

The practical significance of the work lies in the fact that coaches and specialists in artistic gymnastics receive a specific, structured tool for the targeted improvement of one of the most difficult aspects of subject training. The implementation of this methodology allows for the optimisation of the training process, minimises the formation of technical errors at an early stage, and lays a solid foundation for the subsequent mastery of elements of the highest category of complexity.

References

1. Borisova O. Struktura koordinatsionnyh sposobnostey v hudozhestvennoy gimnastike i sredstva ih razvitiya u yunyh gimnastok. Slobozhanskiy vestnik nauki i sporta. 2019. V. 7. No. 3. Pp. 21-27.
2. Voronina T.A., Yarygina O.V. Hudozhestvennaya gimnastika: uchebno-metodicheskoe posobie. SPbGUFK im. P.F. Lesgafta, 2016. 120 p.
3. Ivanova N.S. Formirovanie psihofizicheskoy gotovnosti devochek-gimnastok. Vestnik Adygeyskogo gosudarstvennogo universiteta. Seriya 4: Pedagogika i psihologiya. 2018. No. 1. Pp. 131-136.
4. Karpenko L.A. Osnovy pedagogiki fizicheskoy kultury i sporta: uchebnoe posobie. Moskva: Akademiya, 2017. 256 p.
5. Lisitskaya T.S. Horeografiya v gimnastike. Moskva: Fizkultura i sport, 2014. 176 p.
6. Mezhdunarodnaya federatsiya gimnastiki (FIG). Pravila sorevnovaniy po hudozhestvennoy gimnastike 2021–2024. URL: https://www.gymnastics.sport/site/rules/rules.php (date of access: 12.10.2023).

The influence of football as a 'soft power' in the contemporary socio-cultural situation

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Abstract

Objective of the study is to understand the phenomenon of football from the point of view of philosophical teaching and to identify the phenomenological features of football.

Methods and structure of the study. In this study, the methods of theoretical and systematic analysis, including observation, were used.

Results and conclusions. The philosophical study of football will allow us to get closer to the answer, since it discovers and reveals many layers in the phenomenon of football: ontological (being-in-the-game, time and space on the field), existential (freedom of choice, authenticity, absurdity and meaning), phenomenological (the player's bodily experience, experiencing the moment), socio-philosophical (collective, leadership, identity, value, tradition, common history), aesthetic (beauty, play as art). Football appears as a rich metaphor of life: an arena where cooperation and rivalry are played out, where there are tragedies of defeats and epic victories, where everyone can find their place in the team and their personal value. Note that the study consists of two parts. The proposed first part introduces the stated issues, the second part of the article, which will be published later, discusses the main issues.

Keywords: *football, philosophy, aesthetics and ethics, analysis, phenomenology.*

Introduction. Sport in general and football in particular, as cultural phenomena, fall within the scope of research interests in philosophy, social philosophy, aesthetics, and the philosophy of communication. It is worth noting that, at present, the pool of research on the philosophy of football is quite small. This study aims to fill the identified scientific gap. The authors of the article approached the study of the phenomenon of football in scientific contexts and methodologies of different philosophical directions. Social philosophy and community philosophy reveal that football demonstrates how the individual and the collective can form harmony or expose problems: for example, mass identification with a team sometimes leads to fanaticism and aggression (football fans, hooliganism) – this is the dark side of the need to belong. This aspect is highlighted by the contemporary British philosopher S. Critchley, who wrote the work What We Think About When We Think About Football [5]. The philosophers of the Frankfurt School might see excessive fanaticism as the 'false consciousness' of the masses, a distraction from social problems – when people are more concerned with match results than real political and economic issues. On the other hand, the German philosopher J. Habermas might evaluate football as a sphere of communicative action: fans and players participate in a common discourse (non-verbal and verbal (mottos, chants, slogans, etc.)), where understanding and solidarity are achieved [9].

The philosophy of existentialism finds in the phenomenon of football existentialist themes of choice, risk, responsibility and meaning. Each match is a dramatic project whose outcome is unknown (like our lives) and whose value is determined by the authenticity of participation (playing honestly and passionately, like living authentically). Football emphasises free will: a penalty in the last seconds is almost an example of a pure existential choice, in which the player's freedom and his existential responsibility to himself and others are concentrated.

From the point of view of phenomenology as a philosophical movement, it is most productive to explore and reveal the mental and physical experience of a football player. A field player experiences the field not as a set of metres and tactics, but as a living space of possibilities. French philosopher M. Merleau-Ponty gave the example of a footballer: he possesses a 'bodily schema' of the field – he knows it 'by eye', his body intuitively senses distances and the position of the goal, without even measuring them intellectually [6]. The footballer acts on the basis of pre-reflective knowledge – his playing experience is ingrained in his muscles, like a habit. This is an example of the phenomenology of the body: understanding through action. A famous goal, when a player makes a 'automatic' movement, is often explained afterwards: 'I didn't think, I felt the moment.' We can relate this experience to the concept of 'intentionality' of consciousness in phenomenology: the player's consciousness is focused on the goal (scoring), and the body builds the process of achieving it, bypassing calculation. Thus, football provides rich material for analysing the experience of 'here and now', the stream of consciousness of a player entering a state of 'flow' – complete immersion, when time seems to stand still and there is only the game as a state close to the phenomenological 'being-in-the-world,' to use the terms of philosopher M. Heidegger [10].

From the point of view of the philosophy of communication and the formation of public discourse, it is important to highlight the research experience of the following authors. The famous Italian philosopher U. Eco wrote a work dedicated to and literally titled 'The Mythology of Football,' which analyses the social significance of football and its mythologisation by the mass media [12]. The symbolic power of words in the mythologisation of various phenomena and processes is emphasised by the French philosopher and sociologist P. Bourdieu. The sports sphere and sports discourse through journalism and blogging, coverage of the stories of sports clubs and teams, and individual famous athletes are fully involved in these processes. Discourses are formed in words and develop in the public media space. P. Bourdieu writes that 'the power to name' is an enormous power [2]. According to philosopher M. Foucault, discourse embodies the power of authority and has the power to influence. The scholar emphasises that 'in any society, the production of discourse is simultaneously controlled and organised' [8, 11]. Today, due to the influence of sports football discourse on the audience, other discourses formed by fan audiences are also being incorporated, which exacerbate issues of identity, belonging, and division according to the principle of 'us' versus 'them.'

The philosophical and aesthetic perspective of the study sets the following parameters and concepts to clarify the phenomenon of football: catharsis, play, composition, plot, drama. The philosophical concept of the game 'homo ludens' proposed by J. Huizinga [11] seems significant here. The philosophical and aesthetic works of Yu. Borev [1] and L. Stolovich [7] reveal concepts that are important for our study, such as 'aesthetic value' and 'spiritual values.' We can talk about a football match and reflect on it in terms of such aesthetic categories as beauty, perfection, harmony, and tradition.

Objective of the study is to understand the phenomenon of football from the point of view of philosophical teaching and to identify the phenomenological features of football.

Methods and structure of the study. In the course of this study, methods of theoretical and systematic analysis and participant observation were used. The relevance of this work lies in the fact that in today's complex socio-cultural situation, sport, and especially football as a game that attracts millions of viewers, is becoming an important social, cultural and communicative factor that requires an interdisciplinary and systematic approach to study. It is precisely the broad philosophical perspective on the phenomenon of football that allows us to identify its phenomenological features and understand how football can be used most creatively as a resource for fostering interest in national history and traditions and developing a sense of team unity.

Results of the study and discussion. When reflecting on the philosophy of football, it is important to pay attention to the fundamental concept of agôn (ancient Greek: ἀγών), which originated in Ancient Greek culture. Agôn is competition, and even more than that, it is a philosophy of life, a passion for heroism and victory through overcoming obstacles and self-improvement. This concept was broadly understood in Ancient Greece and included the very concept of 'competition' as well as 'gathering,' that is, the audience that was present there; it also included 'battle,' 'dispute,' and even theatrical performances. It was the drama of a real, honest competition in front of an audience. The famous Swiss philosopher and cultural historian J. Burkhard calls Greek culture agonal in its internal

code [3]. Russian researcher A. Zaitsev emphasises that the aristocratic value system of Ancient Greece either condemns or praises the hero; the colours of this drama are contrasting, predominantly oriented towards approval or condemnation [4]. Homer's heroes strive to avoid condemnation from their peers of equal social status. At the centre of this value system is ἀρετή – valour, which must be appreciated by those around him, primarily those of equal social standing. This appreciation provides the hero with the good reputation he most desires [4]. The hero sought to win in agôn (including the famous Olympic, Pythian, Delphic and Isthmian games) and thus, in fair public combat, secure his own glory and, more importantly, the glory of his family and polis, his country. Poets recorded this glory in words. Homer described the military exploits of heroes, and the poet Pindar immortalised their sporting achievements.

Today, sport in general and football, as a truly fair game played here and now in front of the public, have preserved the spirit of the Greek agôn. A football match is a real sporting and theatrical drama, the outcome of which is played out in real time, where the public is as involved as possible and is also part of the action, the modern agôn. These factors ensure the interest and value of football in the eyes of all participants in the action (players, audience, media). This is where the epic, ethical and aesthetic sides of football lie. Football is a spectacle, a performance. The philosophical aspects of football will be discussed in more detail in the second part of the article. Now let's move on to the preliminary conclusions.

Conclusions. A philosophical study of football has revealed profound analogies between this popular sport and key aspects of human existence. Football can be described as a complex phenomenon that reflects the social, existential and aesthetic nature of humans and society. The game of football reveals fundamental philosophical issues of the meaning and absurdity of human existence, freedom and responsibility, cooperation and individuality, values and traditions. The collective nature of football emphasises the importance of mutual cooperation and teamwork, revealing a socio-philosophical model of unity between the individual and the collective, in which each participant has unique value but realises themselves precisely in unity with others. At the same time, football demonstrates the existential aspects of being, showing how people face the need to make decisions in conditions of uncertainty, take risks and bear responsibility for their actions, as well as realise that even within the strict framework of rules there is room for creative freedom and authenticity.

The aesthetic component of football emphasises its similarity to art, where the game becomes a kind of performance capable of evoking genuine experiences, catharsis and emotional purification in the audience. Football is both a symbol and a metaphor for life, in which beauty and drama, victories and defeats, individual and collective experiences are woven into a single, multifaceted and deeply meaningful process.

References

1. Borev Yu.B. Estetika. Moskva: Politizdat, 1988. 496 p.
2. Burde P. Sotsialnoe prostranstvo i simvolicheskaya vlast. Moskva: Socio-Logos, 1994. 280 p.
3. Burkkhardt Ya. Kultura Italii v epohu Vozrozhdeniya. Moskva: Yurait, 2021. 285 p.
4. Zaytsev A.I. Kulturnyy perevorot v Drevney Gretsii VIII–V vv. do n. e. Sankt Peterburg: Izd-vo SPbGU, 2000. 320 p.
5. Kritchli S. Chto my dumaem o, kogda dumaem o futbole. Moskva: Ad Marginem Press, 2019. 160 p.
6. Merlo-Ponti M. Fenomenologiya vospriyatiya. Sankt Peterburg: Nauka, 1999. 608 p.
7. Stolovich L.N. Krasota. Dobro. Istina. Ocherk istorii esteticheskoy aksiologii. Moskva: Respublika, 1994. 464 p.
8. Fuko M. Poryadok diskursa: inauguratsionnaya lektsiya v Kolledzh de Frans, prochit. 2 dek. 1970 g. Volya k istine: po tu storonu znaniya, vlasti, seksualnosti: raboty raznyh let. Moskva: Kastal, 1996. Pp. 48-95.
9. Habermas Yu. Moralnoe soznanie i kommunikativnoe deystvie. Sankt Peterburg: Nauka, 2006. 377 p.
10. Haydeger M. Bytie i vremya. Moskva: Ad Marginem, 1997. 488 p.
11. Heyzinga Y. Homo Ludens. Statya o proiskhozhdenii kultury v igre. Moskva: Progress, 1992. 240 p.
12. Eko U. «Mifologiya futbola». Zametki na polyah «Imeni rozy». Moskva: Raduga, 1987. 356 p.

The role of logical-sociological methods in applied research in higher education pedagogy

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Abstract

Objective of the study is to determine the prospects for applying logical-sociological methods and operations in specialised applied pedagogical scientific and qualification research in the field of physical culture and sport based on meta-scientific analysis.

Methods and structure of the study. A meta-scientific analysis of the prospects for applying logical-sociological methods and operations in specialised applied pedagogical scientific and qualification research in the field of physical culture and sport has been carried out.

Results and conclusions. The interdisciplinary nature of pedagogical knowledge confirms the possibility and expediency of integrating pedagogical and specific sociological research, demonstrating a model of synthesis between pedagogy and sociology using the example of preparing and defending scientific qualification works on pedagogy. The formation of a meta-scientific algorithm for a promising solution to a pedagogical problem makes it possible to overcome the subject uncertainty of the basic and applied disciplines of the social sciences and humanities.

Keywords: *social sciences and humanities, higher education, meta-scientific analysis, pedagogy.*

Introduction. A comparative analysis of the content of a number of domestic and foreign sources on the humanities forms a theoretical understanding of the systemic incompleteness and imperfect nature of these scientific and educational fields. According to scientists, this problem is caused by the subject uncertainty of humanities knowledge, as well as specific features of the development of history and philosophy of science. To overcome the systemic incompleteness and subject uncertainty of the social sciences and humanities, it is necessary to apply a logical-sociological complex of scientific methods and operations [1-3, 5, 6, 11].

In the context under consideration, pedagogical science is not so much an exception as a rule reflecting the aforementioned metatheoretical problem [4, 10]. The area of most traditional application of the metatheoretical algorithm, as the basis for the formation of universal models that determine the professionalism of young and mature scientists, is their scientific and qualification work.

Objective of the study is to determine the prospects for applying logical-sociological methods and operations in specialised applied pedagogical scientific and qualification research in the field of physical culture and sport based on meta-scientific analysis.

Methods and structure of the study. An analysis of the history and philosophy of science shows that, while accumulating its empirical basis, consistently breaking away from philosophy and relying on the natural sciences in its initial development, political, political-economic, economic, historical, sociological, anthropological, and psychological scientific concepts and theories, despite all efforts, have not been able to finally differentiate themselves from each other and clearly and precisely define themselves [1-4, 9, 10]. Moreover, as these scientific disciplines develop, there is a growing tendency towards their local pairing on a traditional basis or the creation of fundamentally new interdisciplinary scientific products. The coexistence of trends towards differentiation and integration

of the social sciences and humanities and the natural sciences in the 20th century led to the emergence of psychological anthropology, social and cultural anthropology, socio-psychology, anthropological sociology, social pedagogy, kinesiology and ontokinesiology, political sociology, and digital sociology.

The complexity of grouping and systematising this conglomerate of modern scientific knowledge is significantly exacerbated by two important global circumstances:

– the natural phenomenon of the decline in the influence of traditional classical and non-classical science against the backdrop of the rise of non-traditional fake mystical science ('Science 2') and surrogate 'pop science,' adapted to the superficial perception of a multimillion-strong army of representatives of mass consumer culture [11-14];

– the ever-accelerating pace of development of modern society, in the unity and diversity of informatisation processes, which are fundamentally changing the familiar structure of scientific research [12].

Nevertheless, an analysis of the history and philosophy of science simultaneously proves that the influence of software-based concrete sociological research continues to strengthen in the social sciences and humanities. This form of research is gaining popularity, as it not only rejects all mythological, metaphysical and ideological constructs, but is also considered a working draft for a model of hypothetical-deductive theoretical construction [1-3, 5, 6, 13]. At the same time, this theory is considered the only type capable of providing reliable or highly probable knowledge [11, 13].

Finally, an unbiased analysis of the history and philosophy of science proves that the now traditional types of pilot, descriptive, and analytical specific sociological research (hereinafter referred to as SSI) represent an organic synthesis of sociology, formal logic, and mathematics. Moreover, these types of SSI were apparently developed not by the 'first positivist' Auguste Comte and his followers, but in the works of Ludwig Wittgenstein, Rudolf Carnap, Bertrand Russell and other prominent representatives of 'neo-positivism' or 'logical-linguistic positivism' [13, 14].

Pedagogy, along with political science, political economy, anthropology, history, sociology, and psychology, has not yet been able to define the characteristics of its subjects and methods. Within the framework of pedagogy, an analysis of the structure (organisation) of the 'tree' of pedagogical knowledge helps to understand this issue. The 'root base' of this tree is philosophy, the 'trunk' is didactics and the history of pedagogy, and the 'branches' are a wide variety of specialised and applied pedagogical theories and disciplines [4, 7, 10, 13, 14].

Such specific processing is carried out in the process of purposeful formation (education, training and upbringing) of the individual – in a process that transforms this information into a systematic educational (in the broad sense of the word) product.

Results of the study and discussion. The metascientific analysis conducted proves that both in the traditional version and, even more so, in the digital science version, logical-sociological methods and operations, combined in the form of SSI, can and should play the role of at least a preliminary but indispensable link in pedagogical science and the scientific-pedagogical process. In particular, SSI should rightfully take its place in the process of preparing and defending final and scientific qualification works in profile-applied pedagogy.

At the same time, the model of profile-applied sociological-pedagogical research, which we have tested many times, takes the following form:

– an introduction, in which the scientific methods used in the research are listed, including sociological methods, formal-logical methods and operations, and the experimental method. Along with this, both sociological and pedagogical tasks, hypotheses and propositions to be defended are formulated;

– the first (informational) chapter, which includes an analytical review of thematic sources using the method of sociological analysis of documents in the unity of quantitative content analysis and traditional, i.e. qualitative analysis, which, firstly, allows plagiarism to be avoided as much as possible and, secondly, provides a preliminary scientific justification for the research hypothesis;

– the second (organisational and methodological) chapter, which describes the organisation of the research in the form of a plan and a set of pilot and descriptive SSI programmes with a more detailed and comprehensive description of the methods and operations used. The second chapter is followed by a description of the programme for designing and conducting a socio-pedagogical experiment. If the scientific qualification work contains survey methods in the form of expert assessment, focus groups, online or offline questionnaires or interviews, the third (empirical-theoretical) chapter begins with a description of the three levels of processing the empirical tools

obtained and the scientific interpretation of empirical data to transform the latter into empirical indicators. The indicators or metrics in the form of conclusions and recommendations are presented in a specialised analytical report form);

– in the pedagogical part of the third chapter, work with the aforementioned analytical report continues, but now from a pedagogical perspective. It also contains empirical and theoretical methods and operations aimed at the practical implementation of sociological conclusions and recommendations;

– the socio-pedagogical experiment as the main method of pedagogical research, proving the validity of the dissertation material as a whole, either concludes the third chapter or is presented in the fourth chapter.

– the conclusion contains both sociological and pedagogical conclusions and recommendations.

Conclusions. The interdisciplinary nature of pedagogical knowledge acquisition proves the possibility and necessity of combining pedagogical and specific sociological research, demonstrating and describing a model of such a synthesis of pedagogy and sociology using the example of preparing and defending scientific qualification works in pedagogy. The development of a meta-scientific algorithm for a promising solution to a pedagogical problem makes it possible to move away from the subject-specific uncertainty of the basic and applied disciplines of the social sciences and humanities.

References

1. Vagner P. Sotsiologiya. Istoriya chelovechestva XX vek. T.VII. Moskva: YUNESKO, Izdatelskiy Dom MAGISTR PRESS, 2005. Pp. 271-275.
2. Vitrok B. Politologiya. Istoriya chelovechestva XX vek. T.VII. Moskva: YUNESKO, Izdatelskiy Dom MAGISTR PRESS, 2005. Pp. 287-292.
3. Vutton D. Izuchenie obshchestva. Istoriya chelovechestva. T.V. XVI–XVIII v. Moskva: Izdatelskiy Dom MAGISTR PRESS, 2004. Pp. 98-110.
4. Vygotskiy L.S. Pedagogicheskaya psihologiya. pod red. V.V. Davydova. Moskva: Pedagogika, 1991. 480 p.
5. Giddens E. Sotsiologiya. Per. s angl. Izd. 2-e, polnostyu pererab. i dop. [Sociology. Translated from English. 2nd edition, completely revised and expanded]. Moskva: URSS, 2005. 632 p.
6. Danilov A.N., Elsukov A.N. Metodologicheskoe uchenie V. Pareto i ego idei o nauchnom statuse sotsiologii. Voprosy filosofii. 2010. No. 8. Pp. 143-154.
7. Zagaynov R.M. K probleme unikalnosti lichnosti sportsmena – chempiona. Sportivnyy psiholog. 2005. No. 1. Pp. 4-16.
8. Zuev V.V. K voprosu o genezise nauchnoy teorii. Voprosy filosofii. 2011. No. 1. Pp. 98-105.
9. Kondruh A.I., Peredelskiy A.A., Peredelskaya R.A. Psihologiya prakticheskoy strelby. Moskva: Sport, 2017. 130 p.
10. Kraevskiy V.V. Nauki ob obrazovanii i nauka ob obrazovanii (metodologicheskie problemy sovremennoy pedagogiki). Voprosy filosofii. 2009. No. 3. Pp. 77-82.
11. Nikiforov A.L. Filosofiya i istoriya nauki. Moskva: Idea-Press, 2008. 176 p.
12. Orlova I.B. Aktorno-setevaya teoriya i sotsialnaya. Sotsiologicheskie issledovaniya. 2020. No. 7. Pp. 128-137.
13. Peredelskiy A.A., Markin E.V., Konikov S.L. Istoriya i filosofiya nauki, sotsiologiya i psihologiya kak teoretiko-metodologicheskie osnovaniya postroeniya gipotetiko-deduktivnyh teoriy i provedeniya konkretno-sotsiologicheskih issledovaniy v oblasti fizicheskoy kultury i sporta: nauchnaya monografiya. Orel: Kartush, 2022. 232 p.
14. Peredelskiy A.A. Filosofiya sporta. Metanauchnye osnovaniya sportivnogo protsessa. Moskva: YUNESKO, Izdatelskiy Dom MAGISTR PRESS, 2011. 480 p.

The influence of sporting motivation and emotional state on the performance of volleyball players

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Abstract

Objective of the study is to determine the impact of athletic motivation and emotional state on volleyball players' performance. 32 athletes aged 18-23, with at least a first-category qualification, participated in the study. The SMS-II questionnaire, POMS and SAN methods, and an analysis of game statistics were used. It was found that high intrinsic motivation and an optimal emotional state are associated with increased performance efficiency and a reduction in errors.

Methods and structure of the study. A study of the influence of sports motivation and emotional state on the performance of volleyball players was conducted as part of a comprehensive psychological and pedagogical analysis. The study used methods of quantitative and qualitative analysis of the psychological characteristics of athletes, as well as analysis of their competitive activities. The study involved 32 athletes from men's volleyball teams aged 18-23, with a sports qualification of at least I category, undergoing regular training and competitive preparation. All participants were informed about the objectives of the study and gave their consent to participate.

Results and conclusions. Data processing revealed statistically significant correlations between motivational parameters and game performance indicators, which is consistent with the findings of a number of recent studies in the field of sports psychology. The study established a significant influence of sports motivation and emotional state on the game performance of volleyball players. The data obtained confirm that internal motivation is the leading factor ensuring greater involvement in the training process, resistance to competitive stress, and stability of game actions. Athletes with strong internal motivation demonstrated higher accuracy in attacks, more effective defensive actions, and fewer technical errors.

Keywords: *sports motivation, emotional state, volleyball, game performance, sports psychology.*

Introduction. Psychological factors play an important role in achieving high results in sport. In addition to physical, technical and tactical training, motivation and emotional state significantly influence athletes' performance, especially in fast-paced and stressful sports such as volleyball. Research shows that motivation is a key factor in driving athletes to achieve high results, as well as determining their resilience to stress and the difficulties of training and competition.

An athlete's emotional state also has a significant impact on the quality of their performance. Controlling emotions and the ability to manage one's state are essential skills for successful performances [1]. Thus, experimental data show that motivation and emotional components of psychological state correlate with objective indicators of sports performance, including team sports, where the combined influence of these factors is critical for decision-making and the accuracy of game actions [2].

In the context of volleyball, studies of the influence of psychological states on game performance confirm the importance of components such as concentration, confidence, and emotional stability, which are associated with motivation to achieve athletic goals [8].

Objective of the study is to determine the impact of athletic motivation and emotional state on volleyball players' performance. 32 athletes aged 18-23, with at least a first-category qualification, participated in the study. The SMS-II questionnaire, POMS and SAES methods, and an analysis of game statistics were used. It was found that high intrinsic motivation and an optimal emotional state are associated with increased performance efficiency and a reduction in errors.

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The following methods were used to solve the tasks: the SMS-II (Sport Motivation Scale II) to assess levels of intrinsic and extrinsic motivation, amotivation, and behaviour regulation; the Profile of Mood States (POMS) questionnaire to determine the athlete's state of tension, activity, fatigue, confidence and emotional stability; the 'Self-Assessment of Emotional State' (SAES) technique for the operational assessment of well-being, activity and mood on training and competition days.

To objectively assess the effectiveness of volleyball players, statistical indicators in official games were analysed: percentage of successful serves; reception accuracy; number of successful attacks; number of errors in attack and reception; blocking effectiveness; total number of points scored. The data was recorded according to competition protocols and video recordings of games.

Methods of mathematical and statistical processing: correlation analysis (Pearson or Spearman) to identify relationships between motivational characteristics, emotional states and game indicators; comparative analysis (Student's t-test or Mann–Whitney U test) when it was necessary to compare groups with different motivational or emotional profiles; calculation of mean values and standard deviations. Statistical processing was performed using SPSS, Statistica or similar data analysis applications.

The study was conducted in three stages:

1. Assessment stage: collection of initial data on the motivation and emotional background of athletes before the start of control games.

2. Main stage: conducting psychodiagnostic procedures, observations and collection of game statistics during training sessions and official matches.

3. Analytical stage: processing of the data obtained, determination of the relationships between psychological characteristics and performance, interpretation of the results.

The methods chosen made it possible to provide a comprehensive and objective analysis of the influence of psychological factors on the performance of volleyball players and to identify significant relationships between the level of sports motivation, emotional states and the success of playing activities.

Results of the study and discussion. Data processing revealed statistically significant correlations between motivational parameters and game performance indicators, which is consistent with the findings of a number of recent studies in the field of sports psychology.

Motivational characteristics of athletes:

According to the SMS-II questionnaire, most volleyball players showed higher levels of intrinsic motivation, which is consistent with current ideas about its key role in an athlete's resistance to stress and maintaining a high level of engagement [4]. The high values of internal motivation in the sample are consistent with the results of studies showing that athletes in team sports more often demonstrate motivation related to the desire to improve their skills and teamwork [3].

Table 1. Psychological indicators and game performance of volleyball players

Indicators	Average value	SD
Internal motivation (SMS-II)	5.8	0.6
External motivation	3.4	0.7
Amotivation	1.9	0.5
Emotional stability (POMS - Tension-Inertia)	43	7
Confidence (SAES)	4.7	0.5
Accuracy of attacks (%)	52.3 %	6.4
Effectiveness of blocks (%)	37.1 %	5.2
Number of errors per match	8.6	2.1
Overall effectiveness coefficient (EFF Index)	+14.2	3.3

Emotional state of athletes. Using the POMS methodology and the SAES test, individual differences in mood, tension, activity, and confidence were identified among volleyball players. The data are consistent with the researchers' conclusions that the emotional state of an athlete is a dynamic characteristic and changes significantly depending on the phase of the training process and competitive load [7]. Athletes with higher levels of confidence demonstrated more stable performance indicators, which has also been noted in a number of studies on emotional regulation in sport [6].

Game performance. Analysis of competition records showed that athletes with more pronounced internal motivation and a positive emotional profile had higher indicators of offensive and defensive effectiveness [5].

Analysis of the data (Table 1) shows that higher levels of intrinsic motivation and emotional stability are accompanied by increased effectiveness of offensive and defensive actions, as well as a decrease in the number of technical errors.

Athletes with higher levels of intrinsic motivation demonstrated higher activity levels, stable emotional states, less mood variability, and more consistent competitive performance. These results are consistent with studies that have established links between achievement motivation, concentration, and technical and tactical characteristics in team sports [5]. In addition, the influence of emotional state was manifested in the fact that excessive tension or fatigue led to an increase in the number of technical errors, which is confirmed by research [7]. Thus, the combination of an optimal motivational profile and a favourable emotional state is an important psychological condition for improving the effectiveness of training and competitive activities of volleyball players.

Conclusions. The study revealed a significant influence of sports motivation and emotional state on the performance of volleyball players. The data obtained confirm that internal motivation is the leading factor ensuring greater involvement in the training process, resistance to competitive stress and stability of game actions. Athletes with strong internal motivation demonstrated higher accuracy in attacks, more effective defensive actions, and fewer technical errors.

The emotional state of volleyball players also proved to be an important predictor of the quality of competitive performance. Higher values of emotional stability and confidence correlated with improved game performance, while increased tension and emotional instability were associated with an increase in the number of errors and a decrease in the effectiveness of technical and tactical actions. This is consistent with the concept of optimal functioning zones, according to which athletes achieve the best results when they are in their individual comfortable emotional range.

The practical significance of the work lies in the possibility of using the established patterns to improve the training process: developing individualised psychological training programmes, introducing methods for regulating emotional states, and conducting regular diagnostics of the motivational and emotional characteristics of athletes.

The conclusions obtained may be useful to coaches, sports psychologists, and specialists in team sports training, as well as serve as a basis for further research aimed at studying the influence of psychological factors on performance in volleyball and other team sports.

References

1. Vliyanie emotsionalnogo sostoyaniya na effektivnost sportivnoy deyatelnosti. URL: https://7universum.com/ru/psy/archive/item/18035 (date of access: 10.12.2025).
2. Comparative analysis of motivation scales in sport. Kinestetik Journal. URL: https://ejournal.unib.ac.id/kinestetik/article/view/35653 (date of access: 10.12.2025).
3. Clancy R.B., Herring T.J., Campbell B.A., Matthews C.R. Motivation measures in sports: a critical review. Journal of Sport Behavior. 2016. V. 39. No. 2. Pp. 123-145.
4. Deci E.L., Ryan R.M. Intrinsic motivation and self-determination in human behavior. New York: Plenum Press, 2000. 453 p.
5. García-de-Alcaraz A., Ortega E. Technical-tactical performance indicators in volleyball: a systematic review. Journal of Human Kinetics. 2019. V. 68. Pp. 243-253.
6. Lane A.M., Terry P.C., Karageorghis C.I., et al. Mood and performance: a review of research and theory. Journal of Sports Sciences. 2005. V. 23. No. 10. Pp. 939-957.
7. Pelletier L.G., Rocchi M.A., Vallerand R.J., Deci E.L. et al. Comparing sport motivation scales: a response to Pelletier et al. Psychology of Sport and Exercise. 2013. V. 14. No. 5. Pp. 446-452.
8. Psychological factors affecting volleyball performance. URL: https://pubmed.ncbi.nlm.nih.gov/36992946/ (date of access: 10.12.2025).

Diversified exercise programmes in physical education for female students

UDC 796.011.3

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Abstract

Objective of the study is to develop a methodology for using multidirectional exercise complexes in physical education for female students.

Methods and structure of the study. The following methods were used: pedagogical experiment, assessment of physical fitness level, functional tests, questionnaires, surveys, bioimpedance analysis of body composition and measurement of body parameters, methods of mathematical statistics. Thirty-four multidirectional complexes of functional physical exercises were compiled with a description of the methods of their application.

Results and conclusions. The methodology contains: physical exercises of functional training and recommendations for their use in training sessions and in the training process; an individual approach to each student, taking into account her level of physical fitness and training goals; the use of modern technologies for distance learning and self-monitoring.

Keywords: *physical education, training, diverse physical exercises, female students.*

Introduction. The popularity of functional training is growing every year in higher education institutions. Functional training has practical application [6]. This is due to its accessibility and applicability regardless of the conditions provided by a university, fitness club or sports complex. A distinctive feature of functional training is physical exercises that use the weight of one's own body and are used to help people adapt to everyday life. The uniqueness of this training lies in the unlimited number of variations of physical exercises, means, approaches and methods of application to achieve certain goals: the development of physical qualities (endurance, coordination, strength, flexibility and speed); the level of functional condition; working capacity; aerobic and anaerobic intensity of exercise; functional reserves of the human body. Functional training is based on basic physical exercises, most of which imitate human movements in everyday life. The content of functional training includes functional multi-event competitions, integrating exercises from various sports, applied exercises [2]. It is used as a separate type of training and is included in the main part of the content of fitness areas: CrossFit, workout, Pilates, and others. The functional training methodology includes circular and multi-repetition methods of performing physical exercises during training.

One of the most important tasks in scientific and pedagogical activities for the study and improvement of physical education for university students is to acquire knowledge and skills that solve problems for improving physical and functional fitness and promoting a healthy lifestyle, which necessitates the creation of new innovative pedagogical technologies that will enable the design of the physical education

teaching process and and organisational forms of interaction between teachers and students that ensure guaranteed learning outcomes [4]. In this regard, the question arises about the need to develop and apply a methodology using multidirectional complexes of physical exercises for functional training, its implementation and introduction into the educational or training process.

In her study, L.I. Zenina determined that when conducting classes at the institute, it is necessary to monitor the functional state of students' bodies, taking into account their individual and age characteristics [1], which corresponds to Federal Law No. 329-FZ of 04.12.2007 (as amended on 24.06.2025) 'On Physical Culture and Sport in the Russian Federation', Article 28 'Physical Culture and Sport in the Education System', paragraph 3, on the need to develop students' motor skills and knowledge of physical culture, taking into account their individual abilities and state of health, and to create conditions for involving students in physical culture and sports activities; (as amended by Federal Law No. 127-FZ of 30 April 2021) [7].

Consequently, it is necessary to search for new innovative teaching methods that allow for the selection of individual physical activity and its intensity during training, taking into account the physiological characteristics of the female body and the current level of physical fitness.

Objective of the study is to develop a methodology for using multidirectional exercise complexes in physical education for female students.

Methods and structure of the study. The study was conducted during the 2022-2023 academic year at the North-West Institute of Management of the Russian Presidential Academy of National Economy and Public Administration in St. Petersburg. A total of 140 female students participated in the pedagogical experiment, divided equally into two groups: a control group and an experimental group. Students in the control group studied the subject 'Elective Courses in Physical Education' as part of the working curriculum of the North-West Institute of Management of the Russian Presidential Academy of National Economy and Public Administration, St. Petersburg. The experimental group studied using a developed functional training methodology.

The following methods were used in the study: pedagogical experiment, assessment of physical fitness, functional tests, questionnaires, surveys, bioimpedance analysis of body composition and measurement of body parameters, and methods of mathematical statistics. The physical fitness and functional status of girls aged 18-20 in both groups were tested at the beginning and end of the study. To increase the motivation of students to participate in physical education classes, bioimpedance analysis of body composition and measurement of body parameters were used during each semester for the control and experimental groups. In order to monitor subjective indicators of current general well-being and physical condition and to obtain feedback on the application of functional training methods, self-monitoring diaries were developed, which the participants of the experimental group filled out weekly.

In order to develop a methodology for using multidirectional sets of functional training exercises, the content of a phased plan was developed.

The first stage was to define the goals, objectives and direction for the development of functional training sets. The content of this stage included:

1. Functional training complexes have the following general objectives: mastering the technique of performing exercises and determining the order of their repetitions; developing physical abilities; controlling and regulating the level of load and intensity during training; affecting all muscle groups.

2. Seventeen functional training programmes were developed, which are performed using the weight of one's own body. Of these, two programmes are used during menstrual cycles. An additional 17 functional training programmes were developed to increase physical load, using additional sports fitness equipment. Of these, two programmes are used for female students during their menstrual cycle. The complexes are aimed at developing muscle groups and body functions, speed-strength, strength endurance, coordination abilities, functional condition, physical working capacity, balance and flexibility [3].

3. The load was determined individually for each student before the start of each training session.

Resting heart rate, age and gender were taken into account on an electronic calculator, which automatically calculated the intensity of the load. During training, the students followed a mixed aerobic-anaerobic zone regime.

The second stage was to determine the content of the functional training methodology. The functional training methodology includes the following methods: circuit training, multiple repetitions

Table 1. Comparative analysis of physical fitness testing of female students

Physical qualities	Before the study		After the study	
	CG	EG	CG	EG
100 m run (seconds)	25,71 ± 5,22	25,86 ± 5,23	25,57 ± 5,21	24,14 ± 5,11
2 km run (minutes, seconds)	21,14 ± 4,88	20,86 ± 4,86	19,14 ± 4,70	17,29 ± 4,52
Standing long jump with two-foot take-off (m and cm)	2,31 ± 1,80	2,39 ± 1,82	2,46 ± 1,85	2,74 ± 1,95
Push-ups (number of repetitions)	10,00 ± 3,59	12,86 ± 4,00	14,29 ± 4,18	25,71 ± 5,22
Sit-ups (number of repetitions per minute)	47,14 ± 5,97	48,57 ± 5,97	51,43 ± 5,97	62,86 ± 5,78
Forward bend while standing on a gymnastic bench (cm)	18,57 ± 4,65	20,00 ± 4,78	20,00 ± 4,78	22,86 ± 5,02

The third stage was testing the level of performance, physical and functional fitness. Physical qualities were assessed according to the official GTO standards.

The fourth stage was training.

The fifth stage is the final stage. Implementation of two training manuals on functional training. Implementation formats: full-time, distance learning, independent study.

The versatility of the developed functional training content lies in its accessibility regardless of the conditions of the university, the availability of equipment or inventory, and the level of physical fitness of the students [5].

Results of the study and discussion. In order to substantiate the developed methodology for using multidirectional complexes of physical exercises for functional training in the physical education of female students, a comparative analysis of the results of the experimental and control groups was carried out. The results of the development of physical qualities are presented in Table 1.

Based on the data obtained during the comparative analysis of the development of physical qualities of the two groups, the dynamics of increasing the level of physical fitness is significantly higher in the experimental group. Consequently, it can be concluded that the developed methodology using multidirectional complexes of physical exercises of functional training for female students is effectively structured during the academic year.

In order to assess the functional state of the students' bodies, functional tests were conducted, the results of which are presented in Table 2.

The results of the comparative analysis of the functional state of female students, presented in Table 2, significantly exceed those of the experimental group. It should be noted that the girls participating in the pedagogical study of both groups were assessed on the 'untrained' scale due to the lack of physical activity outside of training sessions.

Thus, the use of the developed methodology of multidirectional functional training complexes improves the functional state of female students, which contributes to an increase in their physical fitness and performance, the results of which are presented in Table 3.

The physical fitness data obtained were assessed using the Harvard Step Test Index (HSTI).

According to the results of bioimpedance analysis of body composition, the indicators in the experimental group are within the 'healthy' range. In the control group, the indicators were within the 'normal' range. According to feedback from the students, this testing increased their motivation to train in order to improve their physique. As a result, the girls in both groups at-

Table 2. Comparative analysis of the functional state of female students

Functional tests	Before the study		After the study	
	CG	EG	CG	EG
Stange test (c)	52.86 ± 5.97	51.43 ± 5.97	58.57 ± 5.89	100.00 ± 0.00
Genche test (c)	45.71 ± 5.95	47.14 ± 5.97	50.00 ± 5.98	71.43 ± 5.40
Martine test (% HR)	100.00 ± 0.00	97.14 ± 1.99	84.29 ± 4.35	28.57 ± 5.40

Table 3. Comparative analysis of physical working capacity of female students

Harvard Step Test (HST)	Before the study		After the study	
	CG	EG	CG	EG
	78,57 ± 4,90	82,86 ± 4,50	94,29 ± 2,77	125,71 ± 2,90

tended classes with a minimum number of absences. In order to evaluate the subjective indicators of the developed functional training methodology in physical education, self-control diaries and questionnaires were used, as a result of which the girls noted that their emotional and mental state and mood had improved, and they had developed a desire to attend training sessions and additionally engage in remote training on their own. The data obtained during the questionnaire and feedback are related to the use of an individual approach and the calculation of the intensity of the load for each student. Consequently, taking into account individual load zones, functional training classes were conducted with gradual adaptation of the cardiovascular system.

Conclusions. The developed methodology for using multidirectional complexes of physical exercises of functional training in physical education of female students includes: exercises and recommendations for their use in training sessions and in the training process; an individual approach to each student, taking into account her level of physical fitness and training goals; the use of modern technologies for distance learning and self-control. The multidirectional nature of the methodology is ensured by the content of the complexes and the specifics of their application. Thus, the functional training methodology takes into account the individual characteristics of physical fitness and the intensity of its implementation, taking into account the physiological characteristics of the female body and the current level of functional fitness of students.

References

1. Zenina L.I., Churikova L.N. Innovatsionnye pedagogicheskie tekhnologii obucheniya v sfere fizicheskoy kultury i sporta v vuze. Molodezh XXI veka: obrazovanie, nauka, innovatsii: materialy X Mezhdunarodnoy konferentsii aspirantov i molodyh uchenyh, Vitebsk, 08 dekabrya 2023 goda. Vitebsk: Vitebskiy gosudarstvennyy universitet im P M Masherova.
2. Karpenko V.N., Ermolina N.V. Tekhnologii funktsionalnogo treninga v fizicheskoy podgotovke muzhchin-voennosluzhashchih [Functional training technologies in physical training for male military personnel]. Vestnik sportivnoy nauki. 2024. No. 5. Pp. 37-43.
3. Poddubnaya T.V., Ryabchuk V.V. Obosnovanie soderzhaniya kompleksov funktsionalnogo treninga v ozdorovitelnoy trenirovke devushek 18-21 goda. Uchenye zapiski universiteta im. P. F. Lesgafta. 2023. No. 9(223). Pp. 342-345.
4. Poddubnaya T.V. Pedagogicheskaya tekhnologiya primeneniya funktsionalnogo treninga v fizicheskom vospitanii studentok vuzov. Gertsensky Gertsenovskie chteniya. Fizicheskaya kultura i sport v obrazovatelnom prostranstve: innovatsii i perspektivy razvitiya: Sbornik materialov Vserossiyskoy nauchno-prakticheskoy konferentsii, Sankt-Peterburg, 24 aprelya 2024 goda. Sankt-Peterburg: Sankt Peterburgskiy politekhnicheskiy universitet Petra Velikogo, 2024. Pp. 239-241.
5. Poddubnaya T.V., Ryabchuk V.V., Mironov A.O. Soderzhanie kompleksov funktsionalnogo treninga dlya studentok. RANHiGS. Uchebnoe posobie dlya studentok I-III kursov. Rossiyskaya akademiya narodnogo hozyaystva i gosudarstvennoy sluzhby pri Prezidente RF, 2025. Pp. 206.
6. Poddubnaya T.V. Effektivnost i vliyanie funktsionalnogo treninga na fizicheskuyu i funktsionalnuyu podgotovlennost studentov. Aktualnye tendentsii i innovatsii v razvitii fizicheskoy kultury i sporta v sisteme obrazovaniya Rossii i za rubezhom: Materialy nauchno-prakticheskoy konferentsii s mezhdunarodnym uchastiem, Sankt Peterburg, 26 yanvarya 2023 goda. Sankt-Peterburg, Severo-Zapadnyy institut upravleniya – filial RANHiGS, 2023. Pp. 141-145.
7. Federalnyy Zakon ot 04.12.2007 № 329-FZ (red. ot 24.06.2025) « O fizicheskoy kulture i sporte v Rossiyskoy Federatsii». URL: https://www.consultant.ru/document/cons_doc_LAW_73038/49aa774305aa60becb736b352cd40269cc6d43b5/ (date of access: 10.08.2025).

Analysis of the reasons for the decline in the level of physical fitness of students

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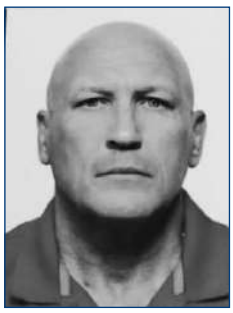

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Abstract

Objective of the study is to analyse the reasons for the decline in students' performance. During the analysis, a sociological survey was conducted, with respondents being first- to fourth-year students (bachelors) at higher education institutions.

Methods and structure of the study. In solving the first task, methods of analysis and literature review were used, which showed that the primary and main problems of low physical activity are lack of time among students, a sedentary lifestyle, lack of motivation, and stress.

To solve the second task, a sociological survey was conducted, with respondents being students of higher educational institutions in their first to fourth years (bachelors).

Results and conclusions. Lack of free time is the main problem in reducing the level of physical fitness among students. As soon as an applicant becomes a student, they are assigned a large number of new responsibilities that are not comparable to those at school. In this situation, it is difficult to properly organise the learning process and allocate time for physical education and sports. In conclusion, it is important to note that students and young people are at increased risk in terms of health and physical development. In this regard, it is necessary to take action to address these issues, including through the organisation of appropriate educational programmes and activities.

Keywords: *physical culture, activity, fitness, psychophysical development, students.*

Introduction. Physical education and the level of physical fitness of students are the basis of their psychophysical development. Currently, the problem of declining physical activity is particularly relevant, as sedentary lifestyles and low mobility reduce physical fitness levels. In addition, the increase in the volume of educational information, the need to search for it online, and the large number and complexity of academic assignments leave students with little personal time and cause stress.

This topic is quite relevant in modern society, as in the current conditions of student life, there is a decline in the level of physical fitness of students, which affects their performance and learning. One of the main tools for maintaining an average level of physical activity, physical condition and overall health among students is compulsory physical education classes. However, despite this, there is a tendency towards a decline in physical fitness, which indicates a number of problems that contribute to this trend.

The problem of declining physical fitness among students is considered by many specialists in the field of physical education. Thus, Balsevich V.K. and Lubysheva L.I. write that the cause of low physical activity may be a sedentary lifestyle, which has emerged among young people due to the development of modern technologies, as well as a lack of motivation [4]. The authors believe that the cause may be increased academic workload and stress, accompanied by growing academic demands. The high intensity of the educational process undoubtedly affects how students allocate their time, and many of them face a lack of time for sports or physical activity [1, 2, 3].

Objective of the study is to analyse the reasons for the decline in students' performance.

Tasks:

Table 1. Ranking structure of negative impact factors

Ranking (significance) (%)	Factors	Ranking indicator
1	Poor ability to restructure motor actions	32
2	Low precision of movements	24
3	Low level of static and dynamic stability	20
4	Weak muscle corset	16
5	Low level of strength endurance	8

1. Investigate possible reasons for the decline in students' physical fitness.

2. Identify the main reasons for the decline in physical fitness among students in higher education institutions by conducting a sociological survey among first- to fourth-year students.

Methods and structure of the study. In solving the first task, methods of analysis and literature review were used, which showed that the primary and main problems of low physical activity are lack of time among students, sedentary lifestyle, lack of motivation, and stress.

To solve the second task, a sociological survey was conducted, with respondents being first- to fourth-year students (bachelors) at higher education institutions.

Results of the study and discussion. The lack of free time is the main problem in terms of reducing the level of physical fitness among students. As soon as an applicant becomes a student, they are assigned a large number of new responsibilities that are incomparable to those at school. In this situation, it is difficult to properly organise the learning process and set aside time for physical education and sports. Another factor is a lack of motivation, which indicates that students are not interested in physical education or sports in general, leading to a decline in physical fitness. The lack of free time due to the academic workload and a sedentary lifestyle, which in itself has a negative impact on students' health, create an increased level of stress, which can affect sleep patterns, nutrition and the frequency of physical activity.

In order to confirm the existence of the identified reasons for the decline in physical fitness, a sociological survey was conducted among 103 first- to fourth-year students (bachelors) at higher education institutions.

The questions asked to respondents are presented below.

1. Do you consider physical development and regular physical activity to be important at present? – Yes; – No

2. Describe your arguments for or against physical education and sports (detailed answer).

3. Indicate which course you are currently enrolled in and, in your opinion, which course has the greatest interest in physical education?

4. What is your average score when passing physical education standards? (from 1 to 5)

5. How would you rate your level of physical fitness? (5 physical qualities are taken into account: strength, speed, endurance, agility and flexibility): 1. Low. 2. Below average. 3. Average. 4. Above average. 5. High.

6. Do you attend physical education classes? Answers: 1. Yes, I consider physical development important. 2. Yes, I enjoy it. 3. Yes, only to get credit. 4. No.

7. If not, why? (You may indicate your reasons for not attending physical education classes). Answers: 1. Lack of motivation. 2. Laziness. 3. Lack of free time. 4. Medical problems. 5. Other.

8. What factors could improve your level of physical fitness? Answers: 1. Personal desire/motivation. 2. More free time. 3. A different system of physical education. 4. No health problems. 5. Sports grounds and gyms within walking distance. 6. Other.

9. Identify the factors that, in your opinion, have the greatest impact on reducing physical fitness. Answers: 1. Lack of free time. 2. Sedentary lifestyle. 3. Lack of motivation to participate in sports. 4. Stress caused by academic workload or other reasons. 5. Other.

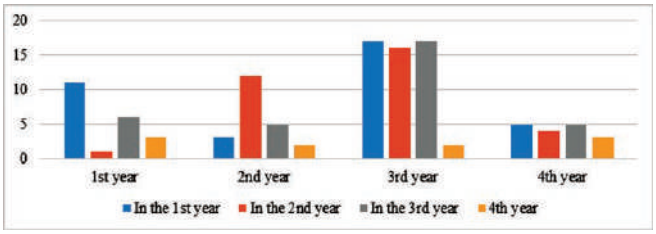
Survey results:

Question No. 1. 'Do you consider physical development and regular physical activity to be important at present?' 78 respondents answered 'yes' and 25% answered 'no.' The majority of respondents consider physical development and activity to be important.

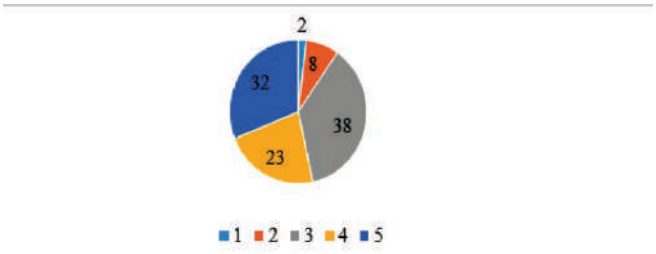
Question No. 2. Among the arguments 'for' or 'against' physical education or sports were the following: 1. 'Sport makes you healthy not only physically but also mentally'; 2. 'Sport is cool, it boosts your self-esteem, the most important thing is to develop consistency and not be lazy'; 3. 'Pros: health, tone, discipline. Cons: injuries, time, the possibility

of performing exercises incorrectly'; 4. 'You feel better in everyday life when you exercise, your health and well-being improve. It develops discipline.' 5. 'Neutral. Physical activity is necessary, but not in large quantities. In my opinion, simple walking is sufficient for me.' 6. 'Sports are important, but as a subject at university, in my opinion, they are useless.' On average, there were more arguments 'for' than 'against', which indicates a positive attitude towards physical education and sport.

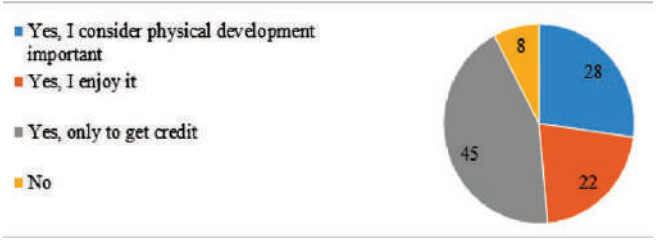
Question 3. 'Indicate which course you are currently enrolled in and, in your opinion, which course has the greatest interest in physical education?'



These data allow us to draw conclusions about trends in interest in physical education. Respondents believe that interest prevails either in the course they are currently enrolled in or in the previous one. To a greater extent, senior students note their interest in the first or second year.



Question No. 4. 'What is your average score when passing physical education standards? (from 1 to 5)'

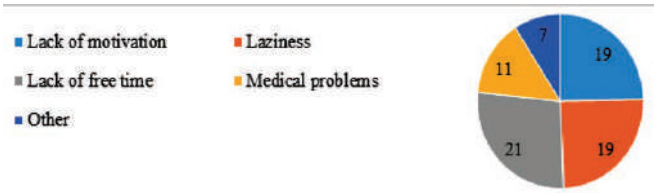


Most students have an average score of 3 when passing the standards, with 5 points in second place.

Question No. 5. 'How would you rate your level of physical fitness?'

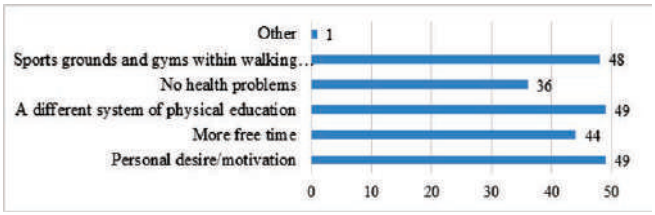
Most students rate their level of physical fitness as 'average,' which is a satisfactory indicator.

Question No. 6. 'Do you attend physical education classes?'



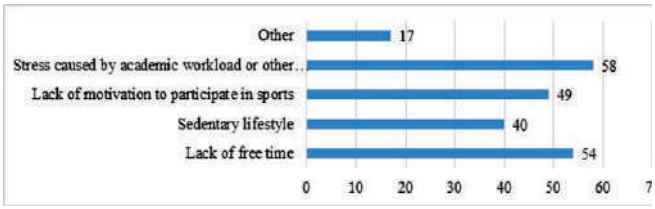
The majority of respondents attend classes only to receive credit, without prioritising physical development.

Question No. 7. 'If not, why?'



The main reason why respondents do not attend physical education classes is a lack of free time. This may indicate that students do not consider the subject compulsory and prefer to spend their time on personal activities.

Question No. 8. 'What factors could improve your level of physical fitness?'



For most students, the main factors for possible improvement in physical fitness are personal motivation, a different educational system, and the availability of sports facilities within walking distance.

Question No. 9. 'Identify the factors that, in your opinion, have the greatest impact on reducing physical fitness.'

According to students, the main factors contributing to the problem of declining physical fitness are

stress, lack of free time, and lack of motivation to participate in sports.

Conclusions: 1. Most students have a positive attitude towards physical education and sports. 2. There is a tendency for interest in physical education to decline as students progress through their studies. Interest prevails either in the current course or in the previous one. To a greater extent, senior students report their interest in the 1st or 2nd year. 3. Students' physical fitness, as assessed by their own evaluation and standardised scores, is satisfactory. 4. Students attend physical education classes not because of personal desire, but to receive credit for the discipline. Students do not attend physical education classes due to a lack of free time. 5. Improving students' physical fitness requires personal desire. 6. According to the respondents, the main factors contributing to a decline in physical fitness are stress caused by academic workload or other reasons.

In conclusion, it is important to note that students and young people are at increased risk in terms of health and physical development. In this regard, measures must be taken to address these issues, including through the organisation of appropriate educational programmes and activities.

References

1. Gasanova V.N., Himich M.N. Vovlechennost studentov ekonomicheskogo vuza v sistematicheskie zanyatiya fizicheskoy kulturoy i sportom. Fizicheskaya kultura, sport i turizm v vysshem obrazovanii. Sbornik materialov XXXVI Vserossiyskoy nauchno-prakticheskoy konferentsii studentov, magistrantov, aspirantov, molodyh uchenyh, professorsko-prepodavatelskogo sostava. Rostov-na-Donu, 2025. Pp. 172-177.
2. Grigan S.A., Rukavishnikova S.K. Analiz prichin snizheniya urovnya fizicheskoy podgotovlennosti studentov. Uchenye zapiski universiteta imeni P.F. Lesgafta. 2025. No. 6(244). Pp. 44-49.
3. Grigan S.A., Neshcheret N.N., Gvozdikova A.A., Pleskacheva O.V. Vliyanie fizicheskoy kultury i sporta na formirovanie moralnyh i nravstvennyh kachestv studentov. Teoriya i praktika fizicheskoy kultury. 2025. No. 1. Pp. 75-77.
4. Lubysheva L.I., Balsevich V.K. Tsennosti fizicheskoy kultury v zdorovom stile zhizni. Materialy mezhdunarodnoy konferentsii Sovremennye issledovaniya v oblasti sportivnoy nauki. Sankt-Peterburg, NIIFK, 2004.

Modern approaches and educational technologies for forming a culture of safe activities of students in universities: a theoretical aspect

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Abstract

Objective of the study is to conduct a theoretical analysis and systematise modern approaches and educational technologies for forming a culture of safe living among students at universities, identify current trends and problems in this educational and applied process, and develop an organisational and pedagogical algorithm for its improvement.

Methods and structure of the study. During 2025, an analysis of scientific and methodological literature and educational programmes for students in the educational and applied discipline of 'Life Safety' was conducted. In the course of the analytical work, a large array of sources on the topic of the work was analysed, as well as a number of educational and methodological literature on the discipline 'Life Safety'. The collected factual material was systematised, and the main directions and trends in the formation of a culture of safe life activities among students in higher education institutions were identified. All this contributed to the identification of basic problems, as well as the development of comprehensive educational and applied directions for adjusting the content of the educational process of preparing students in higher education institutions in the country for safe life activities.

Results and conclusions. The analytical work carried out, aimed at analysing, systematising and identifying the effectiveness of the modern process of forming a culture of safe living among students in the country's universities, showed the need to develop the following scientific and methodological provisions to improve the current educational practice in Life Safety:
- the need to develop a common strategy for forming a culture of safe living among the country's population, starting from preschool age and continuing through to retirement age;
- to develop a single textbook and educational programme on the subject of 'Life Safety' for all educational institutions and age groups of the population;
- improving the training of teachers in life safety at the country's teacher training universities, taking into account new natural, social, environmental and other challenges facing humanity;
- developing standards for the preparedness and control of the population for safe living (similar to the GTO);
- include in the scientific speciality: 5.8.4 - Physical Culture and Professional Physical Training, scientific direction: 'Human Life Safety', thereby expanding this direction, which will activate and expand scientific and methodological developments in the practical discipline of life safety;
- expand and improve the material and technical base for the correct formation of practical skills and abilities of university students for safe life activities.

Keywords: *modern approaches, educational technologies, formation, culture of safe life activities, students, university, theoretical aspect.*

Introduction. Currently, it is becoming increasingly important to educate the population, and in particular young people, about life safety in the context of modern society. This is due to the unpredictable and increasingly negative conditions and factors affecting people's activities in modern society, namely social, economic, military, environmental, natural and other factors. In order to preserve humanity, new, comprehensive applied knowledge and skills are needed to enable people to withstand and anticipate various types and forms of danger (noxology), and there is an urgent need to develop a culture of safe living among the population. A culture of safe living must be formed at all stages of human development and life, from preschool to old age. The educational and applied discipline of 'Life Safety', taught in educational institutions in Russia, is of great importance in preparing children and young people for Life Safety. At the same time,

this important educational discipline is not sufficiently in demand in educational institutions, and there is a need to adjust the content of the current programme to take into account the modern challenges facing humanity. The aim of this scientific work was to identify, systematise and develop modern scientific and methodological principles for the formation of a culture of safe living among the country's population, taking into account new challenges posed by nature and the environment.

Objective of the study is to conduct a theoretical analysis and systematise modern approaches and educational technologies for forming a culture of safe living among students at universities, identify current trends and problems in this educational and applied process, and develop an organisational and pedagogical algorithm for its improvement.

Methods and structure of the study. During 2025, an analysis of scientific and methodological literature and educational programmes for students in the applied discipline of 'Life Safety' was conducted. In the course of the analytical work, more than 50 scientific sources on the topic were analysed, as well as a number of educational and methodological literature on safe living. The collected factual material was systematised, and the main directions and trends in the formation of a culture of safe living for students in higher education institutions were identified. All this contributed to the definition of the main directions for the formation of readiness for safe living among stu-

Table 1. Contemporary literature on the issue of life safety

Authors of the educational programme of 'Life Safety' at the university	Contents of the programme of 'Life Safety'
Gomzyakova N.Yu., Kovalev P.A. (2024)	Life safety must be formed: in society, in the information space, in the natural environment, in military training, in countering extremism and terrorism
Kazieva M.Z. (2016)	Life safety must be based on the formation of healthy lifestyle values among modern youth
Razmakhova S.Yu., Borisovets D.R. (2023)	Life safety must be built on the basis of an analysis of modern society
Okulova L.P. (2018)	There is a need for close interconnection between the formation of a healthy lifestyle culture and the study of the academic discipline 'Life Safety.'
Belov S.V. (2017)	Human life safety must be formed on the basis of the integration of knowledge that provides a person with a comprehensive understanding of the dangers in various spheres of life.
Astarkhanova N.R. (2023)	Modern young people need to develop a certain level of thinking based on comprehensive knowledge of safe behaviour in various spheres of life
Gurina R.R. (2023)	It is necessary to develop a unified system of teaching life safety in universities
Vaulin V.I. (2019)	Forming sustainable guidelines for young people to create a safe and comfortable living environment
Elagina V.S., Trubin L.N. (2015)	Teachers of the subject 'Fundamentals of Life Safety' experience certain difficulties in developing integrative lessons aimed at transferring knowledge and skills from a number of related disciplines. Low level of 'Fundamentals of Life Safety' graduates from pedagogical universities.
Mukhametshina E.R., Babuk G.F. (2020)	Create a model of safe life and behaviour for students at the university
Nedeleva A.V., Sheromova N.N. (2016)	In the discipline 'Life Safety', university students are not sufficiently taught the following subjects: medicine, physiology, hygiene and pedagogy
Okulova L.P. (2018)	When teaching the discipline 'Life Safety', it is necessary to include more binary and problem-based lectures and games
Emeilin K.G. et al. (2022)	When studying the discipline 'Life Safety', students should apply a more practice-oriented approach
Abdulina E.R. (2022)	To develop students' competence in the field of safe living, it is necessary to actively use situational games and tasks
Belov S.V. (2017) Krivorotenko S.N. (2023)	Actively include seminars in the educational process on life safety for university students
Rabadanova P.M., Bashukayeva Z.I. (2023)	For medical students studying the discipline of 'Life Safety,' it is necessary to include more applied physical exercises in the content of classes

Table 2. Stages of forming a culture of safe living among the country's population.

Stages of forming a life safety culture	Contents of the stages
Pre-school stage	Formation of the initial foundations of a life safety culture
School stage	Developing a life safety culture among students
Student stage	Forming the foundations of a life safety culture among students
Professional stage	Forming a life safety culture in the context of professional activity
Retirement stage	Forming a life safety culture among the population in the context of retirement

dents in higher education institutions in the country.

Results of the study and discussion. The analytical work carried out contributed to the systematisation of modern educational technologies aimed at forming a culture of safe living among students in the country's universities, Table 1.

In our work, we also provide the following definition: 'Safety culture' is a process of daily active activity aimed at the systematic formation of comprehensive knowledge and practical skills for anticipating and self-preservation of human nature throughout life in the environment and society.

The presented process of forming a culture of a life safety for the country's population includes five interrelated and sequential stages that form a scientific and practical system for the progressive preparation of the country's population for safe living at all stages of ontogenesis.

Conclusions. The scientific and theoretical research conducted contributed to the formation of the following basic scientific and methodological proposals:

1. It is necessary to develop a general strategy for forming a culture of life safety among the country's population, starting from preschool age and continuing through to retirement.

2. There is a need to develop a unified textbook and educational programme on the subject of 'Life Safety' for all educational institutions and age groups of the population.

3. Improve the training of teachers in safety of life at the country's pedagogical universities, taking into account new natural, social, environmental and other challenges facing humanity.

4. Develop standards for the population's preparedness in life safety (similar to the GTO).

5. Include in the scientific speciality: 5.8.4 – Physical Culture and Professional Physical Training, scientific direction: 'Human Life Safety', thereby expanding this direction, which will activate and expand scientific and methodological developments in the practical discipline of Life Safety.

6. Develop a modern material and technical base for the correct formation of students' practical skills and abilities for safe life activities.

The implementation of the above scientific and methodological provisions will contribute to increasing the effectiveness of the formation of a culture of safe life activities among all segments of the country's population.

References

1. Leskovskiy A.A., Ponomarev V.V. Programmnyy kurs «Formirovanie bezopasnogo povedeniya naseleniya v usloviyah turisticheskogo pohoda». Teoriya i praktika fizicheskoy kultury. 2023. No. 7. Pp. 92.
2. Ponomarev V.V. Model upravleniya bezopasnoy zhiznedeyatelnostyu detey i podrostkov v usloviyah letnego ozdorovitelnogo otdyha. Materialy nauchno-prakticheskoy konferentsii s mezhdunarodnym uchastiem, posvyashchennoy 90-letiyu so dnya obrazovaniya Akademii GPS MCHS Rossii. V 5-ti chastyah. Moskva. 2023. Pp. 218-223.
3. Ponomarev V.V. Organizatsionnye formy i algoritm formirovaniya kultury bezopasnoy zhiznedeyatelnosti u naseleniya. Materialy nauchno-prakticheskoy konferentsii s mezhdunarodnym uchastiem, posvyashchennoy 90-letiyu so dnya obrazovaniya Akademii GPS MCHS Rossii. V 5-ti chastyah. Moskva. 2023. Pp. 223-226.
4. Ponomarev V.V., Boyarinova S.P., Steblyanskiy L.N. Podgotovka naseleniya k deystviyam v chrezvychaynyh situatsiyah po mestu zhitelstva. Materialy IV Vserossiyskoy nauchno-prakticheskoy konferentsii «Aktualnye problemy obespecheniya pozharnoy bezopasnosti i zashchity ot chrezvychaynyh situatsiy». Krasnoyarskiy kray, g. Zheleznogorsk. 2023. Pp. 376-378.
5. Ponomarev V.V., Kazakevich N.N., Turygina O.V. Formirovanie osnov bezopasnoy zhiznedeyatelnosti u detey doshkolnogo vozrasta sredstvami fizicheskoy kultury. Teoriya i praktika fizicheskoy kultury. 2022. No. 1. Pp. 8.

Model indicators of physical and special physical fitness of 11-13 year-old freestyle wrestlers in the Republic of Sakha (Yakutia) at the sports specialization stage

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Abstract

Objective of the study is to theoretically substantiate and develop model indicators of physical and special physical fitness for freestyle wrestlers aged 11-13 in the Republic of Sakha (Yakutia) and to recommend them for use in sports training.

Methods and structure of the study. The study was conducted at the Amga Children's and Youth Sports School for Freestyle Wrestling in the Republic of Sakha (Yakutia) between 2022 and 2024. Thirty-one people aged 11-13 who were involved in freestyle wrestling at the stage of sports specialisation took part in the scientific work. Over the course of two years, systematic testing of the physical and special physical fitness indicators of the participants was organised and conducted. More than 300 measurements were taken for physical fitness and 450 measurements for special physical fitness. All this contributed to the collection of sufficient statistical material, on the basis of which, using methods of mathematical statistics (percentile scales), model indicators of physical and special physical fitness of freestyle wrestlers aged 11-13 years in the Republic of Sakha (Yakutia) were developed.

Results and conclusions. The two-year study contributed to the collection of statistical data on the physical and special physical fitness of freestyle wrestlers aged 11-13 in the Republic of Sakha at the stage of sports specialisation. Physical fitness testing was conducted on five indicators, and special physical fitness testing on seven indicators. A total of 750 measurements were taken. The collected and compiled factual material made it possible to develop model indicators of physical and special physical fitness for freestyle wrestlers aged 11-13 in the Republic of Sakha. The developed model indicators can be recommended for use in the sports training of freestyle wrestlers aged 11-13 in the Republic of Sakha. All this will contribute to the effective and progressive process of sports training for freestyle wrestlers aged 11-13 in the region.

Keywords: *model indicators, physical training, specialized physical training, freestyle wrestlers, stages of sports specialization, Sakha Republic, age of participants 11–13 year.*

Introduction. The modern process of long-term sports training includes the following stages: initial training, sports specialisation, improvement of sports skills, and the stage of advanced sports skills. The stages of long-term sports training are interconnected by the following basic principles of harmonious sports training: individual approach, systematicity, gradualness, and continuity. All these principles are aimed at the correct and optimal combination of physical, special physical, and technical training of athletes at all stages of the long-term process of sports activity. The stage of sports specialisation, where the basic physical and special physical training of athletes takes place, is of particular importance. At the stage of sports specialisation, many coaches and teachers, in order to achieve quick sports results, neglect the basic principles of sports training, do not take into account the physiological processes of children's development during this period, overload the training process with special physical training, and do not pay due attention to harmonious physical training, which leads to various injuries, overloads, and early withdrawal of children from sports (up to 50% or more). This important process of training young athletes must

be harmonious, gradual, and progressive. In order to ensure the effectiveness and harmony of sports training at this stage, correct and appropriate guidelines are needed for coaches and teachers, namely model indicators of physical and special physical fitness, in particular for freestyle wrestlers aged 11-13 in the Republic of Sakha (Yakutia). All this, taken together, determined the subject matter of this scientific work.

Objective of the study is to theoretically substantiate and develop model indicators of physical and special physical fitness for freestyle wrestlers aged 11-13 in the Republic of Sakha (Yakutia) and to recommend them for use in sports training.

Methods and structure of the study. The study was conducted at the Amga Children's and Youth Sports School for Freestyle Wrestling in the Republic of Sakha (Yakutia) between 2022 and 2024. Thirty-one people aged 11-13 who were involved in freestyle wrestling at the stage of sports specialisation took part in the scientific work. Over the course of two years, systematic testing of the physical and special physical fitness indicators of the participants was organised and conducted. More than 300 measurements were taken for physical fitness and 450 measurements for special physical fitness. All this contributed to the collection of sufficient statistical material, on the basis of which, using methods of mathematical statistics (percentile scales), model indicators of physical and special physical fitness of freestyle wrestlers aged 11-13 years in the Republic of Sakha (Yakutia) were developed.

Results of the study and discussion. The collected massive factual material on the physical and special physical fitness indicators of freestyle wrestlers aged 11-13 in the Republic of Sakha at the stage of sports specialisation contributed to the development of model indicators for the above types of sports training (Tables 1 and 2).

Table 1 presents model indicators of wrestlers' physical fitness, which coaches and instructors should use as a guide for a correct and progressive training process.

The model indicators developed for the special physical fitness of freestyle wrestlers aged 11-13 show coaches and teachers what the results of special physical training for children should be at this stage for a smooth transition to the next stages of long-term sports training. The results of the work made it pos-

Table 1. Model indicators of physical fitness of freestyle wrestlers aged 11–13 in the Republic of Sakha, at the stage of sports specialisation

Control exercises	$\bar{X} \pm \sigma$ Model indicators
Pull-ups on a high bar, number of times	9,9±1,6
30 m run, s	5,4±0,31
Forward bend from standing position, cm	9,0±1,6
Standing long jump, cm	176,9±11,7
Sit-ups per minute, number of times	47,1±3,9

Table 2. Model indicators of special physical fitness of freestyle wrestlers aged 11–13 in the Republic of Sakha, at the stage of sports specialisation

Control exercises	$\bar{X} \pm \sigma$ Model indicators
Running to the 'bridge' 5 times in each direction, with	19,9±1,2
Running on your hands, 5 times in each direction, with	21,9±1,1
Running on one arm, 5 times in each direction, with	24,8±2,8
Flips from the bridge position, 10 times, with	18,9±1,2
Passes to the legs, 10 times, with	19,1±1,1
'Mill' throws, 10 times, with	23,1±1,1
'Pitchfork' throws, 10 times, with	23,0±1,2

sible to present coaches and teachers with the necessary model guidelines for the physical and special physical fitness of freestyle wrestlers aged 11-13 in the Republic of Sakha for a steady and harmonious process of long-term sports training.

Conclusions. The scientific and theoretical research conducted contributed to the development of model indicators of physical and special physical fitness for freestyle wrestlers aged 11-13 in the Republic of Sakha (Yakutia), which serves as a guideline for coaches and teachers in the holistic sports and educational training process and is recommended for use in the sports activities of freestyle wrestlers in the Republic of Sakha.

References

1. Efimov A.A., Yatsenko S.V., Ponomarev V.V. Natsionalnaya borba «hapsagay» kak bazovaya osnova v sportivnoy podgotovke yunyh bortsov volnogo stilya Respubliki Saha. Teoriya i praktika fizicheskoy kultury. 2024. No. 4. Pp. 41.
2. Efimov A.A., Ponomarev V.V., Prikhodov D.S. National sports and competitions in applied physical education of schoolchildren of the Sakha Republic: theoretical aspect. Theory and Practice of Physical Culture. 2025. No. 2. Pp. 78-79.
3. Ponomarev V.V., Efimov A.A., Bartnovskaya L.A., Kravchenko V.M. Competitive game technology at the stage of sports specialization of freestyle wrestlers in the Sakha Republic. Theory and Practice of Physical Culture. 2025. No. 2. Pp. 29-31.

Formation of speed-strength abilities in students in the process of physical education

UDC 378.172

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Abstract

Objective of the study is development of speed-strength qualities through additional exercises in the process of preparing students for passing physical standards.

Methods and structure of the study. The experiment involved 100 students of DSTU aged 17-22. Students were divided into two groups: experimental and control, 50 people in each. Students in the control group trained within the standard physical education program. The experimental group trained using a program with an additional set of exercises aimed at developing speed-strength abilities.

Results and conclusions. After the experiment, all five indicators of speed-strength tests in the experimental group demonstrated positive dynamics. Testing in the control group showed less positive results. In one case, negative dynamics were observed – students began running 100 meters slower by 0.3 seconds (1.8%). Also, there was no dynamics in the running high jump – still 98 cm. In the experimental group, the overall effect was significantly greater than in the control group. This indicates the success of the selected exercises and the implementation of the program for forming and developing speed-strength skills.

Keywords: *speed-strength abilities, physical culture, physical training of students.*

Introduction. Among physical abilities, speed-strength qualities hold special importance – they represent a set of characteristics including the ability to rapidly develop strength, maintain high power output during short-term efforts, demonstrate high movement speed and coordination during dynamic actions. For students, regardless of their future professional trajectory, the development of speed-strength abilities ensures the improvement of adaptive capabilities, stress resistance, and overall physical fitness, which in the long term affects health and productivity [3].

The methodology of developing speed-strength abilities as a scientific and practical issue combines research in the field of theory and methodology of physical education, sports training, load physiology, biomechanics, and labor psychology. Domestic and foreign literature presents various approaches to developing these qualities: from classical strength training programs using heavy-load exercises to specialized methods using plyometrics, sprint complexes, power training and techniques improving intermuscular coordination [4].

However, when transferring sports methods into the environment of mass or elective physical education of students, a number of methodological, organizational, and ethical problems arise: optimization of loads considering the initial level of preparedness and students' health conditions, ensuring safety, adapting exercises to the material and technical conditions of universities, considering academic schedules and psychophysiological characteristics of student youth [1, 2].

The development of speed-strength abilities is most effective at the age of 10 to 17 years. The older the person becomes, the more difficult the development of physical qualities becomes, including speed-strength qualities. The development of this physical quality is necessary and beneficial at all age stages, including the age of average university students from 17 to 22 years.

Objective of the study is development of speed-strength qualities through additional exercises in the process of preparing students for passing physical standards.

Methods and structure of the study. The experiment involved 100 students of DSTU aged 17 to 22. Students were divided into two groups: experimental and control, 50 people in each. Students of the control group trained within the standard physical education program. The experimental group trained under a program with an additional set of exercises aimed at developing speed-strength qualities.

There are a large number of exercises that reflect the level of a person's speed-strength abilities. In physical education classes in schools and then in higher education institutions, most often a standing long jump with both feet is used. In addition, push-ups, projectile throwing distance and other exercises may be tested.

In general, exercises for speed-strength qualities can be conditionally divided into three main and one additional categories. They are presented below (Table 1):

Based on the above, a study was developed and conducted on forming speed-strength abilities of students within university physical education classes.

The research included the following stages:

Division of students into control and experimental groups

Conducting tests of speed-strength abilities in both groups

Conducting special training sessions in the experimental group

Analysis of results obtained

Formulation of conclusions

The testing session included measurement of the results of speed-strength qualities in the following exercises: running long jump, standing long jump, running high jump, shuttle run, and 100-meter sprint.

Then, a special complex was developed, which was performed only in the experimental group. The control group trained according to the standard physical education program.

Exercises had their own execution specifics, but overall each lasted for 1 minute. Rest between sets – 30 seconds. Each physical education session included 5 sets — about 30 minutes.

The complex was implemented in the experimental group for 3 months. A total of 10 sessions were held, each dedicating about 30 minutes to speed-strength development.

The next methodological stage was result assessment. For this, pre- and post-intervention results of the experimental and control groups were compared.

Results of the study and discussion. After conducting experimental sessions for three months, the following comparative results were obtained:

A positive result for jumping exercises is increased values in centimeters, meaning that students jumped farther or higher. For the 100-meter run and the shuttle run, a positive result is a reduction in the time spent running.

Thus, in the experimental group, all five indicators of speed-strength tests showed positive dynamics. Testing in the control group was not so unambiguously positive. In one case, negative dynamics were ob-

Table 1. Groups of exercises for speed-strength abilities

Category:	Description:
1. Overcoming resistance greater than competitive load	Movement speed decreases
	Force manifestation increases
2. Overcoming resistance lower than competitive load	Movement speed increases
	Force decreases
3. Overcoming resistance equal to competitive load	Nearly maximal movement speed
4. Instant overcoming of shock-impact load	Maximum power output in short time
	Also called shock-reactive exercises

Table 2. Developed exercise complex for speed-strength skills

Exercise:	Execution features:
"One-leg to the other" jumps along a gym bench	Variable execution
Two-leg jumps over obstacles	Length of obstacle line – approx. 10 cones placed in a row
Jump rope	Variable execution depending on students' skills
Vertical jumps with weight thrown forward from chest	10 reps minimum
Shuttle run	Track length – 10 meters

Table 3. Comparison of mean values in experimental and control groups before and after training

Exercise:	Control Group		Experimental Group	
	Before	After	Before	After
100-m sprint (s)	16,4	16,7	16,5	15,9
Running long jump (cm)	321	324	320	331
Standing long jump (cm)	169	170	167	172
Running high jump (cm)	98	98	98	104
Shuttle run (s)	9,1	8,9	9,3	8,6

Table 4. Comparison of differences

Exercise:	Control Group	Experimental Group
	Difference, %	Difference, %
100-m sprint (s)	+1.8% (negative dynamics)	−3.6% (positive dynamics)
Running long jump (cm)	+ 0,9% (positive dynamics)	+ 3,4% (positive dynamics)
Standing long jump (cm)	+ 0,59% (positive dynamics)	+ 2,9% (positive dynamics)
Running high jump (cm)	0% (no dynamics)	+ 6,12% (positive dynamics)
Shuttle run (s)	- 2,19% (positive dynamics)	- 7,5% (positive dynamics)

served — students began running 100 meters slower by 0.3 seconds (1.8%). Also, there was no dynamics in the running high jump — still 98 cm. In the experimental group, the overall effect is significantly greater than in the control group. This indicates the success of the selected exercises and the implementation of the complex aimed at forming and developing speed-strength skills.

Conclusions. Based on conducting and processing the results, the following conclusions can be drawn:

On the basis of theoretical and methodological studies of other authors, a complex for improving speed-strength abilities of students was developed. This complex includes: “one-leg to the other” jumps along a gym bench, two-leg jumps over obstacles, jump rope, vertical jumps with a front-held weight throw, shuttle run.

The initial level of speed-strength exercises of control and experimental groups of students was assessed. For evaluation, the following tests were used: 100-meter sprint, long jump (standing and running), running high jump, shuttle run.

Experimental sessions were carried out (10 sessions total, each dedicating about half an hour to the developed complex).

Retesting of both groups was conducted and comparative results were assessed:

– positive dynamics in the control group were +0.9%, +0.59%, −2.19% in jumps and shuttle run; – negative dynamics in the control group were +1.8% in the 100-m run; – no dynamics in the control group in high jump; – positive dynamics in the experimental group appeared in all test exercises: from +2.9% to +7.5% within three months.

Thus, the high effectiveness of the developed exercise complex for forming speed-strength abilities in students was confirmed.

References

1. Grigan S.A., Rukavishnikova S.K. Analysis of the Causes of the Decrease in the Level of Physical Fitness of Students. Scientific Notes of P.F. Lesgaft University. 2025. No. 6(244). Pp. 44-49.
2. Grigan S.A. Innovative Forms and Methods of Modern Physical Education. Current Issues of Physical Education, Sports Training, Health and Adaptive Physical Culture. Collection of articles based on the materials of the IX Regional (with All-Russian participation) scientific and practical conference of students and young scientists. Under the general scientific editorship of R.R. Magomedov; Ministry of Education of the Stavropol Territory, Branch of SSPI in Yessentuki. 2020. Pp. 207-210.
3. Zaharova N.A. On the Formation of Students’ Motivational Attitudes to Physical Education in Modern Conditions. Physical Education and Health of Youth. St. Petersburg, 2021. Pp. 43-44.
4. Tolstokora O.N., Yartsev D.A., Shengelaya S.A. Analysis of Students’ Physical Condition in Universities. Issues of Balneology, Physiotherapy, and Therapeutic Physical Education. 2024. V. 101. No. 3-2. Pp. 182-183. EDN: MGIVNK.

Swiss ball gymnastics in the process of correcting musculoskeletal disabilities in students

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Abstract

Objective of the study is to justify the developed programme for correcting musculoskeletal disabilities in students of special medical group A.

Methods and structure of the study. To achieve this goal, the following methods were used: analysis of literary sources on the problem under study; pedagogical observations of the progress of educational and practical physical education classes at the university, a survey in the form of questionnaires, pedagogical testing, pedagogical experiment, mathematical and statistical data processing.

The study involved 2nd-year full-time students of the special medical group of health A with the musculoskeletal system disabilities (n=32).

Results and conclusions. The article discusses the results of the application of the physical rehabilitation program in the special medical health group A for disabilities of the musculoskeletal system, aimed at the use of swiss ball gymnastics, aimed at correcting physical abnormalities in the state of health of students.

Keywords: *gymnastics, swiss ball, special medical group, students, musculoskeletal system.*

Introduction. In recent years, there has been an increase in the number of musculoskeletal disabilities, which requires consideration of the characteristics of their physical and mental development in the process of planning and conducting therapeutic gymnastics classes. During physical rehabilitation, it is necessary to restore the previous range of motion in the joints. Students with physical developmental disabilities require more attention from teachers, empathy, and a comfortable environment during the teaching process.

The sedentary lifestyle of students significantly reduces the degree of muscle activity, the level of functional preparedness and working capacity, which inevitably leads to a deterioration in blood circulation and nutrition in the paravertebral muscles [2, p. 223]. As fatigue increases, the muscles of the torso and neck are no longer able to provide a cushioning function, which is transferred to the structures of the spine. The nutrition of the discs is disrupted, and degenerative-dystrophic functions develop in them. To restore the functions of a disc that does not have its own blood vessels, it is necessary to develop and strengthen the short paravertebral muscles and ligaments that perform both a support and motor function and a transport function.

During the analysis of specialised literature on the research topic [1, 3-5], contraindications and recommendations for the use of a number of fitness technologies for musculoskeletal disabilities were identified (Table 1).

The traditional forms of therapeutic physical training currently in use can be improved by introducing swiss ball gymnastics into practice.

Swiss balls are elastic balls of various diameters that are used for swiss ball gymnastics or aerobics.

Table 1. General indications and contraindications for physical education classes for students in the SMG (special medical group) and with disabilities

Diseases	Contraindications	Recommendations
Musculoskeletal system	- jumping rope and gymnastic apparatus;	- exercises to maintain correct posture;
	- long jump and high jump;	- exercises to strengthen the muscles of the back, neck, abdominal press, torso ('muscle corset');
	- acrobatics;	- swimming, skiing;
	- exercises with heavy weights.	- exercises to strengthen the muscles that support the arch of the foot;
		- spinal exercises for the tibialis anterior muscles and toe flexors with a gradual increase in the load on the feet.

Swiss ball gymnastics includes strength exercises combined with exercises to develop flexibility and coordination. Exercises with gymnastic balls are suitable for people of any age and fitness level; they stimulate muscle work to maintain balance due to the instability of the ball. Swiss ball gymnastics is used as a means of rehabilitation for musculoskeletal disabilities and has a healing effect on the entire body [5]. This effect is achieved not only through the basic methods of swiss ball gymnastics, but also through the brightness and variety of the balls, musical accompaniment, and a positive emotional attitude.

The oscillation and vibration of the ball provide a massage effect, activate the capillary system of the internal organs and microcirculation in the intervertebral discs, which is a means of restoring and correcting musculoskeletal disabilities.

Objective of the study is to justify the developed programme for correcting musculoskeletal disabilities in students of special medical group A.

Methods and structure of the study. Questionnaires and interviews were conducted to identify the most common diseases among respondents. The survey was conducted at the Russian Presidential Academy of National Economy and Public Administration between 2005 and 2025, with 32 students with special medical health group A participating. The survey revealed that 54.8% had musculoskeletal disabilities, 13.5% had myopia, 9.5% had cardiovascular diseases, 5.3% had bronchial asthma, 4.5% had encephalopathy, chronic pyelonephritis – 4.3%, varicose veins – 3.5%, kidney disease – 2.3%, gastroduodenitis – 1.6%, and obesity – 0.7%. The musculoskeletal system is the most extensive system in the human body. It includes the skeleton, muscles, ligaments, and tendons, which together allow a person to move and perform motor actions of varying complexity. The impact of musculoskeletal disabilities on the body is not only limited to restricting the mobility of individual parts of the body, but also has a negative effect on the health of internal organs, heart rhythm, and the general condition of the person. To prevent the impact of musculoskeletal disabilities on students' bodies, a physical rehabilitation programme using fitness exercises has been developed and implemented in the educational process. The effectiveness of the developed programme was tested in an experimental group.

The following additional equipment was used to implement the programme:

– massage balls with spikes (rubber 'hedgehog' massager);

– small balls;

– balancing platforms.

The programme consisted of therapeutic physical exercises aimed at the prevention, treatment and correction of musculoskeletal disabilities (Table 2).

Exercise routines with balls, depending on the specific goals and selection of equipment, have different focuses:

- to strengthen the muscles of the arms and shoulder girdle;
- to strengthen the abdominal muscles;
- to strengthen the back and pelvic muscles;
- to strengthen the leg muscles and arch of the foot;
- to increase flexibility and mobility in the joints;
- to improve posture;
- for relaxation and stress relief as a means of preventing various diseases (of the musculoskeletal system).

Exercises with a balance platform help improve physical fitness, vestibular stability, and mental abili-

Table 2. Approximate costs of a physical rehabilitation programme for students with musculoskeletal disabilities

Equipment, its description, purpose	Sample exercises, dosage	
Mini swiss ball 20-25 cm in diameter. Exercises were performed on different parts of the spine to prevent congestion and improve blood circulation.	 Hold the position for 10-20 seconds	 Hold the position for 10-20 seconds
	 Hold the position for 10-20 seconds	 Roll the ball with your head from side to side (1-2 minutes)
A massage ball is a spiked ball designed for massage and reflexology. The spikes vary in length and frequency. More frequent, harder spikes have a stronger effect on the deep muscle layers, affecting the nerve endings and improving blood circulation.	 Slow rolls of the back of the head on the ball from right to left (2-4 minutes)	 Rolls of the back of the thigh/shin on the ball (2-4 minutes)
	 Roll the ball with your feet alternately (2-4 minutes)	 Roll the ball between your feet (1-2 minutes)
Balance platforms are an excellent tool for developing stabilising muscle strength, allowing you to hold your own body in space.	 Hold the position with your eyes open for 60 seconds	 Hold the position with your eyes closed for as long as possible

ties, and have a positive effect on health and future professional activities.

Results of the study and discussion. The pedagogical experiment was conducted with the aim of testing the developed physical rehabilitation programme in a special medical health group A. At the beginning and end of the pedagogical experiment, pedagogical testing was conducted. The test tasks consisted of standards assessing physiometric and physical development parameters: vital capacity (VC), HR, systolic pressure (SP), diastolic pressure (DP), dynamometry of the right and left hands, strength abilities (lifting the torso from a supine position, flexing and extending the arms from a lying position), flexibility (forward

bend from a standing position on a gymnastic bench), coordination abilities (Romberg test on a moving platform). The test tasks were simple to perform, easy to measure and clear.

The data obtained was processed on a personal computer using the EXCELL – 10.0 standard statistical software package for Windows. The reliability of the differences between the means of the two samples was determined using Student's t-test. The reliability of the differences was tested at a significance level of $p<0.05$.

After the pedagogical experiment, retesting was carried out. Comparing the indicators before and after the experiment, it was found that differences exist, but they are insignificant. However, in particular, the reliability of the differences in the balance exercise and the abdominal muscles was determined at a significance level of $p<0.05$ (Figure 1).

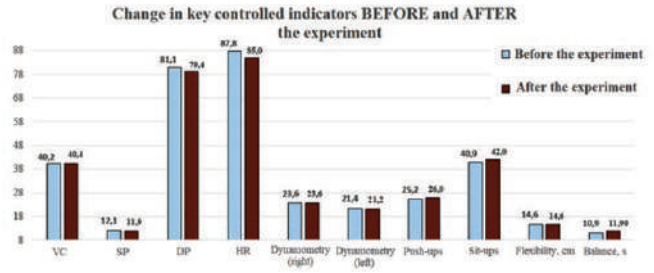

Fig. 1. Assessment of key indicators before and after the experiment

The experiment showed that there was an increase in almost all assessment parameters. This confirms the high effectiveness of the physical rehabilitation programme developed for special medical health group A.

Thus, regular swiss ball exercises have a beneficial effect on the students' bodies, providing a measured mechanical impact on various parts of the body. The massage effect stimulates metabolic processes, activates blood circulation and respiration, and has a calming effect on the nervous system. Targeted exercises with additional equipment significantly increase the level of mobility in various joints, develop coordination and strength abilities, and contribute to the formation of correct posture.

Conclusions. As a result of the experiment, a physical rehabilitation programme was developed and its effectiveness was experimentally proven in a special medical health group A.

This programme contributes to improving physique and forming correct posture. With the correct selection of exercises and distribution of load, it is possible to eliminate the physical development deficiencies of those participating. Classes using swiss ball gymnastics are designed for students with musculoskeletal disabilities.

References

1. Bushma T.V., Zuykova E.G., Volkova L.M., Lipovka A.Yu. Primenenie informatsionnyh tekhnologiy dlya organizatsii samostoyatelnoy raboty studentov na zanyatiyah ozdorovitelnoy aerobikoy. Teoriya i praktika fizicheskoy kultury. 2025. No. 2. Pp. 68-70. EDN: OCXIQQ.
2. Kiryanova L.A., Morozova L.V., Udalova M.A., Lyashenko O.V. Formirovanie myshechnogo balansa studentov s zabolevaniyami oporno-dvigatelnogo apparata sredstvami ozdorovitelnogo fitnesa. Teoriya i praktika fizicheskoy kultury. 2025. No. 6. Pp. 45-47.
3. Morozova L.V., Kiryanova L.A. Variativnost dvigatelnoy aktivnosti studentov spetsialno-meditsinskoy gruppy upravlencheskogo vuza. Uchenye zapiski universiteta im. P. F. Lesgafta. 2023. No. 7(221). Pp. 223-226.
4. Morozova L.V., Kiryanova L.A., Butakova E.D. «Myagkiy» fitnes kak napravlenie v fizicheskom vospitanii studentov spetsialnoy meditsinskoy gruppy. Teoriya i praktika fizicheskoy kultury. 2023. No. 8. Pp. 27.
5. Saykina E.G., Smirnova Yu.V. Fitnes kak vid fizicheskoy kultury. Teoriya i praktika fizicheskoy kultury. 2022. No. 1. Pp. 6-8.

Identifying factors affecting the effectiveness of physical rehabilitation for individuals with lower leg amputations

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Abstract

Objective of the study is to determine the factors affecting the effectiveness of physical rehabilitation of individuals with lower leg amputation during the preparation stage for prosthetics and to identify the contribution of individual factors to the recovery process.

Methods and structure of the study. The study involved 54 people undergoing rehabilitation treatment after amputation of the lower leg aged from 23 to 60 years. All the subjects received the same set of restorative measures.

Results and conclusions. Subjective scales are mainly used to assess the condition of patients. The parameters of anxiety and depression make the greatest contribution to the recovery process. Moreover, by the end of treatment, the level of anxiety decreases, while the level of depression remains at a fairly high level, which subsequently reduces the motivational component and increases problems with further prosthetics. The conducted research revealed the need to develop quantitative criteria and standardized diagnostic methods, which indicates the need to introduce objective scales both to improve the assessment of the condition of the stump and to assess the entire musculoskeletal system, which will allow individualizing rehabilitation programs and reducing the possibility of errors, including when using modern technologies.

Keywords: *physical rehabilitation, adaptive physical culture, lower leg amputation, condition assessment.*

Introduction. One of the most important areas of scientific research is the search for the most effective methods of physical rehabilitation, allowing not only to preserve the working capacity, social activity and psychological health of the victims, but also to enable them to successfully integrate into adaptive sports.

A prerequisite for successful training is a properly organised physical rehabilitation process, starting with the period of preparation for prosthetics. It is at this stage that most problems associated with limb loss are prevented. It is decisive in predicting the outcome of learning to walk with prostheses and, in the future, allows avoiding complications associated with the use of prostheses and the possibility of participating in adaptive sports programmes [3, 5].

Rehabilitation physical culture plays a leading role in solving this problem. However, most studies and methodological developments in this area were carried out more than 15-20 years ago (S.F. Kurdibailo 2006, S.P. Evseev 2010) and do not take into account modern realities or the capabilities of new rehabilitation equipment. And while the stage of fitting prostheses has been studied in sufficient depth, the period of preparation for prosthetics is only advisory in nature, based on provisions that are half a century old. In order to develop rehabilitation programmes, it is necessary to justify or refute the need to differentiate them depending on the severity of the injury, age, level of motor activity and psychological factors.

Objective of the study is to determine the factors affecting the effectiveness of physical rehabilitation of individuals with lower leg amputation during the preparation stage for prosthetics and to identify the contribution of individual factors to the recovery process.

Methods and structure of the study. 54 people aged between 23 and 60 who were undergoing rehabilitation treatment after lower leg amputation took part in the descriptive study. We examined the stage

of preparation for prosthetics in individuals who had undergone traumatic lower leg amputation. All subjects received the same set of rehabilitation measures (work with a psychologist, physiotherapy, massage, rehabilitation physical training in the pool and in the gym).

An analysis of the content of motor correction programmes in various medical institutions in Moscow showed that, in general, this category of patients undergoes group sessions in the pool (hydrokinesitherapy) and in the gym. Groups consist of 8-10 people. The effectiveness of rehabilitation measures was assessed using scales applied in hospitals [4].

The distribution of patients by age, severity and measured variables differs from normal (Kolmogorov criterion, =0.05). Therefore, Kendall's non-parametric correlations were calculated and the sample medians were compared using the Wilcoxon criterion [2]. The indicator obtained on the Rehabilitation Routing Scale (RRS) remained virtually unchanged and was almost always equal to 3, which suggests that it is not informative for assessing the condition of this group of patients. Therefore, despite the fact that this scale is actively used to assess the effectiveness of rehabilitation measures in inpatient treatment, we excluded it from the analysis.

In the correlation analysis, we compared 10 variables: amputation level (severity), age, visual analogue pain scale (VAS), mobility index (Rivermid), 5D-EQ-5L quality of life assessment scale, which we divided into blocks: mobility, pain and anxiety. Hospital anxiety and depression scales and the modified Mazaev scale (MS) were also used to assess anxiety and depression levels.

Results of the study and discussion. Tables 1 and 2 show the factor loadings and the proportion of explained variance for each factor.

As can be seen from a comparison of the results obtained before and after the physical rehabilitation course, the conditions are described by nine factors that explain 90% of their change. The first factor (20% of changes) is composed of the results of subjective self-assessments of the quality of future life: EQ, 5D, 5L, and MS. However, after three weeks of rehabilitation, this factor also includes a variable characterising pain sensations (VAS). The Rivermid variable also ceases to influence the condition of patients, which also indicates the low informative value of this scale at this stage of rehabilitation.

The variables of lesion severity and age are separate factors determining changes in condition (approximately 10% each).

Anxiety and depression are also independent factors of changes in condition. However, before physical rehabilitation, these factors act separately (17% and 9%), and after rehabilitation, their influence decreases and they act together (14%).

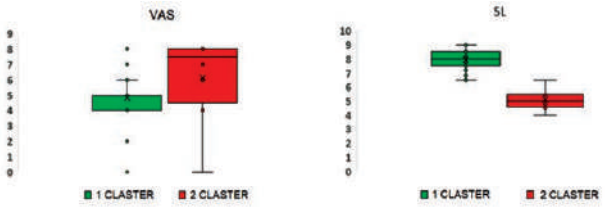

Fig. 1. Differences in clusters according to VAS and 5 L indicators

Table 1. Factor loadings and proportion of explained variance in the initial state of patients (0 sessions)

VARIABLE \ FACTOR	1	2	3	4	5	6	7	8	9
Severity				-0.922					
Age					0.929				
VAS									0.507
Rivermid		0.740							
Anxiety level			0.627				-0.53		
Depression level						0.563			
EQ	0.680							-0.59	
5D	0.540								
5L	-0.580								0.542
MS	-0.610								
DISP., %	20.840	12.99	10.97	10.32	10.24	8.56	7.15	6.62	6.26
ACCUMULATION, %	20.84	33.83	44.8	55.12	65.36	73.92	81.07	87.69	93.95

Table 2. Factor loadings and proportion of explained variance in patients' condition after 15 sessions

VARIABLE \ FACTOR	1	2	3	4	5	6	7	8	9
Severity				-0.79	0.559				
Age			0.717						
VAS	0.657								
Rivermid									
Anxiety level		0.639						-0.567	
Depression level		0.800							
EQ	0.605						0.550		
5D	0.553					0.735			
5L	-0.564						0.569		
MS	-0.755								0.501
DISP., %	20.840	13.87	11.34	10.7	9.082	7.909	7.762	5.925	5.624
ACCUMULATION, %	20.84	34.71	46.05	56.75	65.83	73.74	81.50	87.43	93.05

As a result of the analysis, all patients before and after three weeks of rehabilitation measures were divided into two clusters.

Before therapy, patients were divided into clusters based on pain scores (VAS) and self-assessment of daily activities (5L) (Fig. 1). No differences were found for the other variables.

Younger patients were characterised by lower anxiety scores and higher depression scores compared to patients over 35 years of age, indicating a loss of interest in life.

A comparison of the median values of the variables at the beginning of the rehabilitation course and after the 7th and 15th sessions revealed statistically significant differences in certain parameters assessed during the rehabilitation measures. These changes were most pronounced in the manifestation of pain sensations, including phantom pain. A decrease from 5.4 points to 1.9 was noted (Fig. 2).

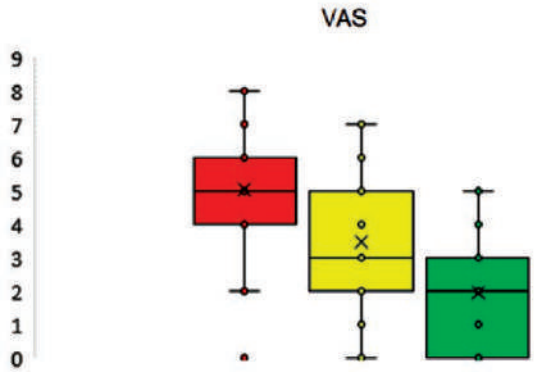

Fig. 2. Dynamics of pain perception indicators on the VAS scale during physical rehabilitation

Assessment of patient mobility using the Rivermaid scale and the EQ quality of life scale also showed that, in general, patients have adapted to their condition and are able to independently perform daily activities and move around.

Discussion. As can be seen from the analysis, the effectiveness of the physical rehabilitation process in a hospital is assessed mainly using scales that determine psychological state, pain sensations and the degree of adaptation to self-care and performing everyday activities.

Pain syndrome is assessed without taking into account its classification (nociceptive, neuropathic, nociceptive-plastic, mixed type, phantom pain syndrome), which is necessary for the development of an algorithm of actions to relieve or reduce it [6].

Kinesiotherapy in the pool and exercise therapy programmes in the gym are aimed at general strengthening of the body and prevention of stagnant phenomena. A unified physical rehabilitation scheme, including for victims of military trauma, has not yet been developed, including the stage of preparation for prosthetics [1].

The assessment tools currently available do not take into account parameters such as muscle tone in the affected limb, the degree of muscle imbalance, joint mobility (knee and hip), the ability to bear weight on the stump, and peripheral blood flow. However, these parameters are of paramount importance for prosthetic fitting. For example, a 15–25 limitation of mobility in the knee or hip joint of the amputated limb causes significant difficulties in fitting a prosthesis, and with a 35–40 contracture, fitting a prosthesis is

practically impossible. In the future, this limitation will lead to pelvic tilt and disruption of the biomechanical structure of movement, which will result in the rejection of the already selected prosthesis [3, 5].

Some authors particularly highlight disturbances in the body's system for converting signals from extero-, intero- and proprioceptors, which manifests itself in disturbances in the spatial organisation of movements and muscle differentiation, regardless of the level of amputation (V.B. Nikishina, N.L. Ivanova, E.A. Petrash 2016). These disorders are functional in nature. Taking them into account and correcting them when organising the rehabilitation process is very important both when preparing for prosthetics and when fitting prostheses.

Haemodynamic indicators (especially peripheral blood flow) are important for the subsequent life of this category of persons [5].

A number of studies highlight the importance of taking into account existing spinal deformities when developing an assessment algorithm and a further motor rehabilitation programme [3].

Conclusions. Subjective scales are mainly used to assess the condition of patients. Anxiety and depression parameters contribute most to the recovery process. By the end of treatment, the level of anxiety decreases, while the level of depression remains quite high, which subsequently reduces motivation and increases problems with further prosthetic fitting.

The study revealed the need to develop a motor rehabilitation technique based on a psychophysical approach. This is especially important for younger patients.

Recent studies confirm the priority of developing quantitative criteria and standardised diagnostic methods, which indicates the need to introduce objective scales both to improve the assessment of the condition of the stump and to assess the entire musculoskeletal system, which will allow for the individualisation of rehabilitation programmes and reduce the possibility of errors, including when using modern technologies.

References

1. Bugaets Ya.E., Gronskaya A.S., Isaenko T.A., Maluka M.V. Otsenka morfofunktsionalnogo sostoyaniya voennosluzhashchih s amputatsiey goleni na etapah fizicheskoy reabilitatsii. Uchenye zapiski Krymskogo federalnogo universiteta imeni V.I. Vernadskogo. Biologiya. Himiya. 2024. V. 10. No. 3. Pp. 3-11. DOI: 10.29039/2413-1725-2024-10-3-3-11. EDN: JVZKDE.
2. Korolkov A.N., Nikitushkin V.G., Germanov G.N. Pedagogicheskaya vazhnost i statisticheskaya znachimost razlichiy rezultatov pedagogicheskih eksperimentov v sporte. Uchenye zapiski universiteta im. P.F. Lesgafta. 2016. No. 1(131). Pp. 111-116. DOI: 10.5930/issn.1994-4683.2016.01.131. EDN: VJFVIZ.
3. Nenahov I.G. Ustranenie myshechno-tonicheskih asimmetriy u lits, perenesshih amputatsiyu nizhney konechnosti na etape podgotovki k protezirovaniyu. Adaptivnaya fizicheskaya kultura. 2017. No. 3(71). Pp. 29-30. ISSN: 1998-149X.
4. Protokol osmotra multidistsiplinarnoy reabilitatsionnoy ko mandy. Prilozhenie № 1 k prikazu FGAU « NMITS LRTS» Minzdrava Rossii ot 27.05.2022 № 214. URL: https://med-rf.ru/regions/docrehab/Протокол%20осмотра%20МДРК.pdf (date of access: 03.08.2025).
5. Semenova S.A., Hrekin D.O. Funktsionalnyy trening lits s amputatsiey nizhnih konechnostey. Vestnik sportivnoy nauki. 2021. No. 2. Pp. 35-39. ISSN: 1998-0833.
6. Smirnova L.M., Artyushkova L.V., Suslyaev V.G. et al. Otsenka bolevogo faktora na etapah protezirovaniya posle amputatsii nizhney konechnosti. Fizicheskaya i reabilitatsionnaya meditsina. 2024. V. 6. No. 3. Pp. 5-19. DOI: 10.26211/2658-4522-2024-6-3-5-19. EDN: HZYQIT.

Block structure of physical training for Chinese volleyball students

UDC 612.821

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Abstract

Objective of the study is to develop and justify a comprehensive physical training system for Chinese volleyball players aged 17-19.

Methods and structure of the study. The work included theoretical development of the problem-oriented block, the pedagogical impact block, the procedural and results-assessment blocks of comprehensive physical training within the framework of a formative experiment (2023-2024) with volleyball players from Chinese university teams (n=64).

Results and conclusions. The implementation of the problem-oriented block, the block of pedagogical impact block, the procedural and effective evaluation blocks allows optimizing the content of comprehensive physical training of volleyball players of Chinese university student teams.

Keywords: *volleyball players, students, physical training, block system, China, training process.*

Introduction. Of particular importance for achieving a high level of physical fitness among volleyball players on Chinese university teams is the implementation of a training process that develops both general and specific physical qualities, which, when combined in competitive activity, should ensure high performance in the game and, as a result, victory in the match [2, 6].

Thus, the solution to this problem is largely determined by the intensive search for new methods and their introduction into the training process of volleyball players for the further improvement of physical and other types of fitness [1, 4]. According to some experts [3, 5], it is possible to improve the physical fitness of student volleyball teams by using a block organisation of comprehensive physical training, including the rational design of motor tasks and the planning of training loads, which justifies the relevance of the study.

Objective of the study is to develop and justify a comprehensive physical training system for Chinese volleyball players aged 17-19.

Methods and structure of the study. The development of a block system for comprehensive physical training of athletes was carried out in the theoretical part of the research during the organisation and implementation of the formative part of the experiment (2023-2024 playing season) with the participation of volleyball players from Chinese university teams (n=64 people). The practical testing of the developed approach to comprehensive physical training of Chinese volleyball players aged 17-19 was preceded by a theoretical justification of the problem-oriented block, the pedagogical impact block, the procedural block, and the results-assessment block, the content of which is discussed in the main part of the scientific article.

Results of the study and discussion. The implementation of the problem-oriented block, the pedagogical impact block, and the procedural and results-assessment blocks allows for the optimisation of the content of comprehensive physical training for volleyball players on Chinese university teams.

Analysing the developed and scientifically based blocks of comprehensive physical training for Chinese volleyball players aged 17-19, it should be noted that they are based on fundamental principles that determine the logical application of a universal model at all stages of players' sports training, establishing a spe-

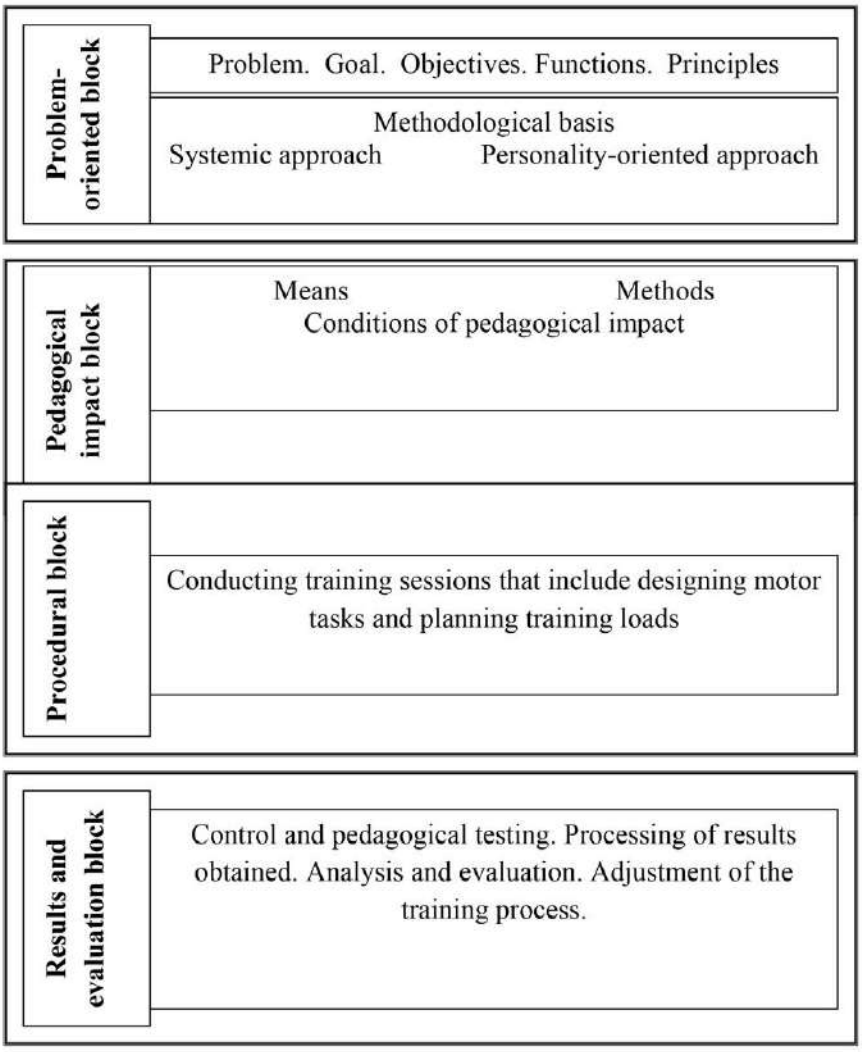

Fig. 1. Block system of components for comprehensive physical training of Chinese volleyball players aged 17-19

cific methodological procedure of actions – from the problem-oriented block to the results-assessment block (Fig. 1).

Problem-oriented block defines the problem of training volleyball players aged 17-19, which consists in the urgent need to resolve issues related to the development and scientific justification of effective methods for comprehensive physical training of athletes based on the rational design of motor tasks and the planning of training loads.

The aim of the developed methodology is to improve the general and specific physical qualities and abilities of Chinese volleyball players aged 17-19 in order to create optimal conditions for improving technical and tactical actions in the training and competition process of athletes. The objectives of the methodology are to effectively apply specific and non-specific exercises within the framework of general and special physical training for Chinese volleyball players aged 17-19, ensuring an increase in the player's motor potential and expanding their functional capabilities. The solution to these tasks is determined by the general and specific functions of the programme-target block of comprehensive physical training for Chinese student volleyball teams (Fig. 2).

The essence of the subject-target block is to successfully achieve the goals and objectives set by the coach for the athletes in the process of organising and conducting training sessions aimed at developing the physical qualities and abilities of Chinese volleyball players.

The pedagogical impact block includes the practical implementation of training tools and methods using rational design of motor tasks and optimisa-

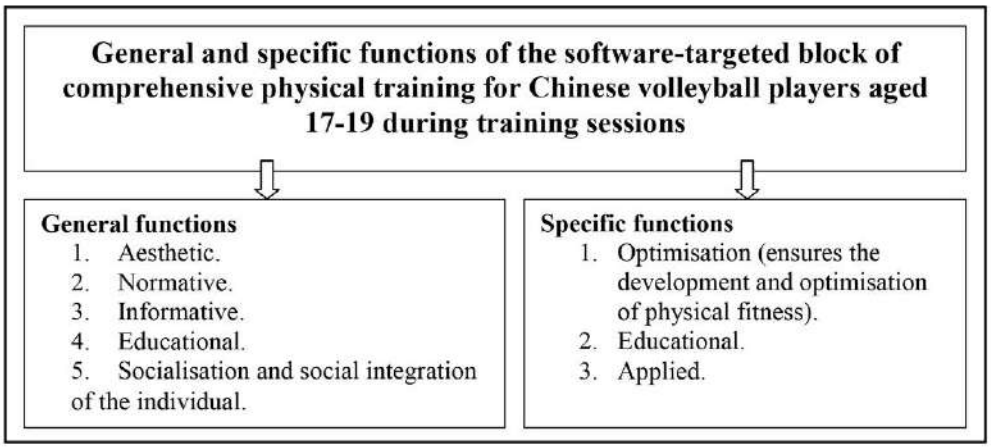

Fig. 2. General and specific functions of the software-targeted block of comprehensive physical training for Chinese volleyball players aged 17-19

tion of physical load, which are aimed at improving the general and special physical fitness indicators of Chinese volleyball players aged 17-19 throughout the entire year-long training cycle. To develop speed and strength abilities, jumping athletics exercises, throwing balls of various weights, and acceleration over various distances were used as part of the testing of the experimental methodology. In addition, strength exercises with weights of various weights were used.

The procedural block includes the rational use of training tools to comprehensively influence the physical qualities and motor abilities of Chinese volleyball players aged 17-19, as well as the improvement of technical and tactical actions, which together determine the player's athletic form, their level of skill, and their readiness to solve various tasks in training and competitive activities.

The results and evaluation block consists of assessing the results of pedagogical influences on Chinese volleyball players aged 17-19 in the process of implementing comprehensive physical training for players.

Conclusions. The block system of comprehensive physical training includes several interrelated modules, which, when implemented, enable the coach to achieve positive training effects for a specific athlete and the student volleyball team as a whole and, on this basis, to determine further ways to optimise the training process using effective tasks and optimal loads, allowing maximum results to be achieved in the process of long-term training. Thus, the developed block system of comprehensive physical training for Chinese volleyball players aged 17-19 is a direction that is designed to ensure significant progress for athletes in training and competitive activities.

References

1. Bulykina L.V., Ananin A.S. Vedushchie fizicheskie kachestva voleybolistov razlichnoy kvalifikatsii. Fizicheskaya kultura: vospitanie, obrazovanie, trenirovka. 2018. No. 3. Pp. 28.
2. Bulykina L.V., Guba V.P., Kostyukov V.V., Rodin A.V. Voleybol i ego raznovidnosti: uchebnik. Moskva: Sovetskiy sport, 2024. 524 p.
3. Guba V.P., Bulykina L.V., Pustoshilo P.V., Rodin A.V., Pleshakov A.A. Sovremennye vektory rossiyskih i zarubezhnyh issledovaniy v oblasti voleybola. Teoriya i praktika fizicheskoy kultury. 2024. No. 9. Pp. 6-8.
4. Nikolaeva I.V., Shihovtsov Yu.V., Lobanov A.A., Koroleva N.N. Rol spetsialnoy fizicheskoy podgotovlennosti igrokov v ovladenii tekhnikoy i taktikoy voleybola. Uchenye zapiski universiteta im. P.F. Lesgafta. 2020. No. 2(180). Pp. 297-301.
5. Rodin A.V., Guba V.P., Bulykina L.V., Ananin A.S. Otsenka effektivnosti raspredeleniya trenirovochnyh sredstv v podgotovitelnom periode godichnogo tsikla kvalifitsirovannyh voleybolistov. Vestnik sportivnoy nauki. 2024. No. 3. Pp. 19-22.
6. Fomin E.V., Bulykina L.V., Silaeva L.V. Fizicheskoe razvitie i fizicheskaya podgotovka yunyh voleybolistov. Moskva: Sport: Chelovek, 2018. 192 p.

Health preservation activities for students in higher and secondary vocational education: analysis of current research

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Abstract

Objective of the study is to identify methodological approaches in health-promoting activities among students in higher and secondary vocational education.

Methods and structure of the study. Dissertation research (abstracts) and articles from peer-reviewed journals were studied, selected according to criteria of relevance, availability of models, conditions and technologies, as well as availability of full text. Theoretical and comparative analysis, structuring and generalisation of data were carried out.

Results and conclusions. The dominance of competence-based and integrative approaches is shown; the typical structure of health-saving activities (value-motivational, cognitive, activity-based and reflexive components) is described; key pedagogical conditions and technological solutions are highlighted. The directions requiring further development are identified, including the need to create integrated integrative models and practice-oriented technologies for the formation of health-saving activities of students in vocational education.

Keywords: *health preservation, pedagogical support, students, analysis, literary sources, models.*

Introduction. The modern vocational education system is focused on developing professional competencies and, at the same time, preparing students to maintain and improve their own health. The increase in academic workload, decrease in physical activity, and increase in stress factors in the educational environment lead to an increased risk of deterioration in the physical and psycho-emotional state of students, which draws the attention of researchers and practitioners to the issues of developing health-preserving activities for students.

The relevance of this issue is determined not only by scientific interest, but also by general trends in state policy in the field of education and public health, reflecting the social demand for strengthening the health of young people and creating conditions conducive to maintaining it in the learning process. In vocational education, this is considered one of the priority tasks of the modern educational process.

Scientific research interprets health-promoting activities as organised pedagogical activities in the educational environment aimed at preserving and strengthening students' health, forming a culture of health and developing a conscious attitude towards a healthy lifestyle [1]. Works devoted to preparing students for activities in vocational education emphasise the importance of a competence-based approach focused on independent action by learners and reflection on their results [2]. This approach allows us to consider readiness for health-preserving activities not as the acquisition of knowledge about health, but as the mastery of actions that ensure its preservation in the real conditions of the educational process.

This article uses the term “pedagogical support” as a basis, reflecting the systematic activities of teachers to create conditions for the formation of health-preserving activities among students.

Despite the existence of a significant number of studies devoted to individual aspects of the forma-

tion of health-saving activities, scientific data remain fragmentary and require systematisation from the perspective of a holistic methodological and pedagogical approach. It is particularly important to identify pedagogical conditions and technological solutions that ensure the formation of health-saving activities as a sustainable and conscious form of student activity in vocational education.

Objective of the study is to identify methodological approaches in health-promoting activities among students in higher and secondary vocational education.

Methods and structure of the study. The research work is presented in the form of a review and analysis and is aimed at studying contemporary domestic scientific publications on the issue of developing health-promoting activities among students in vocational education. The materials used include dissertation abstracts and articles from peer-reviewed scientific journals containing theoretical provisions, descriptions of pedagogical conditions and technologies aimed at the formation of health-saving activities among students [3-5]. The sources were selected based on criteria relevant to the problem under study: the presence of a theoretical and methodological justification for the structure of health-saving activities; a description of the pedagogical conditions influencing its formation; a presentation of the technologies used in the educational process; and the availability of the full text of the publication for analysis. The sample includes works published in the Russian Science Citation Index (RSCI). The final sample included 14 scientific publications, including 6 dissertation abstracts and 8 articles from peer-reviewed journals. The chronological framework of the analysed works was 2015-2025, which made it possible to trace the dynamics of the development of scientific ideas over a ten-year period. The study used theoretical and content analysis to identify key provisions and concepts; comparative analysis to identify common and distinctive characteristics of approaches, models, and pedagogical solutions; structuring and generalisation methods to determine trends and directions for further research development. The analysis was performed manually, which ensured the accuracy of interpretation and the possibility of an in-depth substantive assessment of each publication. To increase the objectivity of the analysis, quantitative content analysis was used to record the frequency of key thematic elements in the selected sources. During the analysis, semantic categories were identified that reflect the main areas of research: the structure of health-promoting activities, pedagogical conditions, pedagogical technologies and models of formation. For each category, the number of publications in which it was represented was recorded. This approach made it possible not only to systematise the data, but also to identify differences between abstracts and articles, as well as to trace trends in the development of scientific approaches to the formation of health-saving activities of students in vocational education.

Results of the study and discussion. An analysis of scientific publications has shown that the formation of health-preserving activities among students is viewed as a holistic pedagogical process that includes the development of a value-based attitude towards health, the acquisition of knowledge about ways to preserve it, and the application of these methods in academic and extracurricular activities [6]. A number of studies examine students' readiness to perform actions aimed at maintaining and strengthening health in the context of vocational education; these characteristics are interpreted as elements of health-promoting activities [3, 4]. The studies reviewed reveal a common structural logic for the formation of health-preserving activities, including four interrelated components: value-motivational, cognitive, activity-based, and reflective. The existence of such a structure allows us to consider health-preserving activities as a holistic pedagogical process, rather than a set of disparate actions, which emphasises its systematic nature and integration into the educational environment. Significant attention in publications is paid to pedagogical conditions that ensure the transition of students from knowledge about health to the actual implementation of health-promoting activities. The most significant conditions are the creation of an educational environment focused on student subjectivity [7]; the integration of curricular and extracurricular activities; and the provision of pedagogical support focused on the development of self-regulation and reflection [8]. These conditions create opportunities for the formation of personal responsibility for health.

A number of studies examine the characteristics of the formation of health-promoting activities among students with health limitations. The need to

create special pedagogical conditions that ensure the accessibility and individualisation of physical education within a special medical group is noted [9]. These data complement the overall picture and emphasise that health-promoting activities require a differentiated approach that takes into account the health status of students. Quantitative content analysis made it possible to establish the distribution of thematic emphases in the studied works. The structure of health-promoting activities is revealed in five sources; the pedagogical conditions for its formation – in seven, including studies devoted to students of the special medical group; various options for pedagogical technologies – in four, and a description of integrative or holistic models is presented in three publications. The components of health-promoting activities are recorded by the authors with varying frequency: cognitive and activity components are identified in seven works, value-motivational components in six, and reflective components in five. A comparison of abstracts and articles showed that structural and activity-based analysis predominates in abstracts, while journal publications more widely cover issues of pedagogical conditions and model construction. The data obtained confirm that the research field is developing unevenly, and key areas are presented with varying degrees of completeness. The analysis revealed a tendency to use individual integrative technologies – the inclusion of project activities and interdisciplinary forms of teaching in the educational process [10]. Such solutions combine various forms of pedagogical interaction at the level of individual processes and contribute to the development of readiness for health-saving activities. However, the application of integrative technologies is local in nature and does not form a unified systemic model. The results of an empirical study conducted at a medical university show that some senior students have a decrease in physical activity and physical fitness levels [11]. This trend may be due to a combination of factors, including an increase in academic workload, changes in daily routine, and the peculiarities of subjective health status. At the same time, the data obtained can be considered an indirect indicator of the need for targeted pedagogical support in the formation of sustainable health-promoting activities. A separate area of research is related to the development of comprehensive models of health-promoting activities implemented at the level of educational organisations. Such models take into account organisational conditions, mechanisms of interaction between participants in the educational process, forms of support, and areas of activity [12]. Such models demonstrate a transition from isolated measures to systematic health preservation management at the university level. A summary of the analysis results showed that research in the field of health-promoting activities is developing mainly within the framework of separate areas: descriptions of the structure of activities, pedagogical conditions or individual pedagogical technologies considered in the context of health-promoting activities [13]. Despite the presence of elements of integration, there are no holistic models that combine the educational environment, pedagogical conditions, technological solutions, and components of activities into a single system. This allows us to identify a relevant direction for further research: the development of an integrative approach and pedagogical model that ensures the formation of sustainable health-promoting activities among students in vocational education.

Conclusions. The analysis showed that research on the formation of students' health-saving activities is developing in several directions: the study of the structure of activities, pedagogical conditions, and pedagogical technologies. It has been established that existing works consider these areas separately, resulting in a lack of comprehensive models for the formation of health-saving activities. The need for an integrative approach that combines the educational environment, the student's subjective position, and modern means of pedagogical support has been identified. The results obtained determine the prospects for the further development of an integrative pedagogical model that ensures the formation of sustainable health-saving activities of students in vocational education.

References

1. Bermus A.G. Problemy i perspektivy issledovaniy zdorovesberezheniya v obrazovatelnoy srede vuza: teoreticheskiy obzor. Pedagogika. Voprosy teorii i praktiki. 2023. V. 8. No. 1. Pp. 1-12.
2. Biryukova N.V. Formirovanie zdorovesberegayushchey pozitsii studentov meditsinskogo vuza na osnove kompleksnoy tekhnologii: avtoref. dis. ... kand. ped. nauk: 5.8.7. Moskva, 2022. 25 p.

3. Bitsheva I.G. Formirovanie fizkulturno-ozdorovitelnogo prostranstva kak faktor zdoroves-berezheniya studentov v sovremennom vuze: avtoref. dis. ... kand. ped. nauk: 5.8.7. Kazan, 2022. 26 p.
4. Gorbunova V.R. Analiz psihologo-pedagogicheskih podhodov k formirovaniyu gotovnosti budushchih uchiteley fizicheskoy kultury k osushchestvleniyu zdorovesberegayushchey deyatelnosti. Problemy sovremennogo pedagogicheskogo obrazovaniya. 2025. No. 88-1. Pp. 75-77.
5. Kolomiets O.M. Kompetentnostno-deyatelnostnyy podhod –metodologicheskaya osnova prepodavaniya v vysshey shkole. Vestnik Moskovskogo universiteta. Seriya 20: Pedagogicheskoe obrazovanie. 2017. No. 1. Pp. 84-98.
6. Loshchakov A.M. Psihologo-pedagogicheskoe soprovozhdenie formirovaniya kultury zdorovya studentov vuzov: avtoref. dis. ... dokt. psihol. nauk: 19.00.07. Moskva, 2020. 45 p.
7. Minnikaeva N.V. Pedagogicheskie usloviya zdoroveformirovaniya studentov SMG v protsesse fizicheskogo vospitaniya vuza. Uchenye zapiski universiteta im. P.F. Lesgafta. 2025. No. 9(247). Pp. 191-199.
8. Palatkin I.V. Podgotovka studentov vuza k zdorovesberegayushchey deyatelnosti: avtoref. dis. ... kand. ped. nauk: 13.00.01. Kemerovo, 2015. 23 p.
9. Petrova D.S., Sultanova V.R. Model zdoroves-beregayushchey deyatelnosti vuza. Fizicheskaya kultura studentov. 2025. No. 74. Pp. 204-209.
10. Safronov R.V., Vanina E.S., Pershikov S.V., Nemchenko I.A. Dinamika urovnya fizicheskoy podgotovlennosti studentov meditsinskogo universiteta v pervye gody obucheniya. Teoriya i praktika fizicheskoy kultury. 2025. No. 3. Pp. 66- 68.
11. Halilova A.F. Pedagogicheskie usloviya formirovaniya zdorovesberegayushchey kompetentsii u studentov vuzov na zanyatiyah fizicheskoy kulturoy: avtoref. dis. ... kand. ped. nauk: 13.00.08. Kazan, 2019. 22 p.
12. Tsakaeva H.B. Pedagogicheskoe sodeystvie studentam v formirovanii tsennostnoy orientatsii na zdorove i zdorovyy obraz zhizni: dis. ... kand. ped. nauk: 13.00.01. Stavropol, 2018. 24 p.
13. Shchelina T.T., Miticheva T.I., Sidorova T.V., Mihaylova S.V. Model zdorovesberegayushchey deyatelnosti vuza. Teoriya i praktika fizicheskoy kultury. 2022. No. 9. Pp. 41.
14. Shchelina T.T., Miticheva T.I., Sidorova T.V., Mihaylova S.V. Model zdorovesberegayushchey deyatelnosti vuza. Teoriya i praktika fizicheskoy kultury. 2022. No. 9. Pp. 41.

The role of physical culture and health activities in harmonising the social and personal life skills of those engaged in physical culture

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Abstract

Objective of the study is to develop conceptual approaches to physical education and health activities for those engaged in physical culture in order to harmonise and correct vitality.

Results and conclusions. The article establishes the most important interrelations between the concepts of 'social and personal viability' and 'physical culture and recreation activities,' necessary for designing physical culture and recreation activities based on a systematic and subjective approach to exert the most complete and widespread influence on the social and personal viability of those involved.

The presented content corresponds to the research directions 'Socio-cultural activities in the field of physical culture' (5.8.4 'Physical culture and professional physical training') and 'Technologies of correction of physical and mental development, self-realization and socialization' (5.8.6 'Health-improving and adaptive physical culture'). The article is aimed at researchers of the problem of the development of subjectivity engaged in physical culture.

Keywords: *physical culture, participants, conceptual approach, physical culture and health activities.*

Introduction. In the current context of radical restructuring of socio-cultural activity (the transition from the dictates of liberalism and globalism to multipolarity and multiculturalism based on equality and respect for the fundamental principles of human life), the problem of individuals gaining control over their own lives has become a pressing issue in personal development and a theoretical and methodological problem in educational science.

The concept of forming social and personal viability in adolescents developed by Paatova M.E. provides an effective and pedagogically sound answer to this problem. However, the method she proposes for the formation of social and personal viability in adolescents through a system of differentiated educational situations is not very acceptable for young people and older individuals. Accordingly, the problem arises of transposing the ideas of the concept under consideration to a sphere of activity that is attractive to other age groups.

Thus, there are grounds for the following statement: physical education and health activities designed on the basis of a systemic-subject approach to the pedagogical process are an effective means of pedagogical influence, which creates favourable conditions for the harmonisation and correction of the social and personal vitality of those engaged in them.

Objective of the study is to develop conceptual approaches to physical education and health activities for those engaged in physical culture in order to harmonise and correct vitality.

Results of the study and discussion. The concept of Paatova M.E. [3, 4, 5] for the social and personal vitality of adolescents and the subject-oriented physical culture and health activities developed in this article [1] are based on general ideas about the development of human subjectivity as a readiness for self-organisation in a particular type of activity and for one's life in general [2].

The unity of methodological approaches can be traced in the content and structure of the pedagogical phenomena of 'social and personal viability' and 'individual physical culture and health competence' (see table).

Analysis of the content of the structural components of social and personal viability (Paatova M.E.) and individual physical culture and health competence (Naumenko Yu.V.) from the perspective of a systemic-subject approach to the pedagogical process [2] allows us to assert that the phenomena under consideration are multi-level manifestations of the subjectivity of the human personality:

- the manifestation of subjectivity in physical culture and health activities is the formation of individual physical culture and health competence in those engaged in them (Naumenko Yu.V.);

- the subjectivity of the individual in life as a whole is manifested through social and personal vitality (Paatova M.E.).

Thus, the individual physical fitness and health competence of those engaged in physical fitness and health activities is a specific (single-factor) manifestation of their more systematic social and personal vitality and, in accordance with the systematic approach to development (I.V. Blauberg, V.N. Sadovsky, A.D. Hall, R.I. Fedgin, E.G. Yudin, et al.), a change in one element of the system (physical fitness and health competence) will lead to qualitative changes in the entire system (social and personal vitality), which, in turn, may serve as an additional stimulus for further changes in individual elements.

The psychological and pedagogical mechanism for the formation of individual physical culture and health competence is self-reflection on individual activity, as the main mechanism for the formation of personality subjectivity [2]. It should be assumed that the formation of individual physical culture and health competence occurs in at least two stages [1].

At the stage of advanced development of value-semantic and motivational components (the first stage), there will be a transition from a naive to a conscious subject of physical culture and health activities with systematic reflection on individual actions in each class: 'What should and can I do to increase my physical education and health activities?' and 'How can I motivate myself to increase my physical education and health activities?'

At the second stage, with the decisive development of regulatory and behavioural components, there will be a transition from a conscious subject to a subject of individual development in physical culture and health activities in the process of self-reflection on the fol-

Table. Systematic analysis of the content of structural components of social and personal vitality (Paatova M.E.) and individual physical culture and health competence (Naumenko Yu.V.)

Structural components	Content	
	Social and personal vitality	Individual physical education and health competence
Value-meaning component	Self-determination in the values and meanings of one's own life in terms of individual systemic well-being (personal and social) and the means of achieving it	Defining oneself in terms of 'health' and 'ill health' in somatic, psychological and social aspects, as well as in the personal content of physical culture and health activities in terms of their life support
Motivational component	Willingness to make the necessary efforts for an indefinite period of time to achieve individual social and personal well-being in accordance with established social and cultural norms and traditions	Willingness to make the necessary efforts for an indefinite period of time to achieve stability, increase the complexity and diversity of forms and means of individual physical culture and health activities
Regulatory component	Self-determination in the direction and content of improving individual social and personal viability in order to achieve an individual state of social and personal well-being	Self-determination in the direction and content of strengthening and developing one's vitality at the somatic and psychological levels for physical and social well-being
Behavioural component	Willingness to choose forms, methods and means and their practical application to improve individual social and personal viability	Willingness to choose forms, methods and means and their practical application to improve individual psychophysiological vitality

lowing questions: 'How does my physical activity influence the formation of my personal self and contribute to the realisation of a holistic state of well-being?' and 'What actions will be an effective tool for influencing physical and health activities on my personal and life self-determination and improvement?'

At the second stage, the formed subject of physical culture and health activities can act as an active agent of physical culture and health activities for naive subjects who have just started exercising.

At the first stage, the principle of competence-oriented physical culture and health activities is relevant (comprehensive mastery of various forms, methods and means of physical culture and health activities, taking into account individual psychophysiological vitality).

At the second stage, the systematic implementation of the personal and developmental orientation of physical culture and health activities is relevant:

- all organisational and pedagogical means of physical culture and health activities used should activate individual self-determination in terms of the values of 'health', 'being healthy' and 'health for well-being';

- all content-related and organisational pedagogical means used in physical culture and health activities should contribute to significant qualitative changes in terms of the values of 'health', 'being healthy' and 'health for well-being', which will accordingly contribute to qualitative changes in the cognitive, behavioural and motivational-regulatory spheres of the individual.

The influence of the formed subjectivity in physical culture and health activities (individual physical culture and health competence) on the structuring and reformatting of individual social and personal viability will be most significant and meaningful, in our opinion, at the second stage. In general, it can be argued that the second stage will see the dialectical interaction and mutual development of two significant personal phenomena: 'individual physical culture and health competence' and 'social and personal viability.'

Conclusions. Physical education and health activities create broad opportunities for the personal development of the younger generation and the personal improvement of mature adults. However, it is not physical exercise itself that is important for the formation of personal qualities, but rather the value-based and meaningful interpersonal interaction of the participants in physical education and health activities.

The study established the most important interrelationships between the concepts of 'social and personal viability' and 'physical culture and health activities' necessary for designing physical culture and health activities based on a systemic-subject approach in order to have the most complete and broadest impact on the social and personal viability of those involved.

Further research should focus on the development and testing of technologies for the formation of individual physical culture and health competence and the increase of motor activity for various population groups using a variety of methods to improve the social and personal vitality of participants.

References

1. Naumenko Yu.V. Kontseptsiya fizkulturno-ozdorovitelnoy deyatelnosti obshcheobrazovatelnoy organizatsii, orientirovannoy na kompleksnoe formirovanie sotsialno-kulturnyh fenomenov «zdorove» i «zdorovyy obraz zhizni». Innovatsionnye protsessy marketingovoy deyatelnosti v sfere fizkulturno-ozdorovitelnyh uslug: teoriya i praktika: Kollektivnaya monografiya. Pod obshch. red. Yu.A. Zubareva. Saratov: Amirit, 2023. Pp. 268-344.
2. Naumenko Yu.V. Teoretiko-metodologicheskiy analiz fenomena «subektnost lichnosti v fizkulturno-ozdorovitelnoy deyatelnosti». Nauka i sport: sovremennye tendentsii. 2023. V. 11. No. 5 Pp. 130-137. DOI: 10.36028/2308-8826-2023-11-S-130-137.
3. Paatova M.E. Pedagogicheskaya model protsessa formirovaniya sotsialno-lichnostnoy zhiznesposobnosti. Izvestiya Saratovskogo universiteta. Novaya seriya. Seriya: Filosofiya. Psihologiya. Pedagogika. 2017. V. 17. No. 2. Pp. 229-236. DOI: 10.18500/1819-7671-2017-17-2-229-236.
4. Paatova M.E. Monitoring psihologo-pedagogicheskih usloviy kachestva vospitatelnoy deyatelnosti obshcheobrazovatelnoy organizatsii po formirovaniyu sotsialno-lichnostnoy zhiznesposobnosti obuchayushchihsya. Izvestiya Volgogradskogo gosudarstvennogo pedagogicheskogo universiteta. 2021. No. 10(163). Pp. 40-45.
5. Paatova M.E. Otsenka psihologo-pedagogicheskih usloviy kachestva vospitatelnoy deyatelnosti obshcheobrazovatelnoy organizatsii po formirovaniyu sotsialno-lichnostnoy zhiznesposobnosti obuchayushchihsya. Vestnik Adygeyskogo gosudarstvennogo universiteta. Seriya 3: Pedagogika i psihologiya. 2021. No. 4(288). Pp. 46-55. DOI: 10.53598/2410-3004-2021-4-288-46-55.

Innovative vector of development in sports science (based on materials from the XII international congress 'sports, people, health,' Saint Petersburg, 2025)

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Abstract

Objective of the study is to identify key factors associated with improving the effectiveness of athlete training. The objectives of the study include evaluating information resources aimed at accelerating the growth of athletic skills and identifying the most common training problems.

Methods and structure of the study. The methodological design of the research ensures an internal consistent relationship between the recorded parameters and the adjustment of functional states and the growth of athletic achievements. In assessing the operational profitability of R&D, the processes of digital transformation of training implemented with the help of artificial intelligence technologies (P. Bordovsky, E. Kosmina, I. Manzheley, P. Petrov, I. Polikanova, G. Ponomarev, E. Sabaeva, A. Shukaeva, Luo Ran) are indicative.

Results and conclusions. The research is dialectically adequate in terms of achieving maximum values through diversification of resources and technological management. New opportunities are opening up with the use of artificial intelligence (AI) algorithms, big data and cloud computing. It has been shown that the use of generative-competitive methods and deep learning technologies allows analysing the effectiveness of load parameter regulation (speed, pace, power) based on physiological shifts within the 'control-effect' limits.

Keywords: *artificial intelligence (AI), forecast, resources, incentives, factors, effectiveness.*

Introduction. The instrumental field of research consists of a meta-analysis of 380 analytical reports presented at the XII International Congress 'Sport, Man, Health', St. Petersburg, 2025. It was attended by 480 Russian and international experts from 28 countries, who presented the results of large-scale pedagogical, sociological, and medical-biological studies.

The interdisciplinary nature of the research develops a conceptual and theoretical platform for solving problems in children's and youth, mass, Olympic, professional, military-applied, student, ethnic, adaptive and phygital sports (S. Ashkinazi, S. Evseev, R. Kadyrov, O. Mironova, S. Neverkovich, N. Peshkova, E. Saikina, Sh. Khubbiev). An assessment of the pace of development of sports science shows that the speed of change in sports technology is outpacing research practice.

Special attention is also paid to specific approaches and strategies aimed at integrating people with special educational needs and disabilities into the youth environment through sport and other forms of physical activity. (T.E. Koval, L.V. Yarchikovskaya, S.M. Lukina, O.V. Mironova).

The Minister of Sport of the Russian Federation and President of the Russian Olympic Committee, M. Degtyarev, emphasised: "... the aim of the Congress is to justify the strategic directions for the development of sport, to strengthen the scientific approach to the

training of athletes and to preserve the traditional values of the Olympic movement" [1].

Scientific developments are conceptually based on a synthetic methodology that intertwines many semantic fields, such as diversification typology and fractal structure modelling. The diversity of ideas put forward expands the scientometric base of applied science and generates innovative principles and training methods. A number of technological developments are groundbreaking in optimising training regimes, improving the efficiency of management decisions, and forecasting the growth of athletic skill.

Objective of the study is to identify key factors associated with improving the effectiveness of athlete training. The objectives of the study include evaluating information resources aimed at accelerating the growth of athletic skills and identifying the most common training problems.

Methods and structure of the study. Methodological research ensures internal consistency between recorded parameters and the adjustment of functional states and growth in sporting achievements. In assessing the operational profitability of R&D, the processes of digital transformation of training implemented with the help of artificial intelligence technologies are indicative (P. Bordovsky, E. Kosmina, I. Manzheley, P. Petrov, I. Polikanova, G. Ponomarev, E. Sabaeva, A. Shukaeva, Luo Ran).

L. Lubysheva proposes a model for the development of sport that involves the use of sports resources and technologies to develop human capital and quality of life. Diffuse learning models, synthesised on the platform of the P.F. Lesgaft National State University of Physical Education, Sport, Youth and Tourism, generate a cascade of applied research that stimulates the development of student sport (S. Petrov). Z. Kuznetsova notes the lag in solving the problem of tolerant attitudes towards the diversity of ethnic sports for the progressive development of Russian sport. L. Byankina took a deep approach to analysing the problem of physicality, realised on anthropocentric boundaries.

V. Fedorov implements the informational capabilities of analytical functionality, which has a predictive result for the transition of highly skilled boxers from Olympic to professional sports. R. Terekhina generates a conceptual platform for the development of artistic gymnastics, based on the ideas of artistic expression in competitive compositions. E. Davydova analyses a number of factors responsible for a qualitative, conceptual leap in the development of beach tennis.

Results of the study and discussion. The information space is dominated by research results structured within the boundaries of a power law showing functional transformations in training. The research is dialectically adequate in terms of achieving maximum values through diversification of means and technological management. New opportunities are opening up with the use of artificial intelligence (AI) algorithms, big data and cloud computing. It has been shown that the use of generative-competitive methods and deep learning technologies allows analysing the effectiveness of load parameter regulation (speed, pace, power) based on physiological shifts within the 'control-effect' boundaries.

The distribution class includes biometric information on the depth of load impact (V. Guba) and on the structure of external and internal training factors in sailing (V. Kulikov). The works propose management models that are similar in their internal logic, reducing the fractal randomness of the training process by analysing information obtained from microprocessor devices (heart rate monitors, pulse oximeters). The logic of the issues under study is implemented within the boundaries of training regime stratification, ensuring the achievement of maximum functional states. In the subject context, algorithms for managing synergistically linked resources and methods for assessing the variability of adaptive adjustments in a recursive training environment are considered.

The absence of a universal solution to the problems explains the wide range of studies focused on solving methodological or practical problems of managing cumulative effects and synchronising morphological, psychophysical, and biomechanical parameters. In particular, the attributiveness of operating systems in cricket, betting, bowling, and fielding is associated with anthropometric classifiers (Salman Muhammad).

The instrumental field of research focuses on assessing resistance reserves, synchronising cumulative effects, and the limits of metabolic and functional restructuring. Ensuring the technological feasibility of control is the basis for the development of ultra-precise predictive models for training athletes.

Research proves the prognostic validity of jump tests, which allow assessing the effectiveness of speed and strength training for skiers (S. Lenkov) and selecting athletes based on target parameters in combined events (A. Talibov). These methods create

unique conditions for the development of athletes' motor potential by identifying the 'weak link' factor and personalising training programmes. The use of an electromyographic complex with biological feedback in a group of swimmers becomes a factor in the prevention of myofascial disorders (V. Melnichuk).

Innovations are associated with the formalisation of the target training vector, monitoring of dynamic parameters, and the development of a qualimetric training model. Crossing operational tasks involves the separate synthesis of the information and management parts included in the adjustment of intermediate states within the specified limits of metabolic stress of training (A. Kuchera), increasing alertness in extreme situations in taekwondo (A. Pavlenko).

The developed approaches demonstrate the functional closedness of the management circuit, which contributes to the growth of the body's reserves for adaptation to loads of varying intensity. A number of studies have demonstrated the prognostic informativeness of anthropometric parameters in the formation of crews in academic rowing (R. Titarenko), selection in freestyle wrestling (M. Tkachuk), and prediction of athletic skill in taekwondo (N. Gorskaya). The use of myotonometry in young gymnasts is justified by the need to assess the limits of muscle tension in the upper and lower extremities (V. Noskova).

The above logic forms an operational field where the volumetric-spatial and tempo-rhythmic parameters of technique are analysed. The modification of operations is aimed at flexible, proactive regulation of training, coupled with the improvement of technique and the development of critically important qualities. In this context, the informative value of accelerometric testing of the dynamic components of jumping actions in volleyball players is assessed (Petrov Georgy). The effectiveness of using high-tech algorithms and microprocessor devices that record the coordination of technical actions of basketball players (L. Minina), optimisation of the structure of jumps (B. Losin), throws, passes and passes of young athletes (S. Rudakas) is proven. In the training of gymnasts, the effectiveness of information and analytical operations carried out on the IMOOVE 600 hardware complex (A. Umanskaya) has been proven.

The strong potential of automated control and digitisation of operational information used in the development of tactical models for the distribution of forces over distance has been noted in the training of cross-country skiers (I. Ivanova). The created information array shows differences from traditional approaches, which requires a review of a number of existing methodological positions in terms of innovations in control.

The operational focus of the research is on the attribution of morphofunctional rearrangements that ensure the achievement of the limits of physical capabilities. The most interesting result of the assessment of fractal-resonance effects arising in the process of changing functional states are innovative models of physical, technical, and tactical training. In the context of analysing the stability of adaptive changes in game sports, a management approach has been developed that allows the depth of cumulative effects to be regulated (A. Rodin).

In various connotations of the task of increasing the effectiveness of training, a project structure is put forward that sets the boundary areas between the main and auxiliary processes. Targeted, concentrated impact on the kinesiological, neurophysiological and mental functions of handball players is achieved within the boundaries of the game role (P. Gromyko). Jahrami Maryam Shiraz achieves a significant increase in motor abilities by regulating the main indicators of the athletes' condition in the phases of the biological cycle.

A number of studies indicate the need for qualimetric analysis for controlled adjustment of the training process. A relevant functional-attributive model is the control of postural adjustments in 16-year-old badminton players, assessing the compliance of parameters with phenotypic limits (Dinh Thi Mai An). It has been shown that the growth of functional reserves in water polo players can be achieved by modulating loads (N. Pysina). An additional lever for increasing the effectiveness of technical and tactical training in bandy is the regulator of integral game quality parameters (A. Malofeev), in women's football – the optimisation of attacking actions (V. Kart), and in tennis – the expansion of motor limits (G. Ivanova).

Randomised studies prove the link between the effectiveness of handball players' shots in attack and the organisation of attacking tactics (A. Ramzaytseva). The effectiveness of technical training exercises for volleyball players has been proven by an increase in the accuracy of jump serves (S. Ashurova), attacking shots (A. Ummato), and feints (O. Nikolaeva). The quality of serves in women's volleyball increases with the development of shoulder joint mobility (N. Lutkova).

In martial arts, research has been conducted on the optimisation of metabolic processes that lead to

sustainable morphological changes. Proposals in this area develop organisational management models that ensure the interconnection of training factors and conditions. In boxing, the object of influence is an individual pre-competition training programme that ensures an increase in the power of the most important functional systems (V. Beloded). A method for improving the effectiveness of defensive techniques with an information-dependent structure has been tested (A. Filatov). A technology for developing coordination skills, implemented within the sensitive limits of young boxers' development, has been proposed (N. Aimbetova).

Of interest is a method for developing motor reactivity in boys and girls aged 7-9 who practise KUMITE karate (Yu. Orlov). V. Kharkova proposes using gymnastic exercises to develop the flexibility of taekwondo practitioners. A method for developing joint mobility in swimmers at the initial training stage has been developed (E. Inake).

A number of experts are considering the possibilities of correcting energy processes in the context of achieving maximum power and maximum results, for example, in women's wrestling (B. Tarakanov). Of interest is a method for coordinating technical actions within the limits of informational, temporal, and energy resources (D. Matveev). Priorities have been identified for the individualisation of technical and tactical training for junior sambo wrestlers (A. Litmanovich). In judo, a method has been developed for teaching throwing, grabbing and sweeping techniques using KYU means (O. Borisenko).

The effectiveness of stretching methods that accelerate the recovery of cyclists' performance after heavy loads has been proven (Xuequyi Bi). The binding effect is achieved by incorporating badfite technologies into the training of 10-12-year-old taekwondo practitioners (L. Alekhin). Patrick Drid's observations, which testify to cases of the use of prohibited drugs in martial arts to improve motor performance, are considered a critical factor in the vital prognosis.

Improvements in arm wrestling results are achieved through the combined effect of improved biomechanical structure and strength focus (V. Kuzmin). L. Ryzhkova defined the structure of combat actions in sabre fencing.

Research focuses on assessing the specificity of training, the cyclical distribution of loads, predicting results, and the dynamics of improving athletic skills. The position put forward by V. Kleshnev at the level of research methodology shows a trend of stagnation in results in the final races in academic rowing at the Olympic Games since 2010, caused by a drop in speed and rowing pace.

It should be noted that the achievement of peak speeds over short distances by skilled kayakers is due to a high concentration of sprint and special strength training (M. Baranova).

E. Maslyukova considers the combination of general (GT) and special (ST) training for 12-14-year-old cross-country skiers from the point of view of optimising the target load zone. The developed methodological techniques related to the synchronisation of breathing and shooting phases at the firing line in biathlon lead to an increase in shooting performance (V. Farbey).

V. Kostyuchenko links the risks of early specialisation in athletics with an increase in non-linear effects that reduce the dynamics of the development of sporting skills. The stratification of developmental loads stimulates the speed of reproduction of energy resources and physical condition of swimmers within ontogenetic limits (A. Krylov). Based on a comparative analysis of the results of Belarusian swimmers' performances at international competitions, K. Minakova makes a forecast of the team's competitiveness.

The creation of a methodology for improving elements on bars of different heights shifts the perspective towards the singularity of training in artistic gymnastics (M. Sobitova).

The cascade training mode synthesised in artistic gymnastics induces a coordinative structure of movements (E. Medvedeva), increased artistry (E. Soboleva) and improved composition quality (V. Makarova).

Conclusions. The information array generated on the congress platform reflects promising areas of research related to improving the effectiveness of athlete training. The technological nature of R&D is rewarded with preferences for supporting scientific research, computerisation of research projects, and acceleration of the implementation of innovative developments into practice.

References

1. XII Mezhdunarodnyy nauchnyy Kongress «Sport, chelovek, zdorove», 16-18 aprelya 2025 g., Sankt-Peterburg. Rossiya: Izd-vo S.-Peterb. un-ta, 2025. 808 p. ISBN: 978-5-288-06475-3.