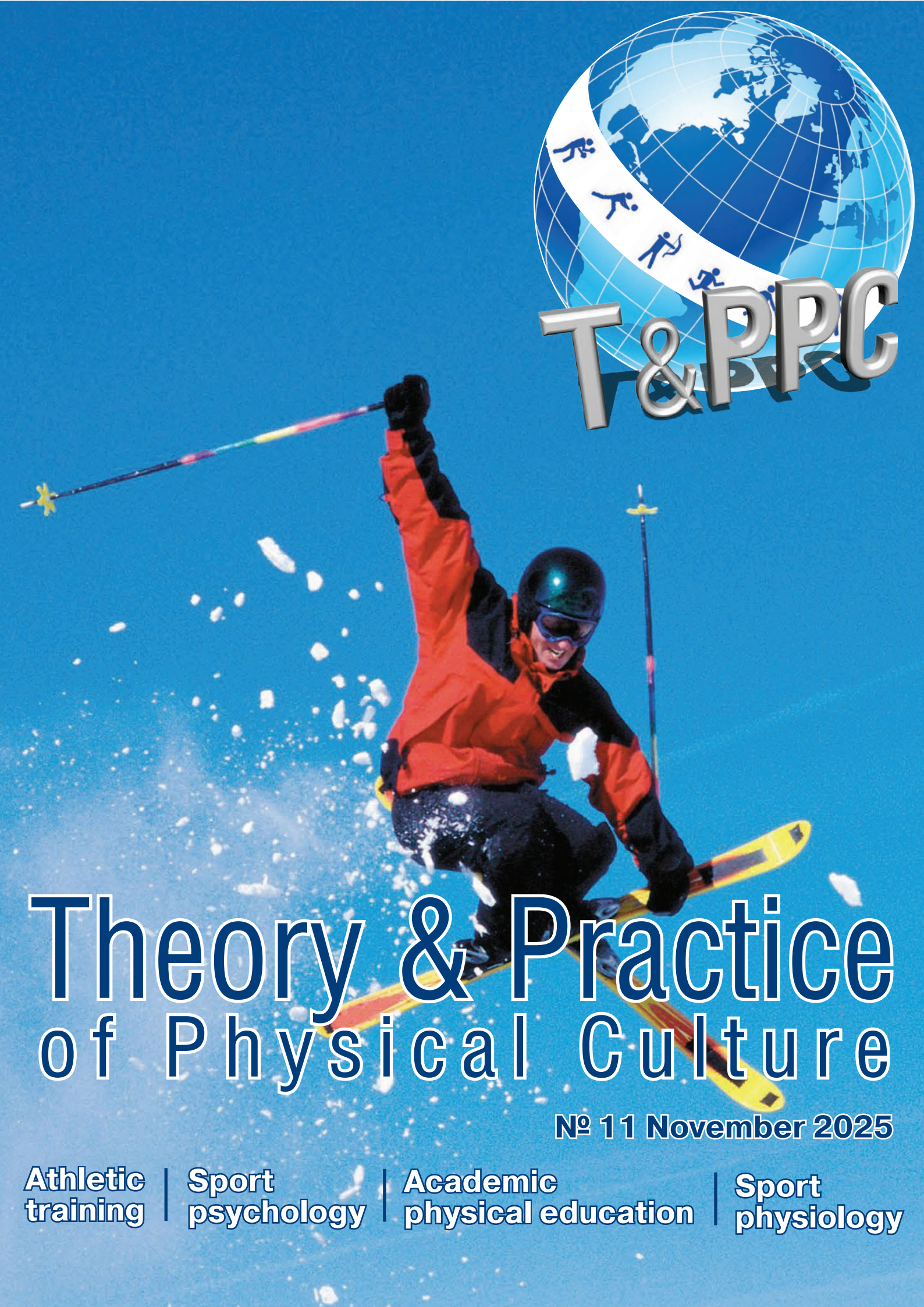

Theory & Practice of Physical Culture

№ 11 November 2025

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

Sports science in the trend of innovation

Today, the main trend in promising areas of research in sports is the development and application of high-tech training process management and injury reduction.

A significant part of the work is devoted to biomechanical motion analysis systems, which make it possible to evaluate performance techniques, identify errors and find ways to correct them. As a rule, GPS monitoring systems are used for this purpose to track the movements of athletes during the training and competition process, which allows them to analyze their activity, calculate the distance traveled, speed and other parameters. In addition, the research uses sensor devices to monitor physiological parameters that allow you to measure pulse, respiratory rate, hydration level and other parameters, which allows athletes and coaches to monitor the condition of the body and adjust the training process.

Another scientific trend of research in sports science is the development and improvement of sports equipment, in particular simulators. Sports equipment is constantly undergoing the evolution of materials and increasing versatility. As you know, modern simulators are software-controlled devices that help improve diagnostic accuracy, fitness, and movement techniques.

Currently, the scientific community is paying close attention to the issues of personnel training for the FKiS. Success in the modern world is impossible without qualified coaches, teachers and other specialists with knowledge in the field of sports science. Today, professional training in educational institutions is focused on the integration of scientific research and practice. In this context, such types of educational activities as:

– development of training programs based on the principle of evidence-based practice, based on the results of sociological research and best practices in sports practice,

– promotion of interactive teaching methods: simulation, gamification, case study, for the development of universal and professional competencies of students,

– organization and implementation of interuniversity sports and social projects for students to gain valuable experience and establish contacts.

Publishing practice shows that a significant number of modern research in sports science is conducted using digital means, where such digital transformation trends have developed as: the use of wearable electronic controlled devices to monitor a person's physical condition in an educational environment and sports activities, the use of mobile applications in teaching and managing the training process, the use of machine vision technologies in analysis and modeling of athlete's movements, development of digital sports

Modern sports science continues to actively develop through the expansion of research in the field of innovative technologies: from sports technology and equipment to training and digital transformation. Scientific work is aimed at achieving high athletic results, reducing injuries and expanding the possibilities of mass sports. Further research and scientific developments in these areas expand the horizons of the future of sports science and sports in general.

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

Parameters of physical development in highly skilled skiers aged 18-20 in the third year of the Olympic cycle

UDC 796.92

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Abstract

Objective of the study is to determine the nature of physical development in high-level cross-country skiers aged 18-20 in their third year of Olympic training.

Methods and structure of the study. 11 athletes from the Russian junior cross-country skiing team aged 18-20, with qualifications ranging from candidate master of sports to master of sports, participated in comprehensive examinations conducted at the ROC and VNIIFK innovation center at the beginning and end of the preparatory period of the third year (2024-2025 season) of the Olympic cycle (OC). The survey program included an assessment of the leading physical qualities and abilities. To do this, athletes were asked to undergo testing consisting of two techniques that measure the reaction force of the support when performing jumping exercises with maximum power on the PD-2 strain gauge platform (VISTI, Russia), used to assess explosive leg strength (ELS) and measure mechanical power when performing handwork on the SkiErg Concept-2 ergometric installation (USA), used to evaluate explosive arm strength (EAS) and speed and strength endurance of the hands (SSEH) [1]. The test procedures, means and methods of monitoring the studied indicators were carried out on the basis of methodological recommendations developed to assess the development of the physical qualities of athletes from the Russian national teams and the nearest reserve. They persisted throughout all stages of the Olympic cycle [2, 3].

Results and conclusions. The results of the comparative analysis show that a distinctive feature of the development of the leading physical qualities of cross-country skiers at the end of the preparatory period (PP) of the third year of the Olympic training cycle is the multi-level increase in the indicators studied, differentiated by the nature of muscle activity when demonstrating explosive arm strength (work per hand movement in terms of absolute and relative values: Aabs. +7.0% and Arel. +6.9%) and legs (in terms of force gradient: Jabs. and Jrel. +8.2%) in relation to the speed-strength endurance of the hands (in terms of power output in the 5-minute 5PMR test: Nab. +11.8% and Nrel. +11.7%). At the same time, the greatest decrease in the degree of deviation from the model level of the 2022 Olympian, primarily (in terms of the physical qualities studied), occurs in the explosive strength of the arms (Aabs. -5.1% and Arel. -2.8%), reaching the lower limit of ML, and explosive leg strength (by force gradient: Jab. -10.0% and Jrel. -7.9%), approaching the lower limit of ML, and the continuing lag in the level of speed-strength endurance of the arms (Nabs. -11.3% and Nrel. -9.2%). The greatest differences in relation to ML in terms of the physical qualities studied remain in terms of absolute values, reflecting their dependence on total body size.

Keywords: *ski racers, Olympic cycle, strength indicators, speed-strength characteristics.*

Introduction. The results of studying the characteristics of the development of the leading physical qualities and abilities of cross-country skiers aged 18-20 in the first year of the Olympic training cycle (2022-2023 season) showed that both at the beginning and at the end of the preparatory period, the absolute and relative values of explosive strength of the arms (EAS) and legs (ELS) and speed and strength endurance of the hands (SSEH) are low, significantly below the model characteristics for adult athletes [2]. Thus, the degree of deviation from the model level (ML) at the end of the preparatory period in terms of absolute (Aabs.) and relative (Arel.) EAS values was -8.9% and -4.2%, respectively, in terms of ELS (force gradient, Jabs. and

Jrel.) was -16.3% and -12.2%, and for SSEH (power in a 5-minute test, Nabs. and Nrel.) was -17.1% and -12.9%. In the second year of the Olympic training cycle (2023/24 season), the degree of deviation from the model level in terms of EAS values was -6.8% for Aabs. and -2.5% for Arel., reaching the lower limit of the model for the 2022 Olympians, and in terms of ELS (force gradient) for Jabs. -13.4% and -9.6% for Jrel, and -13.5% for Nabs and -9.5% for Nrel for the SSEH level, maintaining a significant lag (for all physical qualities studied) in absolute values directly dependent on body mass [3].

Objective of the study is to determine the nature of physical development in high-level cross-country skiers aged 18-20 in their third year of Olympic training.

Methods and structure of the study. According to a standardised programme at the beginning and end of the preparatory period, the third year of the Olympic training cycle for the 2024-2025 season, comprehensive examinations were conducted on 11 athletes of the Russian junior national cross-country skiing team aged 18-20, with qualifications ranging from candidate master of sports to master of sports. The dynamics of the development of leading physical qualities and abilities were studied using the following research methods: anthropometry, ergometry with test procedures on the PD-2 tensodynamic platform (VISTI, Russia), including jumps from a static position with both feet and arm swing (at a knee angle of 120°) with maximum power, and the SkiErg ski ergometer, Concept-2 (USA), which allows you to simulate the work of the arms when moving with a simultaneous stride in two modes: a single movement of the arms (jerk) with maximum power (test 1) and 5 minutes of maximum muscle work (5MMR) in competitive mode (test 2) [5, 6].

The application of test procedures, means and methods of control over the physical qualities and indicators of the body systems under study was carried out on the basis of methodological recommendations developed for highly qualified athletes of Russian national teams and was carried out at the ROC and VNIIFK innovation center within the framework of comprehensive examinations at the beginning and end of the preparatory period of each of the three years of the Olympic training cycle [1-3].

Results of the study and discussion. The research results provide data that allows for a comparative analysis of the dynamics of physical qualities at the end of the preparatory period of the third year in terms of the rate of increase in absolute values and the degree of deviation from the model level developed for the XXIV Winter Olympic Games in Beijing in 2022 [4].

Intragroup differences in the indicators studied, presented in the figure and table, show that a characteristic feature of the development of explosive arm strength (EAS) was that with positive dynamics in the growth rates of absolute (Aabs.+7.0%) and relative (Arel. +6.9%) values of work performed per movement at maximum power, the lag behind the model level for Aabs. decreases to -5.1%, and for Arel. to -2.8%, confirming the stabilisation of age-related changes and the achievement of the lower ML limit for the 2022 Olympians.

Table – Differences in the studied indicators of physical development at the beginning and end of the preparatory period of the third year of the Olympic training cycle in the 2024/25 season (n=11)

Investigated indicator	Body mass	Explosive strength						Speed and strength endurance of the arms		
		arms		legs						
		Aabs.	Arel.	Fmax	tmax	Jabs.	Jrel.	Nabs.	Nrel.	HR
Average value (EPP)	73,44	36,31	0,496	179,2	0,209	858,82	11,71	1496,6	20,42	183,2
Standard deviation	6,79	3,10	0,027	16,0	0,002	80,61	0,65	132,4	1,23	4,0
Average value (SPP)	73,42	33,94	0,463	170,1	0,214	793,54	10,82	1338,4	18,29	184,6
Standard deviation	6,21	2,32	0,022	14,8	0,002	73,34	0,64	90,9	1,22	5,3
Differences EPP SPP, abs.	0,02	2,37	0,032	9,1	-0,006	65,27	0,89	158,1	2,13	-1,5
EPP -SPP, rel. (%)	0,03	7,0	6,9	5,3	-2,7	8,2	8,2	11,8	11,7	-0,8
t calculated EPP-SPP	0,007	1,939	2,926	1,321	-5,539	1,894	3,106	3,114	3,893	-0,693
Significance level	-	p<0,1	p<0,01	p<0,2	p<0,001	p<0,1	p<0,01	p<0,01	p<0,001	-
Model of an Olympian -2022 (Beijing)	75,0	38,25	0,510	186,1	0,195	954,4	12,72	1688,0	22,5	186,0
	3,0	1,41	0,026	7,1	0,007	41,7	0,50	76,0	0,9	2,0

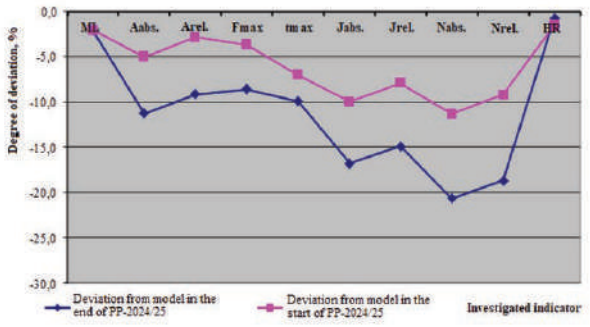

Fig. Degree of deviation in explosive strength indicators for arms and legs and speed-strength endurance indicators for arms at the beginning and end of the preparatory period of the third year of the Olympic training cycle relative to the 2022 Olympian model)

A characteristic feature of the development of explosive leg strength was that, with positive dynamics in the growth rates of strength gradient indicators in absolute (Jabs. +8.2%) and relative (Jrel. +8.2%), the lag of the studied indicators from the model level in absolute terms Jabs. was -9.8%, and in relative terms Jrel. -7.9%, significantly approaching the lower limit of ML. It should be noted that the growth rates of the indicators forming the strength gradient were ensured by an increase in maximum strength (Fmax) by +5.3% (with a deviation from ML of only -3.7%) and a decrease in the time to reach maximum strength (tmax) by 2.7% (with a deviation from ML of 7.0%), indicating a tendency towards stabilisation of age-related changes and reaching the lower limit of the model level.

A characteristic feature of the development of speed-strength endurance indicators for the arms was that, with the highest positive dynamics of growth rates in absolute and relative power values in the 5-minute test, Nabs. increased by 11.8% and Nrel. by 11.7%, the lag behind the model level in absolute terms Nabs. was -11.3%, and in relative terms Nrel. -9.2%, approaching the lower limit of ML for the 2022 Olympians. The established dynamics are accompanied by a decrease in the intensity of the cardiovascular system's response to the load performed (HR = 183.2 bpm, = -1.5 bpm; -0.8%), indicating an increase in the significance of the formation of regulatory mechanisms that influence the level of functional economy.

Conclusions. The results obtained made it possible to establish that a distinctive feature of the development of the leading physical qualities of cross-country skiers aged 18-20 at the end of the preparatory period of the third year of the Olympic training cycle is the multi-level increase in the absolute and relative values of explosive arm strength (work per movement at maximum power): Abs. +7.0% and Rel. +6.9% and explosive leg strength (jumps at maximum power): by strength gradient Abs. and Rel. +8.2%) in relation to the speed-strength endurance of the arms (5-minute maximum muscle work): Nabs. +11.8% and Nrel. +11.7%). At the same time, the elimination of differences in relation to the model level of the 2022 Olympian occurs primarily in terms of the level of explosive strength of the arms according to Aabs. -5.1% and Arel. -2.8%, reaching the lower limit of MU) and explosive strength of the legs according to the force gradient according to Jabs. -10.0% and Jrel. -7.9%, approaching the lower limit of ML and maintaining a lag in the level of speed-strength endurance of the arms according to Nabs. -11.3% and Nrel. -9.5%, maintaining a significant lag (in all physical qualities studied) in absolute values, which are directly dependent on total body size.

The results obtained made it possible to formulate the position that a feature of the development of the physical qualities of ski racers in the age period of 18-20 years (relative to adult athletes) in the third year of the Olympic training cycle is the heterochrony of the sequence of elimination of the degree of deviation from the model level of absolute and relative values, with the primary elimination of differences in explosive arm strength, reaching definitive values and the model level for the 2022 Olympians, followed by explosive leg strength, whose indicators, especially in terms of the relative value of the force gradient and maximum repulsion force, reach the lower limit of ML, and speed-strength endurance of the arms, whose indicators show a marked downward trend. At the same time, there is a general pattern of lagging behind the model level of absolute values for all physical qualities studied, which is a limiting factor in readiness for competitive activity.

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About the impact of individually tailored plyometric training on the competitive performance of amateur boxers

UDC 796.015.44

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Abstract

Objective of the study is to determine how personalised physical training using plyometrics affects the competitive results of amateur boxers.

Methods and structure of the study. A 6-week plyometric program has been developed that takes into account the individual characteristics of athletes, identified by their psychophysiological parameters. The experiment involved amateur boxers from Jordan (average age 23.2±2.9 years), who were divided into three groups depending on their "weak link": speed (17 people), endurance (14 people) and power/coordination (20 people).

Results and conclusions. The results showed that the plyometric program, adapted to specific lagging physical qualities, led to a significant and purposeful improvement in the competitive performance of boxers. This confirms the importance of pre-testing to identify lagging indicators and optimize training in conditions of limited resources.

Keywords: *amateur boxing, personalised approach, effectiveness, plyometric exercises.*

Introduction. Modern amateur boxing requires athletes to have a high level of physical fitness, including speed and strength parameters, specific endurance and coordination skills [1, 3]. In amateur clubs, which often lack access to expensive equipment and advanced monitoring technologies, implementing an individualised approach to training can be tricky. This makes it even more important to find and adapt affordable methods that can make training more effective. Plyometric training, which has proven its effectiveness in developing explosive strength and power in martial arts practitioners [2, 4], is one such method.

Objective of the study is to determine how personalised physical training using plyometrics affects the competitive results of amateur boxers.

Methods and structure of the study. Amateur boxers from Jordan (aged 23.2±2.9 years (18-29 years)) with 3 years of training experience participated in the study. The participants were divided into three groups according to their physical fitness indicators, depending on their weaknesses: group 1 – lack of speed (17 people), group 2 – lack of endurance (14 people) and group 3 – lack of power/coordination (20 people). For 6 weeks, participants in each group performed plyometric exercises (jumps, multi-jumps, medicine ball throws) selected to target the boxers' lagging qualities and integrated into their regular training routine with the aim of increasing explosive power and reactivity. To assess the significance of the differences, a one-way analysis of variance was used, followed by Tukey's post-hoc test for intergroup comparisons. Significance was accepted at $p<0.05$. The effect size d was calculated to assess the practical significance of changes in the groups (d=0.2 – small; d=0.5 – medium; d=0.8 – large; d=1.2 – very large; d=2.0 – huge).

Results of the study and discussion. The results of the 6-week plyometric programme showed that all groups exposed to the training achieved significant improvements in key indicators (Table 1).

Table 1. Initial indicators of competitive activity among amateur boxers in Jordan

Indicator	Group 1 (n=17)	Group 2 (n=14)	Group 3 (n=20)	p-value
Age (years)	23,4±2,7	22,9±3,1	23,2±2,9	0,874
Experience (years)	4,2±1,1	4,5±1,3	4,3±1,2	0,912
Combination speed (blows per second)	2,10±0,16	2,25±0,14	2,22±0,14	0,783
Dodges/movements (times per minute)	2,97±0,33	3,02±0,29	3,05±0,31	0,745
Strikes in the third round (times per minute)	37,2±4,8	36,4±5,1	38,1±4,9	0,632
Decrease in activity (%)	15,8±3,9	16,9±4,4	15,2±4,1	0,587
Accuracy of strikes (%)	39,4±5,2	38,7±5,6	38,1±5,8	0,812

As can be seen from the data in Table 1, the groups were homogeneous in all parameters of competitive activity at the start of the study ($p>0.05$). This confirms the validity of subsequent comparisons between the groups. After completing a 6-week training cycle using plyometric exercises, the athletes were retested (Table 2).

The data in Table 2 show that the training intervention had a more pronounced effect on those indicators of competitive performance for which the qualities identified as problematic for each group were important.

Group 1 (lack of speed) showed the greatest improvement in the speed of performing combinations (an increase of 7.45%, $p<0.001$) and an increase in the number of evasions (9.76% increase, $p<0.001$). These changes were very significant ($d=1.83$ and $d=2.56$, respectively), which is consistent with studies on the positive effect of plyometrics on speed characteristics [5]. Group 2 (endurance deficit) noted a significant increase in the number of strikes in the third round (8.52%, $p=0.017$) and a decrease in activity decline (14.73%, $p=0.024$). The average effect size ($d=0.76$ and $d=0.64$) indicates the practical benefit of the intervention. This confirms the idea that plyometric training can increase specific endurance by improving the economy of movement [6]. Group 3 (power/coordination deficit) achieved significant gains in shot accuracy (5.77% increase, $p<0.001$) and number of blocks (6.31% increase, $p<0.001$), with a very large effect size ($d=1.38$ and $d=2.54$). This is probably due to improved intermuscular coordination and the ability to generate more powerful and faster efforts.

According to Table 2, statistically significant differences in the effectiveness of the interventions applied between the groups were also identified. In terms of 'combination speed,' group 1 demonstrated better results compared to groups 2 and 3 ($p<0.01$), in terms of 'strikes in the 3rd round,' group 2 outperformed

Table 2. Dynamics of competitive performance indicators for Jordanian amateur boxers after a 6-week training cycle

Indicator	Group	Initial	Final	Δ%	t	p	d
Combination speed (blows per second)	1	2,10±0,16	2,27±0,16	+7,47	30,41	<0,001	1,83
	2	2,25±0,15	2,31±0,14	+2,60	4,32	0,087	0,42
	3	2,22±0,14	2,29±0,15	+3,06	5,17	0,043	0,48
Dodges/movements (times per minute)	1	2,97±0,33	3,27±0,33	+9,76	91,00	<0,001	2,56
	2	3,02±0,29	3,15±0,30	+4,17	12,45	0,035	0,44
	3	3,05±0,31	3,18±0,32	+4,26	13,28	0,029	0,41
Strikes in the third round (times per minute)	1	37,2±4,8	38,1±4,9	+2,42	3,24	0,125	0,19
	2	36,4±5,1	39,5±5,3	+8,52	7,69	0,017	0,76
	3	38,1±4,9	39,8±5,0	+4,46	5,83	0,062	0,34
Decrease in activity (%)	1	15,8±3,9	14,9±3,8	-5,70	-4,17	0,094	0,23
	2	16,9±4,4	14,5±4,1	-14,73	-6,38	0,024	0,64
	3	15,2±4,1	14,3±4,0	-5,92	-3,95	0,102	0,22
Accuracy of strikes (%)	1	39,4±5,2	40,8±5,3	+3,55	8,47	0,052	0,27
	2	38,7±5,6	39,9±5,7	+3,10	6,32	0,074	0,21
	3	38,1±5,8	40,3±5,8	+5,77	61,00	<0,001	1,38
Blocks (times per minute)	1	3,92±0,54	4,05±0,55	+3,32	9,18	0,041	0,24
	2	3,84±0,61	3,98±0,62	+3,65	7,45	0,068	0,23
	3	3,87±0,58	4,12±0,59	+6,31	61,00	<0,001	2,54

Table 3. Intergroup differences in the effects of training on the competitive performance of amateur boxers in Jordan

Indicator	Group 1 (Δ) M±SD	Group 2 (Δ) M±SD	Group 3 (Δ) M±SD	F- value (2,48)	p-value	Post-hoc analysis (Tukey)*
Δ Combination speed (blows per second)	+0,17 ± 0,02	+0,06 ± 0,02	+0,07 ± 0,02	185,72	<0,001	Гр.1 > Гр.2, Гр.1 > Гр.3
Δ Dodges/movements (times per minute)	+0,30 ± 0,01	+0,13 ± 0,02	+0,13 ± 0,02	768,00	<0,001	Гр.1 > Гр.2, Гр.1 > Гр.3
Δ Strikes in the third round (times per minute)	+0,9 ± 0,4	+3,1 ± 0,6	+1,7 ± 0,5	55,74	<0,001	Гр.2 > Гр.1, Гр.2 > Гр.3
Δ Decrease in activity (conditional units)	-0,9 ± 0,3	-2,4 ± 0,5	-0,9 ± 0,3	64,00	<0,001	Гр.2 > Гр.1, Гр.2 > Гр.3
Δ Accuracy of strikes (%)	+1,4 ± 0,3	+1,2 ± 0,3	+2,2 ± 0,1	58,67	<0,001	Гр.3 > Гр.1, Гр.3 > Гр.2
Δ Blocks (times per minute)	+0,13±0,02	+0,14±0,03	+0,25±0,01	77,32	<0,001	Гр.3 > Гр.1, Гр.3 > Гр.2

* Note: In the 'Post-hoc analysis' column, the '>' sign indicates a statistically significant superiority in effectiveness (greater increase) of one group over another (statistically significant differences at the $p<0.01$ level). For example, Gr.1 > Gr.2 means that the increase in the indicator in Group 1 was significantly greater than in Group 2.

groups 1 and 3 ($p<0.05$), and in terms of 'accuracy of strikes,' group 3 showed higher results than groups 1 and 2 ($p<0.05$).

To assess the specificity of the training effect, an analysis of the differences in the increase in indicators between groups (Δ) was performed. The results of the variance analysis are presented in Table 3.

Analysis of the data in Table 3 showed that the differences between the groups of athletes were statistically significant ($p<0.001$; $F(2,48)=55.74–768.00$). This confirms that individualising training programmes depending on the type of motor deficit has a positive effect on results. Further analysis confirmed the initial division of groups: group 1 (speed deficit) demonstrated a significant improvement in the speed characteristics of competitive activity, such as the speed of performing combinations and the speed of evasive manoeuvres. Group 2 (endurance deficit) showed a decrease in fatigue and an increase in the number of strikes in the third round. Group 3 (power/coordination deficit) achieved an increase in accuracy and power of strikes, which was reflected in an increase in the number of blocked attacks.

The results obtained serve as convincing confirmation of the theory of training load specificity in applied sports science [7]. Our findings demonstrate that even when using the same training method (plyometrics) in amateur athletes, targeted changes in exercises and their focus on specific motor qualities lead to different adaptive responses in the body. From a practical point of view, the analysis proves that coaches can manage the training process with a high degree of predictability. Preliminary testing to identify individual weaknesses allows you to identify lagging physical qualities and select a specific training module that is likely to lead to the desired improvement in competitive performance. This solves the problem of the ineffective use of universal programmes, which often do not take into account the individual characteristics of athletes.

Single-factor analysis of variance provided reliable statistical evidence of the effectiveness of the proposed methodology. The differences identified between the groups are not random and clearly indicate that the developed approach allows for the targeted and effective development of specific aspects of the physical fitness of amateur boxers. Thus, the study moves from a simple description of the results to the creation of a scientifically based methodology ready for practical application. It is worth noting that all groups showed improvements in indicators that were not the main goal of the training, albeit to a lesser extent. This confirms that plyometric training has a comprehensive positive effect on the specialised training of boxers.

The absence of a control group, the short observation period, and the inability to completely exclude the influence of other training factors can be noted as factors that could compromise the results obtained.

Conclusions. An individual approach to plyometric training, taking into account the specific physical fitness levels of amateur boxers, significantly improves

their competitive performance. The effect of training is most evident in those aspects that are priorities for each specific group of athletes. The developed methodology can be successfully implemented in the training process of amateur boxers.

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Development of a computer service for assessing and analysing the readiness of freestyle athletes

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Abstract

Objective of the study is to develop a computer programme for automating the assessment and analysis of freestyle athletes' preparedness.

Methods and structure of the study. The computer program was written in the following languages: HTML, CSS, PHP, JavaScript. Development environment: Visual Studio 2022 Community, Visual Studio Code.The database is PostgreSQL. Client: HTML, CSS, JavaScript. Server:PHP, PostgreSQL. The control indicators were determined based on the results of a theoretical analysis of the research problem. The computer service has been successfully tested in scientific and methodological support activities for the training of athletes of the Russian national sports team during 2025.

Results and conclusions. The developed computer program for assessing and analyzing the fitness of freestyle skiers is implemented in sports training using a number of interrelated modules: administration and information protection; personalized information about the athlete; control of fitness; setting model characteristics; video archive; analytics; creation and correction of sports training plans, which creates favorable opportunities for improving the effectiveness of management from pedagogical influences in freestyle.

Keywords: *computer system, automation, analysis, physical fitness, freestyle athletes.*

Introduction. Information technologies and services have long occupied a leading place in the Russian Federation's scientific and technological development strategy. Their active use allows for the automation of routine operations and increased productivity in a wide variety of areas [5]. The physical culture and sports industry is no exception, where special importance is traditionally attached to the management of athletes' training [4].

A study of the issue has shown that in recent years, scientists and specialists have been striving to improve the effectiveness of management in sport by developing and introducing special services into the training process that allow them to accumulate databases on the preparedness of athletes, analyse their athletic form through analytical comparisons with normative values, and use the information obtained to develop and implement athletic training plans [1, 2, 6].

At the same time, research conducted to date in freestyle [3] indicates the need to take into account the specifics of freestylers' motor activity in the process of monitoring their fitness. However, key management operations in this sport still take place without the use of information technology, which is one of the factors preventing the effectiveness of pedagogical influences from being raised to a fundamentally new level of quality.

Objective of the study is to develop a computer programme for automating the assessment and analysis of freestyle athletes' preparedness.

Methods and structure of the study. Theoretical analysis of scientific and methodological literature on the research problem and computer programming were used.

Through analysis of literary sources, valuable information was obtained on key indicators for moni-

toring the preparedness of athletes in each freestyle discipline (acrobatics, moguls, ski cross, halfpipe, slopestyle, big air), which made it possible to develop the structure of the future computer programme and determine the programming environment and tools. The data obtained formed the basis of the technical specifications for the development of a computer programme for assessing and analysing the preparedness of freestyle athletes.

The programme is written in the following programming languages: HTML, CSS, PHP, JavaScript. Development environment: Visual Studio 2022 Community, Visual Studio Code. Database – PostgreSQL. Client: HTML, CSS, JavaScript. Server: PHP, PostgreSQL.

The created service was tested for fault tolerance and was successfully implemented in the process of scientific and methodological support for the training of freestyle skiers of the Russian national team.

Results of the study and discussion. The structure of the computer programme we have developed consists of a number of interconnected modules: administration and information protection; personalised information about the athlete; training readiness monitoring; model characteristics configuration; video archive; analytics; creation and correction of sports training plans. Let us consider the functional capabilities of each module in more detail.

The administration and protection module provides secure access and operation of the service, and also allows the administrator to assign rights and differentiate user roles. The users were freestyle coaches and athletes, and the administrators were software engineers from the Tchaikovsky State Physical Education and Sport Academy, who confirmed user accounts after registration and assigned the following roles: 'coach' (only viewing data in the athlete's profile and access to analytics), 'scientist' (the ability to add athletes, edit information about them, and enter data after control measurements). Each time a user logs into the service, they agree to the security policy requirements for working with personal data in accordance with the legislation of the Russian Federation. At the same time, athletes (or their parents) gave their written consent to the placement of personal data in the computer service.

The personalised athlete information module contains brief, generally accepted information about the freestyle athlete (full name, gender, date of birth, sports organisation, length of training and stage of preparation, affiliation with a freestyle sports discipline) in order to identify them in the database and automatically synchronise the freestyler's personal data with their scientific test results.

The training readiness module is a database containing the results of monitoring examinations (stage, current and competitive) of freestyle athletes in each freestyle discipline. The freestyle database consisted of six submodules: Acrobatics, Moguls, Ski Cross, Halfpipe, Slopestyle, and Big Air. Each submodule of the database (freestyle sports discipline) consists of indicators characterising the morphological features of the body structure (weight, height, BMI, percentage of muscle and fat in the body, muscle and fat mass in the body, lean (fat-free) leg muscle volume index), motor abilities (maximum leg muscle strength, ratio of flexor to extensor strength of the knee joint, power of push-off in a jump from a squat with and without hands, coordination readiness index), parameters of functional state (maximum leg muscle power, stroke volume index, maximum minute blood flow index on a bicycle ergometer, maximum oxygen consumption during leg muscle work, anaerobic power, heart rate at the anaerobic threshold) and competitive activity of freestyle athletes (in accordance with the specifics of the sport).

The model characteristics adjustment module allows you to set the required values for the indicators included in the database, since over time, as generations of athletes change, the average training results change. In addition, athletes' physical condition develops gradually, so the coach can adjust the model taking into account the training period (preparatory, competitive). This option allows for more accurate and objective analytical comparisons of actual fitness results with model values. This is especially important if the coach decides to work not only with highly qualified athletes, but also with the next generation of athletes.

The video archive module is designed for entering, storing and playing back video materials: individual exercises and their combinations, fragments of performances at competitions, analytical materials with angular characteristics and data from pedometric platforms in accordance with the objectives of training and coaching.

The analytics module is designed to perform automated comparisons of the results of freestyle skiers' preparedness (obtained after scientific examinations and entered into the database) with model characteristics, as well as with the results of other athletes in the

form of graphs, allowing you to get an idea of the leading and lagging indicators of preparedness (depending on the magnitude of the discrepancy between the actual result and the model characteristics), including the dynamics of preparedness for the required period. In this section, the user can select all indicators or only those that are of most interest to them (for example, competitive activity indicators) and set the time period for the results. This section allows the user to export all necessary data in Excel and PDF formats.

The module for creating and correcting sports training plans allowed the user to enter and adjust training loads using a special exercise designer and dosage in terms of duration and intensity. The user can create plans for different periods of time, from several days to several months. At the same time, all operations for creating plans are as automated and simple as possible, which does not lead to significant time costs for filling them out, since, using special filters, the user has the ability to fill in exercises by selecting from a database (which is already created in the database) or writing their own version. All plans are saved in the computer programme, which creates favourable opportunities for their analysis and editing. This module also has the ability not only to create and adjust pedagogical influences, but also to analyse their distribution over periods of the annual cycle by summing up the volume of loads according to the parameters of focus (type of training loads: aerobic, speed-strength, speed, recovery, etc.) and intensity zones (from the first to the fifth). This makes it possible to conduct research on the periodisation of loads throughout the annual cycle, allowing the coach to compare the impact of the loads performed on the athletic form of freestylers.

All of the above operations are performed by users via remote access, which allows for flexible time management, optimisation of work processes, and maintaining performance regardless of geographical location.

Conclusions. Thus, a special computer programme for automated control and analysis of freestyle skiers' preparedness, with the ability to create and correct training plans, provides users with the opportunity to work remotely with a high level of protection and reliability. The key feature of the service is the ability to conduct analytical comparisons of athletes' actual results with model characteristics in terms of morphology, motor skills, functional state and competitive activity, taking into account the specifics of each freestyle discipline, as well as the simulation of sports training depending on the focus and intensity of loads during the annual training cycle.

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Developing the physical fitness of volleyball players using modern training equipment

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Abstract

Objective of the study is to investigate and substantiate the effectiveness of using training equipment to improve the physical and technical training of volleyball players aged 17-25 at the advanced training stage.

Methods and structure of the study. 38 volleyball players took part in the scientific work (candidates for the master of sports – 9 people, I category – 12 people, II category – 15 people, without category – 2 people) of two teams of the Russian State Agrarian University, which had different levels of training. One team of the II category level took part in the student competitions of the highest league B, the second – of the I category in the Super League. The age of the players in each team ranged from 17-25 years. The educational and training process was accompanied by the integrated use of training devices according to the author's methodology.

The research program involved studying the level of special speed and strength training in pedagogical tests and technical training in five tests performed using training devices and connected to digital equipment. The data obtained was processed by a special digital program for conducting statistics in training sessions.

Results and conclusions. All indicators of special physical fitness are closely related to the growth of sports skills. Correlation analysis allowed us to establish that the indicators of speed, speed-strength qualities, special endurance in jumping exercises, indicators of hand and back muscle strength in both volleyball teams are closely interrelated with the technique of performing an attacking strike and blocking (r=0.48) with an increase in athletic prowess. Research has proven the effectiveness of using training devices for digitally processing each training session of 40% of the workload in a one-year cycle at the advanced stage of volleyball training.

Keywords: *volleyball players, sports training, student athletes, intensive training, speed and strength qualities.*

Introduction. The training of athletes, including volleyball players, goes through several stages. The age period of 17-19 years corresponds to the stage of in-depth training and coincides with the beginning of university education for volleyball athletes [5]. A series of studies for the in-depth training stage has developed specific practical recommendations for building the training process in volleyball [1, 8].

The main aspects of sports training in volleyball are speed-strength and technique, especially at the stage of intensive training [2, 6]. Due to the intensification and increase in the volume of physical activity at all stages of training, there is a need to find new ways to improve the leading aspects of volleyball training – speed-strength and technique.

However, with the emergence of new opportunities for using modern training equipment, rapid digital analysis and processing of results, there is growing interest in the experimental use of such technologies to improve the athletic training of volleyball players [3, 7, 9]. This information is particularly important for coaches, as the intensive training stage corresponds to the period when the body's main systems are fully developed [3]. There is a need to develop a set of guidelines for the training of volleyball players at the intensive training stage during their university educa-

tion. This study is devoted to the study of the optimal combination of various means using training devices in the training process of volleyball players.

Objective of the study is to investigate and substantiate the effectiveness of using training equipment to improve the physical and technical training of volleyball players aged 17-25 at the advanced training stage.

Methods and structure of the study. The study involved 38 volleyball players (9 candidates for master of sports, 12 first-class players, 15 second-class players, and 2 unranked players) from two teams at the Russian State Agrarian University, who had different levels of training. One team of the second category participated in the student competitions of the higher league B (EG-1), the second – of the first category and candidates for master of sports in the Super League (EG-2). The teams were formed taking into account the training of the sports reserve. The age of the players in each team ranged from 17 to 25 years. The training process was accompanied by the comprehensive use of training equipment according to the author's methodology, in which the training load included 60% basic and 40% auxiliary exercises using training equipment.

The research programme involved studying the level of special speed and strength training using pedagogical tests and technical training using nine tests performed with training equipment connected to digital equipment for operational data analysis. The pedagogical tests included throwing a 1 kg stuffed ball while sitting behind the head, standing long jump, standing high jump onto a block, three-step high jump (ball lift height), 100 m run, 3000 m run, right and left hand grip strength, deadlift. The technical tests, which were calculated as the average of five attempts, included serving the ball, blocking an attacking shot, attacking shot, passing the ball with both hands from above, receiving a serve with both hands from below. A total technical score was calculated. The Speed Trac radar system was used to record serves, and training equipment was used to perform technical tests: a mobile inclined frame with suspended balls, a 'volleyball cannon' and a 'mobile block' were used to measure jump height. Measurements were taken before and after the application of the author's methodology for using training devices in an annual cycle.

The data obtained was processed using special digital software for keeping statistics on training sessions. Statistical indicators were calculated: arithmetic mean, arithmetic mean error, confidence level, correlation coefficient.

Results of the study and discussion. The results of the level of physical fitness in two teams, which are necessary for volleyball players to achieve results at the stage of intensive training, are presented in Table 1.

Table 1. Dynamics of the development of basic physical qualities in volleyball players of different skill levels

Control tests	EG-1 group (n=19)		EG-2 group (n=19)	
	Before	After	Before	After
Throwing a 1 kg stuffed ball while sitting behind the head, m	8,76±1,0	9,93±0,92	9,35±0,87	10,10±0,76
Increase, Δ	1,17		0,75	
Standing long jump, cm	230,21±17,4	241,28±14,6	248,43±13,8	259,56±13,4
Increase, Δ	11,07		11,13	
Standing high jump on a block, cm	274,44±11,3	286,53±10,6	295,63±7,4	309,34±6,7
Increase, Δ	12,09		13,71	
High jump from three steps (ball height), cm	290,64±9,9	319,93±9,4	327,21±6,1	338,11±5,9
Increase, Δ	29,29		10,9	
100 m run, s	14,40±0,57	13,60±0,59	13,40±0,47	13,00±0,41
Increase, Δ	0,8		0,4	
3000 m run, s	17,82±3,4	16,77±2,7	14,24±2,2	12,40±2,0
Increase, Δ	1,05		1,84	
Right hand grip strength, kg	48,80±5,2	53,40±4,9	50,50±1,2	55,40±1,1
Increase, Δ	4,6		4,9	
Left hand grip strength, kg	42,20±4,9	46,13±4,1	45,19±2,7	49,30±2,2
Increase, Δ	3,93		4,11	
Deadlift, kg	102,56±17,4	111,34±15,8	113,85±12,3	118,64±11,8
Increase, Δ	8,78		4,79	

Volleyball players with improved skills show a statistically significant increase in speed, speed-strength qualities, special endurance in jumping exercises, and hand and back muscle strength (Table 1, Figure 1).

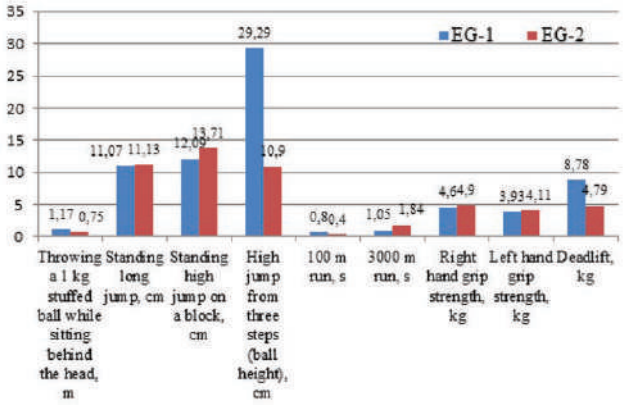

Fig. 1. Increase in physical fitness indicators of volleyball players over a one-year cycle

The figure shows that both groups of volleyball players improved their level of special physical fitness over a one-year cycle using the same training method with exercise equipment. It is worth noting the greatest increase in speed and strength training results in terms of standing long jump, standing block jump, and three-step jump (ball take-off height).

At the same time, the volleyball players in group EG-1 showed the greatest increase in the three-step high jump (ball take-off height) by 29.29 cm and deadlift by 8.78 kg compared to the more skilled team. This is 18.39 cm and 3.81 kg better than in the EG-2 group.

The result in the standing high jump on the block was 1.62 cm better in the EG-2 group than in the EG-1 group. The results of the development of special physical fitness showed the effectiveness of using training equipment in the preparation of volleyball players, with particularly large gains occurring in the less skilled team of the 2nd category. This increase is apparently associated with a more active increase in muscle mass and better adaptation to large volumes of load in less trained athletes.

The level of technical training of volleyball players from two teams of different skill levels is presented in Table 2.

Volleyball players with higher qualifications show a statistically significant improvement in technical training indicators (Table 2). In absolute terms, technical training indicators were significantly higher in the EG-2 group, which had higher qualifications. By the start of the competition period, the EG-2 group had 1.22 times better results in serving, 1.55 times better results in blocking attacking hits, 1.25 times better results in attacking hits, 0.38 times better results in passing the ball with both hands from above, and 1.3 times better results in receiving serves with both hands from below.

During the use of training equipment in the training process, up to 40% of volleyball players in group EG-2 showed the greatest increase in technical skills

Table 2. Dynamics of technical readiness indicators for volleyball players of different skill levels

Control tests	EG-1 group (n=19)		EG-2 group (n=19)	
	Before	After	Before	After
Throwing a 1 kg stuffed ball while sitting behind the head, m	8,76±1,0	9,93±0,92	9,35±0,87	10,10±0,76
Increase, Δ	1,17		0,75	
Standing long jump, cm	230,21±17,4	241,28±14,6	248,43±13,8	259,56±13,4
Increase, Δ	11,07		11,13	
Standing high jump on a block, cm	274,44±11,3	286,53±10,6	295,63±7,4	309,34±6,7
Increase, Δ	12,09		13,71	
High jump from three steps (ball height), cm	290,64±9,9	319,93±9,4	327,21±6,1	338,11±5,9
Increase, Δ	29,29		10,9	
100 m run, s	14,40±0,57	13,60±0,59	13,40±0,47	13,00±0,41
Increase, Δ	0,8		0,4	
3000 m run, s	17,82±3,4	16,77±2,7	14,24±2,2	12,40±2,0
Increase, Δ	1,05		1,84	
Right hand grip strength, kg	48,80±5,2	53,40±4,9	50,50±1,2	55,40±1,1
Increase, Δ	4,6		4,9	
Left hand grip strength, kg	42,20±4,9	46,13±4,1	45,19±2,7	49,30±2,2
Increase, Δ	3,93		4,11	
Deadlift, kg	102,56±17,4	111,34±15,8	113,85±12,3	118,64±11,8
Increase, Δ	8,78		4,79	

across all recorded indicators compared to group EG-1, except for the result in passing the ball with both hands from above. The total technical indicator was 2.36 higher in the EG-2 group than in the EG-1 group.

Thus, based on the data obtained, it is possible to adjust the level of development of physical qualities and the degree of technical skills in volleyball using the methodology of using training devices and their operational digital analysis at the stage of in-depth training.

Conclusions. All indicators of special physical fitness are closely related to the growth of athletic skill. Correlation analysis showed that indicators of speed, speed-strength qualities, special endurance in jumping exercises, and hand and back muscle strength in both volleyball teams are closely related to the technique of attacking and blocking (r=0.48) as athletic skill improves. High correlation coefficients were also obtained between speed-strength qualities and serving and receiving techniques in first-class volleyball players.

Studies have proven the effectiveness of using training devices in digital processing of each training session up to 40% of the load in an annual cycle at the advanced stage of volleyball training.

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The impact of algorithmic training in basic taekwondo strikes on the technical preparedness of young athletes

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Abstract

Objective of the study is to develop and implement a training algorithm that contributes to improving the technical accuracy and effectiveness of basic strikes in WTF taekwondo practitioners.

Methods and structure of the study. The main method of research in the pedagogical experiment was testing basic striking techniques. 20 taekwondo practitioners aged 12-14 from Ekaterinburg took part in the experiment. An algorithmic approach was developed, according to which the experimental group trained for 3 months. This method involved step-by-step training, where each stage represented a specific set of actions aimed at forming and improving motor skills. The entire algorithm was divided into phases (preparatory, initial learning, consolidation and improvement). The phases were divided into steps (more detailed learning, in which, if an error occurs in the execution of an element in a strike, it is necessary to return to the previous step).

Results and conclusions. As a result of the study, the experimental group improved their technique in the following basic strikes: front kick with the leading leg (ap chagi), side kick with the rear leg (dole chagi), and 180° turn kick (tit hurio chagi). Thus, the effectiveness of algorithmisation as a means of optimising the teaching of basic taekwondo kicks has been experimentally proven.

Keywords: *algorithm, taekwondo, sports training, young athletes, basic techniques.*

Introduction. In recent years, algorithmisation of learning processes has attracted increasing interest in various fields, including sports. The algorithmic approach involves breaking down a complex action into a sequence of simple, logically connected steps, which makes the learning process more structured, conscious and controllable. This technique allows athletes and coaches to visualise the sequence of actions more clearly, control each step and quickly correct mistakes.

Despite the effectiveness of algorithmisation, there is insufficient research on its use in taekwondo in the scientific literature. Of particular interest is the study of how structured, step-by-step training using algorithms can help reduce the number of typical mistakes and improve athletes' adaptation to the specific requirements of WTF taekwondo.

Thus, the relevance of this study is due to the need to find new, more effective ways to improve the technical training of 12-14-year-old athletes in WTF taekwondo. Studying the impact of algorithmisation on the quality of basic strikes and reducing the number of typical mistakes will help optimise the training process and improve athletic performance.

Objective of the study is to develop and implement a training algorithm that contributes to improving the technical accuracy and effectiveness of basic strikes in WTF taekwondo practitioners.

Methods and structure of the study. The scientific work involved testing the technique of basic

strikes performed by athletes in WTF taekwondo. 20 athletes aged 12-14 from the taekwondo department of school No. 19 'Children's Stadium' in Ekaterinburg participated in the study (10 athletes in the control group and 10 in the experimental group).

An algorithmic approach was developed, according to which the experimental group trained for 3 months. This method involved step-by-step training, where each step represented a specific set of actions aimed at forming and improving motor skills. The entire algorithm was divided into phases (preparatory, initial learning, consolidation and improvement). The phases were divided into steps (more detailed learning, in which, if an error occurs in the execution of an element in a strike, it is necessary to return to the previous step).

Testing was conducted before the start of the experiment (pre-test) and after its completion (post-test). The athletes performed three attempts of each kick. The following kicks were tested: front kick with the front leg (ap chagi), side kick with the back leg (dole chagi) and 180° turn kick (tit hurio chagi).

In the first and third tests, indicators such as accuracy, correctness, balance and speed were assessed (each element was scored from 0 to 5 points). In the second test, the power, accuracy, correctness and speed of the kick were assessed (scores from 0 to 5 points).

The scores depended on the presence or absence of errors when performing the kicks. Typical errors when performing a front kick with the front foot were: insufficient rotation of the body, which significantly reduces the striking power; loss of balance (staggering, falling after the kick). When performing a side kick with the rear foot, typical errors were: insufficient knee lift (as a result, the kick is not concentrated and accurate); incorrect body rotation (the kick is not sharp, but more of a 'push'). When striking with a 180° turn, frequently identified errors were: incorrect rotation of the supporting leg (making it difficult to create an axis of rotation); loss of balance and incorrect striking surface. The maximum score for each strike was 20 points.

Results of the study and discussion. As a result of introducing the developed algorithm for teaching basic strokes into the training process, the following data were obtained, which are presented in Table 1.

Table 1. Dynamics of striking technique assessment in the control and experimental groups (points)

Group	Testing stages	Ap chaga	Dole chaga	Tit hurio chaga
EG	Before	11	11,2	9,5
	After	14,2	14,4	12,6
CG	Before	11	11,2	9,5
	After	11,5	10,8	9,7

The table shows that before the experiment, the average score for all strokes was approximately the same in the control and experimental groups (ap chagi 11 points, dole chagi 11.2 points, and tit hurio chagi 9.5 points). After the experiment, positive dynamics were observed, especially in the experimental group. Thus, for the ap chagi strike, the average score at the end of the experiment was 14.2 points (an increase of 3.1 points), for the dole chagi kick, the average score was 14.4 points (an increase of 3.2 points), and for the tit hurio chagi kick, the average score was 12.6 points (an increase of 3.1 points). In the control group, the indicators for assessing striking technique also increased, but insignificantly (by 0.5 points for the ap chagi strike and 0.2 points for the tit hurio chagi strike), while the score for the dole chagi strike even decreased by 0.4 points.

It is also evident that the average final score for all types of basic strikes in the experimental group is higher than in the control group. This confirms the overall higher technical preparedness of the taekwondo practitioners in the experimental group by the end of the experiment.

Conclusions. The results of the study confirm the effectiveness of the algorithmic method of teaching basic WTF taekwondo strikes for athletes aged 12-14. It has been found that algorithmisation allows: to speed up the process of mastering the technique due to a clear structure and sequence of actions; to improve the quality of performance by reducing the number of typical mistakes and improving all evaluated indicators. Thus, algorithmisation of the training process is an important step towards improving the technical skills of taekwondo practitioners.

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Methodology for improving speed and strength endurance of qualified taekwondo athletes at the stage of improving their sports skills

UDC 796

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Abstract

Objective of the study is to theoretically substantiate the methodology for improving speed and strength endurance in qualified taekwondo athletes at the stage of improving their sports skills.

Methods and structure of the study. To substantiate the methodology, a pedagogical experiment was conducted on the basis of the Volga Region State University of Physical Culture with qualified taekwondo athletes. An experimental group (n=10) and a control group (n=10) were created for the experimental work. We used the following research methods: analysis of scientific and methodological literature; pedagogical testing; pedagogical experiment; mathematical and statistical methods.

Results and conclusions. A method of developing the speed and strength endurance of qualified taekwondo practitioners was developed, which was included in the content of the main part of the training session. The methodology includes the following principles: gradualness; individual approach; compliance with the means and methods of training; compliance with the FSSP for the sport "taekwondo". Classes according to the experimental method were held for 20 weeks, 2 times a week. In total, 40 classes were held, where the methodology was given 30 minutes. The main means were: special-preparatory exercises, exercises on special equipment, working in pairs on equipment with a partner in full ammunition, competitive fights.

Keywords: *technique, speed and strength endurance, qualified taekwondo athletes, competitive fights, special preparatory exercises, exercises on special equipment.*

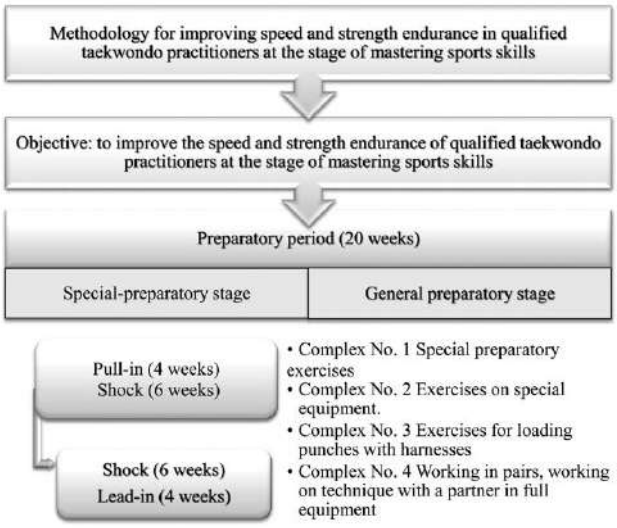
Introduction. The issue of special physical training of taekwondo athletes is becoming particularly relevant, as it is necessary to develop specialized physical qualities necessary for effective performance of competitive exercises. Modern requirements for the physical fitness of taekwondo athletes, among which speed and strength qualities play an important role, are becoming increasingly high [2].

The process of training in taekwondo is complicated by the need to combine the striking technique of hands and feet with the development of different types of endurance, which emphasizes the importance of this topic. An analysis of the scientific validity of the topic under study allowed us to conclude that few researchers have devoted their work to the problem of studying the features of the development of speed and strength endurance in taekwondo athletes [1, 3]. Thus, generalizing the experience of leading specialists and coaches, as well as developing scientifically based training methods for the development of special endurance, becomes extremely relevant.

Objective of the study is to theoretically substantiate the methodology for improving speed and strength endurance in qualified taekwondo athletes at the stage of improving their sports skills.

Methods and structure of the study. To substantiate the methodology, a pedagogical experiment was conducted on the basis of the Volga Region State University of Physical Culture with qualified taekwondo athletes. An experimental group (n=10) and a control group (n=10) were created for the experimental work. We used the following research methods: analysis of scientific and methodological literature; pedagogical testing; pedagogical experiment; mathematical and statistical methods.

Results of the study and discussion. We have developed a technique for improving speed and strength endurance of qualified taekwondo athletes at the stage of improving their sports skills, which was introduced into special physical training for 6 months.



The method included 4 sets of exercises of different orientation, which were used 2 times in a weekly microcycle, in the main part of the lesson. An example of the selection of exercises for microcycles is presented in Table 1.

Our method included 2 stages of preparation: general- preparatory and special-preparatory, which consisted of 4 mesocycles, and those, in turn, of microcycles.

Retracting microcycle is aimed at bringing the athlete's body to intense training work and is characterized by a low total load. In this microcycle, we used the repeated method, repeatedly performing exercises at rest intervals, during which a fairly complete recovery of performance occurs.

The shock microcycle is characterized by high loads, a large total amount of work, the main task is to stimulate adaptive processes in the body of athletes, solving the main tasks of physical, special and integral training. In this microcycle, we used a variable method, characterized by a consistent variation of the load during continuous exercise, by directional changes in the speed of movement, tempo, duration of rhythm, amplitude of movements, the amount of effort, changing the technique of movements.

The lead-up microcycle was built according to the rules of direct lead - up to competitions and, in general, was characterized by a low level of volume and total intensity.

Table 2 shows sets of exercises with different directions: special-preparatory exercises, exercises on special equipment, work in pairs, work on equipment with a partner in full ammunition, competitive fights.

Table 1. Planning of mesocycles for the development of speed and strength endurance of qualified taekwondo athletes

Mesocycle	Microcycle week	Name of complexes	Intensity, %
General training stage			
Retractor (4 weeks)	Retractor	Complex No. 1 Special-preparatory exercises	60-70
		Complex No. 2 Exercises on special projectiles.	60-70
Basic development course (6 weeks)	Shock	Complex No. 3 Exercise of blows with harnesses	65-75
		Complex No. 4 Work in pairs work on equipment with a partner in full ammunition.	80-90
Special-preparatory stage			
Basic stabilizing (6 weeks)	Shock	Complex No. 3 Exercise of blows with harnesses	70-80
		Complex No. 4 Work in pairs work on equipment with a partner in full ammunition.	70-80
		Complex No. 1 Special-preparatory exercises	70-80
Pre-competition (4 weeks)	Shock	Complex No. 2 Exercises on special projectiles.	80-90
		Complex No. 4 Work in pairs work on equipment with a partner in full ammunition.	80-90
	Feeding	Complex No. 1 Special-preparatory exercises	80-90

Table 2. Sets of exercises with different directions

Group of exercises	Means	Intensity	Average heart rate in 1min	Intensity %	Durationof work	Rest time between repetitions
Special-preparatory	Simulated exercises With weights (2-3 kg)	Average pace	150-155 155	60	2 rounds of 2 min	2min
	Shadow fight (dumbbells 1 kg)	High tempo	160 -169 169	70	2rounds of 2 min	1.5min
	Skipping corope	High tempo	160 -169 169	70	2 rounds of 2min each	2 min 1.5min
	Shadow fight	High tempo	160 -169 169	75	2rounds of 2 min	2min
Exercises on Special projectile exercises	Hit «neryu-chaga» kick with the right foot in the middle and upper level of the bulk pear, the exercise is performed with maximum speed and accuracy of impact.	Medium even pace, with short-term ac-celerations	of 150-159 159	60	2 rounds of 4 min	2min
	Hit «neryu-chaga» with the right and left foot alternately on a loose pear, at an average level.	High tempowith accelerations	of 160 -169 169	70	2 rounds of 2.5 min	1.5min
	Jump over the barrier to the left with a «doli-chaga» right foot on a loose pear in the upper level, jump to the right with a «doli-chaga» left foot on a loose pear in the middle level	High tempowith accelerations	of 170-179 179	80	2 rounds of 2.5 min	1.5min
	Step forward with a «doli-cha-ga» kick with the far foot on a loose pear on the upper level, step back with a «doli-chaga» kick with the near foot on a loose pear on the middle level.	Medium pace withaccelera-tions	170 -179 179	80	2 rounds of 2.5 min	1.5min
	Doli-chaga punches on a loose pear at the middle level with the right and left feet alternately moving forward (to attack) 10 punches, without rest with mov-ing back (to counterattack)	High tempowith accelerations	180 -189 189	85	2 rounds of 2min	1min
Exercises in pairs on equipment in full gear	Work in pairs work on equip-ment with a partner in full gear	Medium tempo	160 -169	70	2 rounds of 3 min	1.5
	Work in pairs work on equip-ment with a partner in full gear	High tempo with accelerations(strong partner)	170 -179	80	2 rounds of 2.5 min	1.5min
	Training match	Medium pace, group method (weak partner)	170 -179	80	2 rounds of 2.5 min	1.5min
	Training match	High tempo, (strongpartner)	180-189	95	2 rounds of 2.5 min 2.5 min	1.5min
	Competitive fights	Medium and high tempo	180 -200	100	2 rounds of 2 min	1 min

Conclusions. Thus, in the developed methodology for the development of speed and strength endurance of taekwondo athletes, the main means were: simulation exercises with weights, special preparatory exercises, work on special equipment, competitive fights. When developing endurance, specific development methods were: circular, interval (when performing all training tasks, time for rest was necessarily planned), competitive.

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Teaching students the technique of upper ball transfer in volleyball with the use of sports and technical devices

UDC 796

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Abstract

Objective of the study is to theoretically substantiate and develop the content of teaching 10-11-year-old schoolchildren the technique of upper ball transfer in volleyball using sports and technical devices.

Methods and structure of the study. The pedagogical research was conducted on the basis of I. P. Tchaikovsky Secondary School No. 1, Votkinsk. The experiment involved 15 schoolchildren (10-11 years old), of which two groups were formed: students of group 1 (n=8) – the control group (CG) and students of group 2 (n=7) – the experimental group (EG). The control group of students was engaged in the traditional method of technical training of school students in the Volleyball section, and the students of the experimental group used sports and technical devices.

Results and conclusions. The content of teaching 10-11-year-olds the technique of upper ball passing in extracurricular volleyball classes developed by us consisted of two stages of training: 'initial stage' and 'advanced stage.' At the 'initial stage' we use sports and technical devices to more accurately set up the transmission technique, at the second stage we carry out the learning process through exercises in pairs and outdoor games. We also developed a set of exercises with the use of sports and technical devices, including such devices as a hoop on a grid, suspended and movable hanging rings, 'Gander.'

Keywords: *training, upper ball transfer technique, sports and technical devices, schoolchildren, volleyball, extracurricular activities.*

Introduction. Training in volleyball technique starts from the age of 9-11. The development of speed, strength, agility and flexibility helps to master the technique of playing volleyball more easily [6]. The main role is played by speed and strength in certain combinations. At the same time, the speed of muscle contraction and regulation of the speed of movement is of paramount importance [6]. Special importance is attached to the spatial accuracy of movements, which is extremely necessary for the first and second passes of the ball [5].

The correct and accurate execution of volleyball technique depends on a number of factors, for example, on the organization of classes by a physical education teacher, sports and technical devices, the location of training (hall, stadium, playground on the street), etc.

Often, extracurricular activities in this sport are conducted monotonously, without paying due attention to more accurate training. Consequently, due to the use of various means and methods by the teacher in extracurricular volleyball classes, he achieves not only the preservation of interest among students, but also the quality of sports and technical training in training [2]. Only due to technical readiness, the student becomes more coordinated in their actions.

According to M.A. Pravdov, thanks to sports and technical devices, it is possible to teach precise execution of volleyball techniques, as well as to develop physical qualities such as coordination, strength, speed, agility and flexibility in certain parts of the body [3].

Objective of the study is to theoretically substantiate and develop the content of teaching 10-11-year-

old schoolchildren the technique of upper ball transfer in volleyball using sports and technical devices.

Methods and structure of the study. The pedagogical research was conducted on the basis of I. P. Tchaikovsky Secondary School No. 1, Votkinsk. The experiment involved 15 schoolchildren (10-11 years old), of which two groups were formed: students of group 1 (n=8) – the control group (CG) and students of group 2 (n=7) – the experimental group (EG). The control group of students was engaged in the traditional method of technical training of school students in the Volleyball section, and the students of the experimental group used sports and technical devices.

Results of the study and discussion. To train students aged 10-11 in the technique of upper ball passing, we have developed a training plan (training tasks by stages) and a set of exercises using sports and technical devices.

Sports and technical devices for upper gear training:

- Hoop on a grid.
- Hanging rings.
- 'The Gander.'

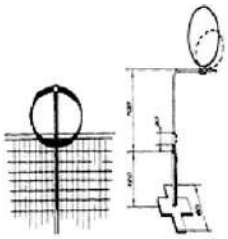
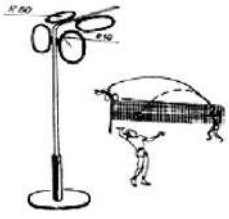
In addition, thanks to the analysis of the results of testing the level of physical fitness of students aged 10-11 years, as well as the methods of E.V. Fomina, we were able to develop our own content of classes on training the transfer of a volleyball ball [4].

We have developed the content of lessons on volleyball ball transfer training for schoolchildren aged 10-11 years, including preparatory, summing up and basic exercises. The method is designed for 5 months (37 classes).

G.R. Danilova was convinced that "mastering the technique is connected with physical training." Only with good physical training and a high level of development of special physical qualities can you achieve success in the initial training of volleyball techniques, and in the process of improvement – more effectively apply the learned techniques in the game and in competitions [1].

Figure 1 shows a scheme of sequential problem solving when teaching the technique of upper ball passing in volleyball, including sequential solution of 5 problems:

Table 1. Set No. 1 of exercises for upper gear with the use of sports and technical devices in the training of students aged 10-11 years

Sports and technical device	Content	Dosage	Illustration
Sports and technical devices for training and improving the technique of upper ball	1) Hoop on a pole. It has many varieties and manufacturing methods. It is installed near the grid and serves to train, improve and control the upper gear. A modified version of this device is shown in the second figure. The device has the ability to rotate the hoop and move it from grid to grid. The height of the hoop above the net can also change, and due to this, the device can work out different trajectories of the ball after passing and receiving the ball.	3x10 times	
	2) Hanging rings. Two pipes are welded at right angles. Two rings of different diameters are welded to the horizontal and vertical pipes. The device is fixed in the frame, the height is adjusted by clamps and allows you to train and improve the accuracy of the upper gears from different starting positions.	3x10 times	
	3) 'Gander.' It is a rack that is branched from the top. In the branched part of the rack, a pole is fixed with special wing nuts. At the distal end of the pole, a rubber band is attached to hold the ball in the air. The height of the pole can be adjusted. The height of the ball is selected individually. The ball must be one head taller than the student's height.	3x10 times	

– Task 1. Introduce the technique of upper ball passing;

– Task 2. Teach how to hold and throw the ball using a sports and technical device – 'Gusak';

– Task 3. Teach the upper transfer of the ball from a place to a sports and technical device-a rack with a ring and a net;

– Task 4. Teach the upper gear technique in motion/pairs;

– Task 5. Teach the upper gear technique through mobile games.

The content of complex No. 1 of exercises with the use of sports and technical devices in the preparation of schoolchildren aged 10-11 for the upper ball transfer is presented in Table 1.

Based on the results of testing and the method of A.I. Zhilkin, we developed the content of classes on teaching the technique of upper ball passing to schoolchildren aged 10-11 years.

As a basis, we have taken the training method of A.I. Zhilkin with exercises at the stage of initial and advanced learning, as well as possible errors in their implementation. The content includes training in the technique of passing the ball for five months (37 classes). Below are 5 exercises in pairs for practicing the top pass of the ball.

Exercise 1. The first player passes over himself with two hands from below, and then passes to the partner with two hands from above; the partner receives the ball and passes over himself with two hands from below, and then passes to the partner with two hands from above, and so on.

Exercise 2. Transfers in pairs: partners gradually increase the distance between them to 12-16 m, and then gradually reduce it to 1.5-2 meters.

Exercise 3. Passes in pairs: the first player passes in such a way that the ball does not reach his partner.

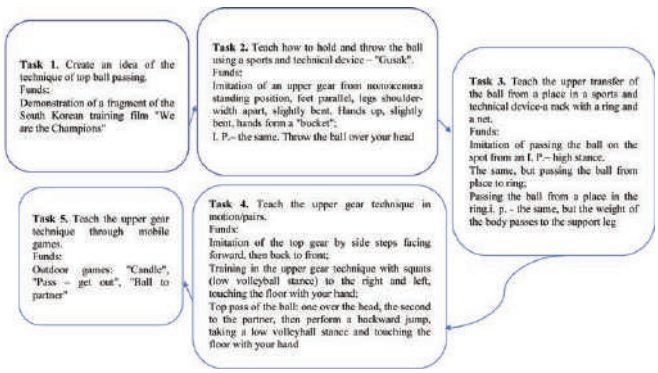


Fig. 1. Sequence of problem solving when learning the upper gear technique

The partner, running under the ball, passes to the first player, and then returns to the starting position (you can go backwards). After a series of broadcasts, the partners change roles.

Exercise 4. The first player passes to the right (left) from a partner. He, having moved, performs the transfer and returns to his place again. The first one again directs the ball to the right (left) After a series of broadcasts, players change roles.

Exercise 5. The first person throws the ball from behind the head into the wall, the second takes the ball that bounces off the wall.

Conclusions**.** Thus, the content of training in the upper ball transfer technique developed by us provides for consistent solution of pedagogical tasks using special sports and technical devices.

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Development of a psychological support system for skiers based on biopsychosocial factors

UDC 796.925; 159.99

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Abstract

Objective of the study is to develop a model of psycho-pedagogical support for the training process of ski jumping, taking into account biopsychosocial factors.

Methods and structure of the study. To achieve our goal, the following methods were used in the work: theoretical analysis of scientific and methodological literature and documents, questionnaires and modeling. The key biopsychosocial determinants of ski jumpers' athletic performance, including psychophysiological, cognitive, emotional, and social characteristics, were identified. The study was conducted on the basis of the Tchaikovsky State Physical Education and Sports Academy in the period from February 1 to October 1, 2025.

Results and conclusions. An innovative model of psychological support has been developed, which has a modular structure and includes four interrelated components: conceptual, diagnostic, content-forming, and control-correcting. The model provides systematic diagnosis of biological, psychological, and social factors, prevention of unfavourable pre-start conditions, and development of stress resistance, emotional regulation, and communication skills in athletes.

The implementation of the proposed model contributes to a comprehensive improvement in the effectiveness of psychological training for ski jumpers, strengthening the interaction between the athlete, coach and sports psychologist, as well as increasing the stability of sports results in competitive conditions.

Keywords: *model development, psychological support, skiers, block structure, biopsychosocial factors.*

Introduction. Modern sport is characterised by ever-increasing demands on athlete training, in which psychological support is becoming increasingly important. In ski jumping, this aspect is particularly significant, as sporting performance in this sport largely depends on psychophysiological reactions (visual-motor reactions to a moving object), concentration, resistance to various distractions, and the ability to self-regulate the nervous system in the extreme conditions of a jump [2]. At the same time, the results of previous studies convincingly show that a high level of motor preparedness of athletes on the eve of important competitions does not guarantee victory or prize places [3, 4]. This is characteristic of ski jumpers, who, as a rule, are distinguished by a high level of excitation processes in the central nervous system, which makes them vulnerable to the emergence of unfavourable pre-start conditions that prevent jumpers from fully demonstrating their real level of preparedness when performing competitive attempts, the results of these attempts may be significantly lower than expected [5].

Based on this, the role of psychological support from qualified specialists who are able to reduce athletes' anxiety and help them maintain emotional stability and concentration is becoming increasingly important [1]. However, at present, in ski jumping, the system of psychological support for jumpers' training is implemented in the training process only sporadically, based on available opportunities.

At the same time, in recent years, science has been actively developing a biopsychosocial model that views a person as a unity of biological, psychological and social factors [6]. The application of this model in sport opens up new opportunities for comprehensive analysis and support of athletes' training, taking into account not only the morphological, motor and technical indicators of competitive exercise, but also the psychophysiological, cognitive-emotional, personal and social aspects of sporting activity.

Objective of the study is to develop a model of psycho-pedagogical support for the training process of ski jumping, taking into account biopsychosocial factors.

Methods and structure of the study. The following methods were used in the study: theoretical analysis of scientific and methodological literature and documents, questionnaires and modelling.

Theoretical analysis of scientific and methodological literature and documentary sources made it possible to establish the specificity of motor activity in ski jumping, as well as to determine the prospects for applying the concept of biopsychosocial human health in ski jumping.

Through a questionnaire conducted in our previous studies [3], specific characteristics for the model under development were identified, which were the balance of nervous processes, the speed of sensorimotor reactions, coordination of movements, the ability to concentrate, stress resistance, mental fortitude, development of psychological defence mechanisms, ability to set goals and plan their achievement, emotional intelligence, and the relationship between athletes and their coach.

To create a model of psychological support for the training of ski jumpers based on biopsychosocial factors, we used a modelling method.

Results of the study and discussion. A summary of accumulated experience on the research problem and our own results [3] allowed us to develop a model of psychological support for the training of athletes in ski jumping based on biopsychosocial factors, which is schematically presented in the figure 1.

It should be noted that the entire psychological support programme is agreed with the coaching staff before its implementation.

The innovative model has a block structure comprising four components: conceptual, diagnostic,

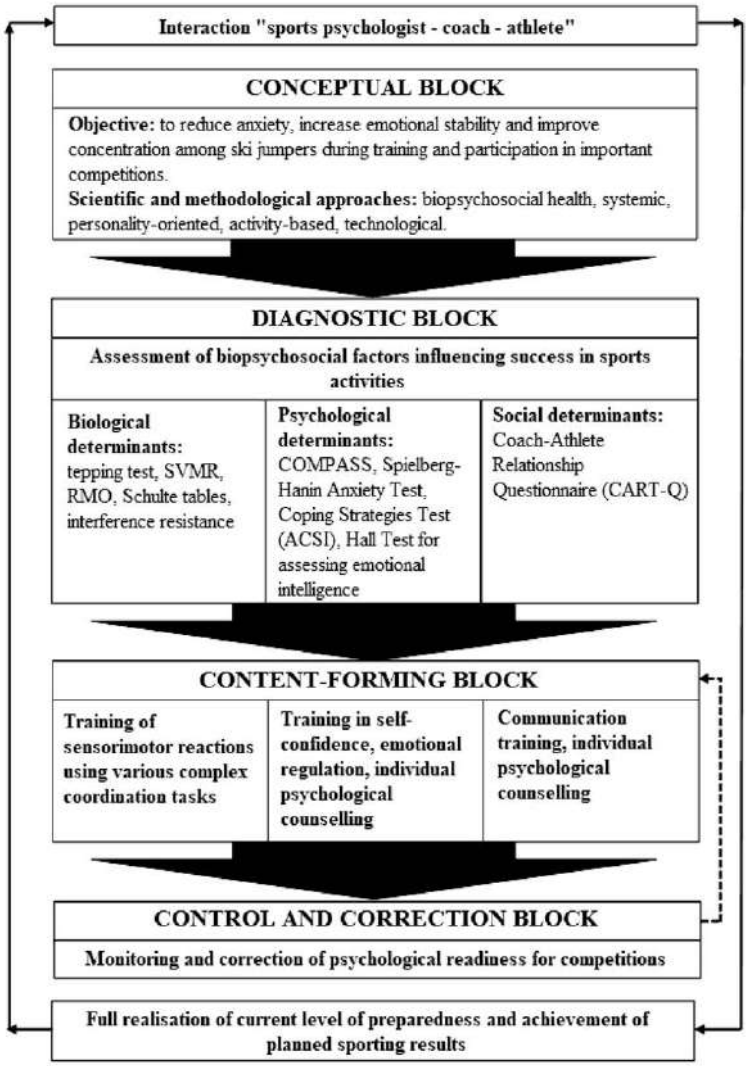

Fig. 1. Model of psychological support for the training of ski jumpers based on biopsychosocial factors

content-forming and control-correcting. Let us describe each of the blocks in more detail.

Conceptual block – contains the key idea, which is to organise psychological support based on a three-way interaction (sports psychologist – coach – athlete) using the assessment and diagnosis of biopsychosocial factors in ski jumpers and their systematic implementation in real sports training with a focus on the set goal and based on scientific and methodological approaches.

Diagnostic block – contains tools that can be used to assess the biopsychosocial factors of success in ski jumping. Biological determinants are mainly determined on the basis of psychophysiological indicators that are key to ski jumping: strength and balance of the nervous system (tapping test), speed of simple visual-motor reaction (SVMR), accuracy of reaction to a moving object (RMO), interference resistance, performance and concentration (Schulte tables).

The psychological determinants in our study were as follows: coping with unpleasant thoughts and emotions, activation and relaxation skills, engagement and 'flow', visualisation, self-efficacy, planning, activity under stress, relationship with the coach (methodology 'Categorical assessment of the mental strength and adaptability of an athlete' (COMPASS)); anxiety; characteristics of athlete behaviour in difficult situations (ACSI); emotional intelligence.

Social determinants include key indicators characterising the relationship between the coach and the athlete, including closeness, commitment and complementarity.

Content-forming block – this section of the model presents a pool of tools and methods for preventing the occurrence of unfavourable pre-start conditions in ski jumpers before participating in important competitions. To form biological determinants, athletes are encouraged to train their sensorimotor reactions using various hardware and software complexes, as well as complex coordination tasks during training.

To develop psychological determinants, specialised training is used to increase self-confidence and develop emotional regulation mechanisms, as well as individual psychological consultations to identify and eliminate personal problems and prevent neuroticism.

To develop social determinants, athletes are offered communication training and individual psychological consultations.

Control and correction block – focused on monitoring the comprehensive psychological preparedness of ski jumpers. If the results of the control examinations do not meet the planned targets, the sports psychologist, after discussion and agreement with the coach, may adjust the psychological support programme for the athletes.

Conclusions. Thus, members of the research team developed a model of psychological support for the training of ski jumpers based on biopsychosocial factors, consisting of four interrelated blocks: conceptual, containing the key idea of psychological support for the training of ski jumpers; diagnostic, including a pool of indicators for assessing the biological, psychological and social determinants of success in sports activities; content-forming, developing determinants of all types through various psychological means and methods integrated into ski jumping training; control and correction, aimed at obtaining feedback on the effectiveness of the psychological influences offered to athletes and making changes to the psychological support programme if necessary.

The proposed model helps to increase the effectiveness of psychological training for ski jumpers, providing a holistic approach to athlete development based on biopsychosocial factors.

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Modernisation of the physical education system as a factor in increasing stress resistance and developing students' psychophysical readiness for professional work

UDC 796.015

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Abstract

Objective of the study is to justify the need to use physical education methods to increase stress resistance and improve students' mental and physical preparedness for professional work.

Methods and structure of the study. To achieve this goal, a stress sensitivity test developed by Yu.V. Shcherbatykh was used. The study conducted at the beginning of the academic year involved first-year students studying in the following training areas: Medical Institute (hereinafter referred to as MI, 103 people); Polytechnic Institute (hereinafter referred to as PI, 56 people); Institute of Humanities and Sports (hereinafter referred to as IHaS, 38 people).

Results and conclusions. It has been established that there are differences in the subjective perception of increased stress due to the start of university studies among first-year students studying in various fields of study. Both young men and women use constructive and destructive ways to overcome stress, which requires explanatory work and increasing the importance of physical exercise to normalize the emotional background and reduce anxiety. In the process of physical education, it is necessary to promote the formation of psychophysical readiness, taking into account the requirements of future professional activity.

Keywords: *students, professional activity, stress resistance, survey, overcoming stress.*

Introduction. The transformation of requirements for modern workers in various sectors of the economy, caused by the intensification of labour, de-standardisation and the development of flexible forms of employment, as well as changes in the demand for skills and competencies, dictates the need to adjust the educational process and its results in higher education. This fully applies to the implementation of physical education and sports disciplines, whose current tasks are to develop students' psychophysical readiness for professional activity and to increase their stress resistance to stress factors in the natural and social environment [2-4].

Moreover, the above-mentioned areas of physical education for students are significant not only in the long term, but also directly during their studies at the university. The constant academic stress that young people experience, which intensifies during exam sessions, can have a negative impact not only on the quality of education, but also on health, communication and overall vitality. Particular attention should be paid to first-year students, as for many of them, the beginning of higher education is characterised by a sharp change in their social environment, the establishment of new communication links, the assimilation of the norms and requirements of academic life, everyday difficulties, etc. [1, 6].

Objective of the study is to justify the need to use physical education methods to increase stress resistance and improve students' mental and physical preparedness for professional work.

Methods and structure of the study. The research was conducted at the Department of Physical Education of Surgut State University. Stress sensitiv-

ity testing (Yu.V. Shcherbatykh) was conducted at the beginning of the academic year among first-year students enrolled in the following programmes: Medical Institute (hereinafter referred to as MI, 103 students); the Polytechnic Institute (hereinafter referred to as PI, 56 people); and the Institute of Humanities and Sports (hereinafter referred to as IHaS, 38 people) [5]. During the analysis of the obtained values, special attention was paid to the final indicator of stress sensitivity, students' subjective perception of increased constant stress during the adaptation period of university education, and the methods of coping with stress that young people use in their daily lives.

Results of the study and discussion. Most of the first-year students surveyed indicated that their level of constant stress had increased slightly over the recent period, and this was true for both young women and young men (Fig. 1). At the same time, when looking at the results by gender and field of study, it is important to note that more than a third of female students in the IHaS_F group believe that their stress levels have increased significantly. A high percentage of respondents from the polytechnic institute also agreed with this statement.

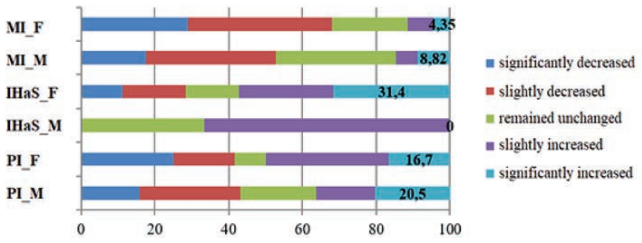

Fig. 1. Distribution of students according to their assessment of changes in their level of constant stress over the last period (in %)

How young people cope with stress is of significant importance in relation to the issue under consideration. Y.V. Shcherbatykh's test suggests assessing the use of destructive behaviours such as alcohol consumption, cigarette smoking, watching television, eating tasty food, and aggression towards other people [5]. Overall, the analysis of the results shows that most students do not abuse the above-mentioned behaviours. The average score prevails in the selected groups of students: 46.0% of young men and 65.7% of young women. However, unfortunately, 28.6% of the surveyed IHaS females quite often resort to destructive ways of coping with stress (Fig. 2).

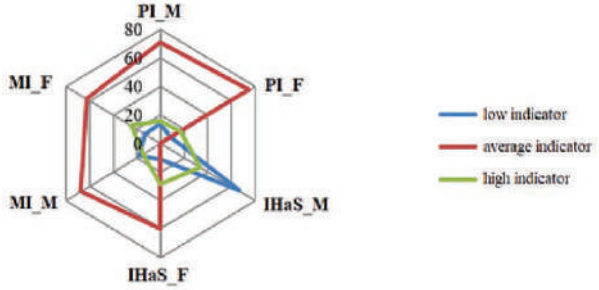

Fig. 2. Distribution of students by the indicator 'destructive coping with stress' (in %)

Against the backdrop of the identified data on the use of destructive methods of coping with stress, it is important to note the high values in constructive coping. Among young women, the percentage of high scores in the MI and PI groups differs positively from that of boys by more than ten points and amounts to 55.0% and 58.3%, respectively. In the IHaS_F group, high scores for constructive coping were found in only 28.6% of respondents. The maximum score of 10 points, corresponding to the assessment 'always use,' was given to physical activity by 15.3% of students.

The assessment of the final stress sensitivity indicator among the first-year students surveyed allows us to conclude that 21.75% of female MI respondents and 22.9% of IHaS respondents have a very high sensitivity to stress (Fig. 3).

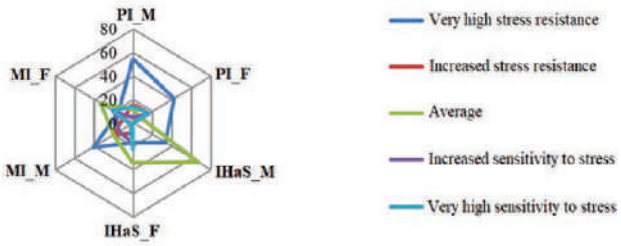

Fig. 3. Distribution of students by final stress sensitivity score (in %)

Among young men in the general sample, 'very high stress resistance' prevails - 33.9% and indicators corresponding to the 'average' scale - 29.1% of respondents. Among young women, 20.4% were found to have 'very high sensitivity to stress' and 17.5% had 'increased sensitivity to stress.'

In the process of implementing physical education and sports disciplines, it becomes relevant to teach students constructive ways to overcome stress (autogenic training, breathing techniques, muscle relaxation, physical exercises, etc.), as well as the formation of motivation for independent physical activity as an effective means of reducing

anxiety and improving the overall emotional background.

Conclusions. The results presented confirm the need for targeted use of physical education to increase students' stress resistance. The differences identified between young men and women, as well as between first-year students studying in different fields, are important. It should be noted that during the academic year, the impact of stress factors and their intensity can vary significantly, which requires an individual approach and the selection of appropriate means and methods, taking into account the needs of students.

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Assessment of the interrelationship between competitive confidence and cognitive skills among basketball players

UDC 796.011.1

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Abstract

Objective of the study is to determine how competitive confidence correlates with the mental skills of students of different levels of skill in sport.

Methods and structure of the study. The study sample consisted of 25 basketball players from the first and second basketball teams of the Ural Federal University (UrFU). The first team won the Belov League in the 2023-2024 and 2024-2025 seasons. To assess confidence and mental skills, the Competitive State Anxiety Inventory (CSAI-2), the Ottawa Mental Skills Assessment Test (OMSAT), and the Mental Toughness Scale (MTS) adapted by K.A. Bocharov et al. (2020) were used. Participation in the study was voluntary, and Google Forms was used to collect data.

Results and conclusions. Significant differences were found in competitive confidence scores, which were higher in the first team, which had a higher level of skill, and in cognitive anxiety scores, which were higher in the second team players. The assessment of the mental skills of athletes from the first and second teams also confirmed the existence of significant differences in terms of self-confidence, anxiety management, interference resistance, and imagination. According to the results of the correlation analysis, a relationship was found between confidence and mental toughness (r_s=0.553, $p<0.01$), stress resistance (r_s=0.484, $p<0.05$), and anxiety management (r_s=0.510, $p<0.05$). The data obtained indicate that self-confidence and mental skills of athletes are interrelated and suggest the need to develop special psychological programmes for their development.

Keywords: *competitive confidence, cognitive abilities, athletic training, basketball players.*

Introduction. The growing popularity of student basketball is leading to increased competition, making the psychological resilience of student basketball players a significant factor in their success. The psychological reliability of athletes is manifested in their ability to demonstrate high performance in stressful competitive situations, i.e., to perform without mistakes or breakdowns [3, 4]. According to a number of researchers, it is self-confidence that is the key characteristic that ensures the psychological reliability of basketball players [2, 5].

Objective of the study is to determine how competitive confidence correlates with the mental skills of students of different levels of skill in sport.

Methods and structure of the study. 25 student basketball players participated in the scientific work, including 13 players from the UrFU first team, winners of the Belov League in 2024 and 2025, and 12 players from the UrFU second team (Ekaterinburg). The following methods were used to assess confidence and mental skills: competitive anxiety, CSAI-2 (M. Martens et al.), adapted by K.A. Bochaever, L.M. Dovzhik, A.O. Savinkina (2020) [1], the Ottawa Mental Skills Assessment Test (OMSAT) and the Mental Toughness Scale (MTS), adapted by K.A. Bochaever, L.M. Dovzhik, M.D. Balakshina (2020) [1]. Statistical analysis was performed in SPSS version 21.0. To compare psychological indicators, the Mann-Whitney U test was selected for two independent samples. To study the relationship between self-confidence and mental skills, a correlation analysis was performed using Spearman's criterion.

Results of the study and discussion. Results of the Competitive Stress Anxiety Inventory (CSAI-2) test, presented in Table 1.

As can be seen from Table 1, team 1 of basketball players tend to have higher levels of competitive confi-

Table 1. Data on the 'competitive anxiety' test among students who are basketball players on the first and second teams

Indicators	Team 1		Team 2		U Mann-Whitney	Significance level p
	Average	Standard deviation	Average	Standard deviation		
Cognitive anxiety	16,4	3,87	22,0	7,27	30,5	0,046
Self-confidence	26,7	3,5	22,4	6,02	33,5	0,053
Somatic anxiety	15,6	3,43	17,3	4,99	51,5	0,418

dence and lower levels of cognitive anxiety, indicating that players with higher skill levels have greater psychological potential.

The results of the mental skills test (OMSAT) are presented in Table 2.

Based on the data in Table 2, we can talk about significant differences in the level of mental skills development in terms of such indicators as self-confidence, anxiety management, and imagination, where the values in the first team are significantly higher compared to the second team.

In addition, despite the absence of statistically significant differences, the players of the first team have higher average values for stress resistance and interference resistance compared to the second team.

The data suggest that the confidence of athletes and a number of mental skills that directly ensure control over the psychological state during competitions are higher in athletes with a higher level of athletic skill.

Correlation analysis conducted on the results of three methods showed that self-confidence is directly related to mental characteristics such as mental toughness ($r_s=0.553$, $p<0.01$), stress resistance ($r_s=0.484$, $p<0.05$), anxiety management ($r_s=0.510$, $p<0.05$), and imagination ($r_s=0.438$, $p<0.05$).

Conclusions. The study proves that basketball players with higher skill levels have significantly higher levels of self-confidence and mental skills that reduce anxiety, which, in our opinion, ensures a higher level of psychological reliability in competitions and, as a result, high success rates. The identified correlations between the confidence of student basketball players and mental toughness, anxiety management, stress resistance, and imagination prove the need to organise psychological work aimed primarily at developing these psychological indicators in student basketball players.

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Table 2. Data on the 'mental skills' test for basketball players in the first and second teams

Indicators	Team 1		Team 2		U Mann-Whitney	Significance level p
	Average	Standard deviation	Average	Standard deviation		
Determination	5,40	0,65	5,08	0,96	65,5	0,510
Hard work	4,71	1,41	4,38	1,75	70,5	0,703
Self-confidence	5,67	0,56	4,85	0,86	38,5	0,032
Stress resistance	4,20	1,41	3,32	1,51	61,0	0,368
Anxiety management	4,73	0,85	2,56	1,60	20,5	0,002
Relaxation	4,17	1,11	3,73	1,37	62,5	0,413
Mobilisation	4,67	1,05	4,50	0,82	68,0	0,603
Concentration	4,60	1,17	4,09	1,65	60,5	0,354
Interference resistance	3,67	0,94	2,50	1,26	65,0	0,123
Imagination	5,65	0,68	3,88	1,12	18,5	0,001
Ideomotor skills	4,68	0,88	4,52	0,96	55,5	0,230
Planning	4,21	1,14	3,87	1,05	55,5	0,229

The role of ideomotor representations in the displacement of the overall centre of mass

UDC 376.2

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Abstract

Objective of the study is to determine how ideomotor processes affect the displacement of the centre of mass.

Methods and structure of the study. The scientific work was carried out on the basis of the Center for Adaptive Physical Culture of Petrozavodsk State University. The experimental group consisted of 14 students. The assessment of postural stability was carried out using a Stabilan-01-2 stability analyzer equipped with a biofeedback function. To determine the effect of visual afferentation, the basic indicators of postural balance were recorded using a simple Romberg test (with eyes open and closed) – stability was assessed with and without maintaining visual control in a standard static pose.

Results and conclusions. It has been established that ideomotor load affects posture by increasing the amplitude of oscillations of the general centre of mass without shifting its systematic position, which is recorded by stabilography and confirms the manifestation of the ideomotor act during postural control. The inclusion of ideomotor exercises with visual biological feedback in the system of adaptive physical education classes appears to be an effective method for stabilising posture in individuals with musculoskeletal disorders, including cerebral palsy.

Keywords: *centre of mass, adaptive physical education, ideomotor representations, muscle functions, cerebral palsy.*

Introduction. Contemporary scientific works have published convincing evidence that imagined movements contribute to the initiation, learning, restoration, and improvement of muscle functions [4]. Researchers note that mentally performed physical exercises are accompanied by distinct changes in vegetative functions (ideomotor representations) [1].

The results of the analysis of physiological and clinical data confirm the assumption that the internal representation system is a complex of complex brain mechanisms underlying many functions related to one's own body and the immediate external space [3].

Yu.K. Stolbkov and Yu.P. Gerasimenko note that representation is a hidden stage of action, which includes the goal, means, and consequences of its implementation for the organism and the external world [5, 6].

A significant advantage of cognitive rehabilitation of motor functions is the possibility of its application not only in healthcare organisations or rehabilitation centres [7], but also in adaptive physical education classes, either independently or under the guidance of a specialist, which contributes to the spread of this method.

Objective of the study is to determine how ideomotor processes affect the displacement of the centre of mass.

Methods and structure of the study. The scientific work was carried out at the Centre for Adaptive Physical Culture at Petrozavodsk State University. The experimental group consisted of 14 students. Postural stability was assessed using the Stabilan-01-2 stabiliser, equipped with a biological feedback function.

To determine the influence of visual afferentation, basic indicators of postural balance were recorded using a simple Romberg test (with eyes open and closed) – stability was assessed while maintaining visual control in a standard static position and in the absence of visual control. In addition to screening for possible stability and coordination disorders, the result of the Romberg test was a control condition characterising the effect of the absence of visual af-

ferentation. This made it possible to compare it with tests involving cognitive-motor load, in which a more pronounced destabilisation of postural balance was expected. After the Romberg test, specialised tests were performed. In the first test, the subject consciously controlled the position of the centre of mass to move the cursor on the monitor screen along a given trajectory (visualisation of three squares). The second test (ideomotor test) was performed while mentally imagining the movement of the cursor along a given square, following instructions to minimise any conscious postural movements. The setup for this test involved consciously suppressing motor activity while simultaneously performing a cognitive task consisting of mentally reproducing the movement and visually tracking the cursor. The deviations in stability parameters (amplitude, speed of oscillation of the centre of mass) recorded in the stabilogram relative to the control indicators in the Romberg tests with open and closed eyes and test No. 1 were interpreted as objective manifestations of the ideomotor act.

Results of the study and discussion. Analysis of stabilographic data revealed fundamentally different patterns of postural control under the conditions studied. Performing test No. 1 (active movement) predictably led to a sharp increase in the ellipse of oscillations of the total centre of mass by 2-3 orders of magnitude (from 23,018.7 to 47,116.6 mm2), compared to the Romberg test with eyes closed (from 54.6 to 122.9 mm2), which corresponds to significant purposeful movements of the total centre of mass in space. This was confirmed by high values of average speed (45.68–76.28 mm/s) and trajectory length in the sagittal and frontal planes, as well as significant shifts in the common centre of mass in some subjects.

In contrast to active movement, the performance of test No. 2 caused a qualitatively different effect, objectively confirming the influence of mental representation on postural control. The key indicator of this influence was the parameter of the ellipse area. In 10 of the 14 subjects, the area of the total centre of mass fluctuations in test No. 2 exceeded the values recorded in the Romberg test with closed eyes, demonstrating a moderate increase in the amplitude of fluctuations (from 44.6 to 133.8 mm2). At the same time, the values of the ellipse area in test No. 2 remained significantly lower than in test No. 1, emphasising the specificity of the ideomotor effect (Table 1). The average speed of movement of the common centre of mass (7.29 mm/s) and the length of the trajectory in test No. 2 did not statistically differ from the indicators of the Romberg test with closed eyes (9.78 mm/s) and were lower than in test No. 1.

An important indicator is the absence of a systematic shift in the position of the common centre of mass in test No. 2 (X from -1.97 to 2.41 mm; Y from -3.27 to 6.25 mm) compared to the Romberg tests (X from -4.46 to 4.89 mm; Y from -4.49 to 4.46 mm). This may indicate that ideomotor representations do not cause a purposeful shift in the centre of pressure, but lead to an increase in the amplitude of its oscillations around the average position.

The observed decrease in stability indicators during visual deprivation in the Romberg test confirms the adequacy of the subjects' postural system response. Individual manifestations of the severity of the ideomotor load effect (for example, in subject No. 4: the area of the ellipse in test No. 2 is larger than in the Romberg test with closed eyes, 131.3 mm2 and 115.5 mm2, respectively) may reflect differences in the ability to ideomotor representation or suppression of involuntary movements.

Thus, the results obtained demonstrate that ideomotor representations associated with visual tracking and conscious suppression of movements cause a statistically significant and specific change in postural control. The main objective manifestation of the ideomotor act is an increase in the amplitude of the oscillations of the overall centre of mass (registered as an increase in the area of the statokinesiogram), without a significant systematic shift in its position or an increase in the average speed of movement. This effect

Table 1. Average stabilographic test results (excluding min/max values)

Parameter	Romberg test (eyes open)	Romberg test (eyes closed)	Test 1 (active movement)	Test 2 (ideomotor test)
Frontal displacement (X), mm	0,24	0,77	-5,22	-0,33
Sagittal displacement (Y), mm	-1,94	0,65	7,95	0,90
Ellipse area (S), mm2	84,48	84,07	36444,65	135,57
Average velocity (V), mm/s	8,59	9,78	60,71	7,29
Trajectory length (X), mm	99,48	116,27	2108,78	238,47
Trajectory length (Y), mm	117,97	137,23	1788,07	292,07

is qualitatively different from the total destabilisation during active movement and moderate deterioration of stability during simple visual deprivation.

Conclusions. The results of the study suggest that ideomotor load affects posture by increasing the amplitude of oscillations of the overall centre of mass without shifting its systematic position, which is recorded by stabilography and confirms the manifestation of the ideomotor act in postural control. The inclusion of ideomotor exercises with visual biological feedback in the system of adaptive physical education classes appears to be an effective method for stabilising posture in individuals with musculoskeletal disorders, including cerebral palsy.

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Research into factors of motivation and self-regulation in sporting activities

UDC 159.9

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Abstract

Objective of the study is to identify the relationship between motivation and self-management ability in athletes.

Methods and structure of the study. The research was conducted using two methodologies: 'Assessment of motives in professional sports' by L. Pelletier and R. Vallandry (adapted by K.A. Bocharov et al.) and 'Methodology for studying self-management' by Yu. Kuly and A. Furman (adapted by O.V. Mitina and E.I. Rasskazova). The sample consisted of 50 active athletes (28 young women and 22 young men) aged 16 to 21, engaged in various sports (football, volleyball, figure skating, etc.). Statistical analysis of the data was performed using the jamovi Desktop programme, including correlation analysis based on Spearman's rank correlation criterion.

Results and conclusions. The analysis showed that internal motivation prevails among athletes, which is confirmed by high scores on the 'Emotions' and 'Self-development' scales. External stimuli, such as social approval or a sense of duty, play a less significant role. Respondents demonstrate a strong internal motivational base, contributing to sustained engagement in the training process. Athletes showed higher levels of cognitive self-regulation, internal motivation, and planning than on the emotional regulation and volitional activity scales. This may limit their ability to cope with stress, overcome setbacks, and achieve long-term goals. Correlation analysis revealed significant positive links between the internal motivation scales and self-management components, which is consistent with self-determination theory. The inverse links between demotivation and initiative and overcoming setbacks indicate a decline in the regulatory system when the personal meaning of the activity decreases.

Keywords: *motivation, self-management, professional activity, athletes, sports psychology.*

Introduction. Motivation and self-management are complex psychological phenomena that play a central role in professional activity. In modern conditions, their study is becoming particularly important, as they determine not only achievements, but also the overall psychological well-being of the individual.

Contemporary research emphasises the multi-component nature of motivation, where internal drives and external stimuli, personal factors and environmental influences are intertwined [2, 4, 5, 6].

In sports psychology, this dynamic is particularly evident: an athlete's success depends on the complex interaction of motivation, external rewards, and the ability to self-regulate.

The development of self-management skills is of particular importance, as they enable athletes to cope effectively with stress, achieve their goals, and maintain psychological stability. At the same time, the external environment — coaching style, social support, sports culture — has a significant impact on the formation of an athlete's psychological state and motivational profile [3].

Objective of the study is to identify the relationship between motivation and self-management ability in athletes.

Methods and structure of the study. The following methods were selected for the study:

1. 'Assessment of motives in professional sports' by L. Pelletier and R. Valléran (adapted by K.A. Bochaever, I.T. Vykhodets, and V.N. Kasatkin)

2. 'Methodology for researching self-management' by Yu. Kuly, A. Furman (adapted by O.V. Mitina, E.I. Rasskazova);

Sample characteristics: the sample consists of

50 active athletes (football, volleyball, figure skating, swimming, rhythmic gymnastics, sports acrobatics, artistic gymnastics, athletics, combined events, cross-country skiing, tennis, rifle shooting, karate, freestyle wrestling, army hand-to-hand combat, powerlifting) aged 16 to 21, including 28 young women and 22 young men.

Statistical analysis was performed using the jamovi Desktop programme.

Results of the study and discussion. Analysis of average values using the 'Assessment of motives in professional sport' methodology showed that, based on the sample, the values are high on the following scales: 'Emotions' (M=23, with a maximum possible value of 28), 'Self-development' (M=23); average values on the 'Cognition' (M=20) and 'Goal Shift' (M=17) scales; low values on the 'Duty' (M=17), 'Social Approval' (M=10), and 'Demotivation' (M=11) scales.

Respondents demonstrate a strong internal motivational base, which contributes to sustained engagement in the training process. The desire to learn and acquire new skills plays a secondary role compared to enjoyment and self-development. Nevertheless, this indicator remains significant and emphasises the importance of the educational aspect in sports activities. Low or average scores on the external motivation scales ('Duty,' 'Social Approval,' 'Goal Displacement') indicate the predominance of internal motivation over external stimuli. The low score on the 'Demotivation' scale indicates a lack of a pronounced desire to stop participating in sports.

Analysis of the average values using the 'Self-Management Research Methodology' showed the following: the 'Self-Regulation' component (M=35, with a maximum possible value of 48), the 'Self-Determination' scale (M=12), 'Self-Motivation' (M=12), 'Self-Relaxation' (M=11); component 'Self-Control' (M=23, with a maximum possible value of 32), scales 'Cognitive Self-Control' (M=12), 'Affective Self-Control' (M=11); the 'Will Development' component (M=31, with a maximum possible value of 48), the 'Initiative' scale (M=11), 'Willpower' scale (M=10), 'Ability to Concentrate' scale (M=10); component 'Self-Sensitivity' (M=31, with a maximum possible value of 48), scales 'Orientation towards action after failure' (M=10), 'Congruence with one's own feelings' (M=10), 'Integration of Contradictions' (M=11); component 'Experiencing general life stress' (M=20, with a maximum possible value of 32), scales 'Overcoming Failures' (M=9), 'Orientation towards action in anticipation of success' (M=11).

Thus, respondents' levels of cognitive self-regulation, internal motivation, and planning ability are higher than their levels of emotional regulation and volitional qualities, which may limit their ability to cope with stress, overcome setbacks, and achieve long-term goals.

During correlation analysis (using Spearman's rank correlation criterion), correlations were identified between motivation scales and self-management scales:

'Emotions' and 'Self-Motivation' ($R_s = 0.460$, $p < 0.001$)

'Emotions' and 'Self-Determination' ($R_s = 0.399$ at $p < 0.001$);

'Emotions' and 'Cognitive Control' ($R_s = 0.323$ at $p < 0.001$);

'Cognition' and 'Self-Determination' ($R_s = 0.471$ at $p < 0.001$);

'Cognition' and 'Integration of Contradictions' ($R_s = 0.367$ at $p < 0.001$);

'Self-Development' and 'Self-Motivation' ($R_s = 0.460$ at $p < 0.001$);

'Demotivation' and 'Initiative' ($R_s = -0.424$ at $p < 0.001$);

'Demotivation' and 'Overcoming Failures' ($R_s = -0.412$ at $p < 0.001$);

The identified positive correlations between the scales of internal motivation – 'Emotions,' 'Cognition,' 'Self-development' – and the components of self-management confirm the theoretical provisions of the self-determination approach to motivation. According to E. Deci and R. Ryan's Self-Determination Theory, intrinsic motivation is based on the satisfaction of three basic needs: autonomy, competence, and relatedness. It contributes to the formation of a stable regulatory structure, autonomous goal setting, and voluntary behaviour control, which is consistent with the high values of the 'Self-Motivation,' 'Self-Determination,' and 'Cognitive Control' scales.

The reverse correlations found between the 'Demotivation' scale and the self-management components 'Initiative' and 'Overcoming Failures' indicate a decline in the regulatory system when the personal meaning of an activity is lost. Demotivation is interpreted as a general decrease in personal involvement, emotional reinforcement, and meaningful support, which is reflected in a decrease in voluntary activity and the ability to sustain effort.

E.I. Berilova et al. [1] in their study link the development of demotivation with perfectionist attitudes and external pressure, especially in cases where the athlete's personal maturity is not sufficiently developed. At the same time, there is a decrease in initiative, volitional flexibility, and a tendency toward mental rigidity. This is reflected in our data: participants with high levels of demotivation demonstrate lower values of volitional activity indicators, in particular initiative and resilience to failure.

Conclusions. The study confirmed that athlete motivation is a complex and multifaceted phenomenon involving a combination of internal drives and external stimuli; it confirmed the key role of internal motivation and cognitive self-regulation in achieving success in sport. External factors play a secondary role. This is consistent with self-determination theory, which emphasises the importance of autonomy and intrinsic meaning in activities for the formation of sustainable motivation.

To achieve maximum results, it is important to harmoniously develop both the cognitive and emotional-volitional aspects of self-management, creating conditions for the formation of a sustainable motivational base and psychological stability. These conclusions are of great importance for improving sports training methods and increasing the effectiveness of working with athletes. Based on the data obtained, training programmes can be developed aimed at developing the emotional and volitional aspects of self-management. Particular attention should be paid to reducing external pressure and creating conditions for autonomous goal setting. Further research may focus on the role of external factors (coaching style, social support) on the motivational profile of athletes.

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Physical practices as a way to improve the psycho-emotional state of students in a special medical group (A)

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Abstract

Objective of the study is to assess the impact of body-oriented creative techniques and breathing practices on the psycho-emotional state of students in a special medical group.

Methods and structure of the study. The experiment involved 126 first- to third-year students from a special medical group, aged 17 to 19 (Mage = 18.3; SD = 4.12; 87 young women and 39 young men). The study was conducted based on the method of M. Lüscher (colour choice method – MCC – modified by L.N. Sobchik). Fisher's criterion and rank statistics of the number of observations were used to process quantitative data.

Results and conclusions. The following techniques were used in physical education classes with students of the special medical group: yoga, body-oriented creative techniques and breathing training. Before and after classes, students of the special medical group laid out stimulus material (using the Lüscher method) to assess their psychoemotional state. Physical education classes in an educational format were conducted with students for 4 months. The structure of the lesson corresponded to the traditional model and included preparatory, main and final parts, the duration of classes ranged from 45 to 60 minutes. The intensity of the psychophysical load in the classroom did not exceed the requirements for wellness training based on an individual approach, taking into account the possibilities and limitations. During the lessons, pedagogical control was carried out over the condition of the students.

Studies have shown that all techniques have a positive effect. So, after classes, the indicators of self-esteem in a positive mood and well-being improve. At the same time, the technique of body-oriented creative technique based on the dance-movement direction has caused the most positive changes.

Keywords: *special medical group, psycho-emotional state, physical practices, yoga, breathing practices.*

Introduction. Currently, there has been an increase in the number of students with health problems related to psycho-emotional disorders. This article discusses the possibilities of psychological correction for students based on accessible physical activity.

One of the significant strategic tasks of the state in the sphere of increasing the well-being and prosperity of the nation is to preserve and strengthen the physical, mental and social health of the younger generation and, above all, of students, as they are actively involved in all spheres of human activity and constitute the intellectual and economic potential of the country [1, 2].

At the same time, negative socio-economic, demographic and environmental factors, an unbalanced diet, harmful habits and stressful situations associated with exams lead to disorders of the musculoskeletal system, cardiovascular, respiratory and regulatory systems, and also contribute to depressive states and neuropsychiatric disorders [4, 5].

One of the main means of correcting health indicators is physical activity that is adequate to one's abilities and limitations, contributing to the expansion of the body's functional capabilities, improvement of the main indicators of physical development and psycho-emotional state [3, 4]. Neurobiological data confirm that changes in the representation of actions are primarily associated with perceptual-cognitive rather than motor aspects [6]. In this regard, the development and improvement of methods for designing health-promoting training programmes to strengthen health, increase physical activity and correct the psycho-emotional state are of particular importance.

Objective of the study is to assess the impact of body-oriented creative techniques and breathing practices on the psycho-emotional state of students in a special medical group.

Methods and structure of the study. The scientific experiment involved pedagogical observation, a self-assessment survey, and testing before and after physical education classes at the university using the Lüscher method [5], as well as statistical analysis of the data. The study involved 126 first- to third-year students from a special medical group, aged 17 to 19. The students have health issues and are involved in recreational physical education.

Results of the study and discussion. The results of a survey conducted to determine the reasons for the unsatisfactory attendance of physical education classes by students in the special medical group showed that the most common response was: 'I don't like the psycho-emotional state after classes' – 87%, 65% felt depressed, 23% felt tired and irritated, and only 12% of students in the special medical group responded that they felt neutral after classes.

A significant proportion of students (89%) noted that they were motivated to attend classes by the 'credit' rather than the process itself. When asked the open-ended question, 'What would you like to see in your classes to increase your interest in them?', students responded that it could be mental fitness activities (yoga – 38%; Eastern health techniques – 33%). In second place were classes incorporating breathing and eye movement exercises (15%), while the rest chose body-oriented creative techniques (dance and movement) and autotraining techniques (14% of students in the special medical group).

Based on the results of the study, a programme was developed to motivate students in the special medical group to participate in physical education classes. The programme was implemented over a period of four months and included a combination of techniques: yoga, body-oriented creative techniques (BOCT) and breathing training (BT). Each session lasted 45 minutes and was tailored to the individual psychophysical abilities of students in the special medical group.

The next task was to investigate the effects of the presented health improvement techniques separate-

Table 1. Average colour rankings in the Lüscher test before and after yoga (Yoga), body-oriented creative techniques (BOCT) and breathing training (BT) classes (at n=121 and above; tcritical_0.05≈1.97; tcritical_0.01≈2.61; tcritical_0.001≈3.32)

Col.	Йога		BOCT		BT	
	before	after	before	after	before	after
(1)	4,6±0,19	3,9±0,16	3,5±0,08	3,5=5±0,06	4,5±0,14	3,7±0,06
	t = 2,81 (p<0,01)		t = 2,05 (p<0,05)		t = 4,82 (p<0,001)	
(2)	5,42±0,09	5,81±0,14	5,65±0,06	5,81±0,07	5,76±0,13	6,63±0,09
	t = 2,34 (p<0,05)		t = 2,08 (p<0,05)		t = 5,65 (p<0,001)	
(3)	6,41±0,06	6,64±0,05	6,57±0,14	7,4±0,07	6,46±0,13	6,91±0,10
	t = 1,99 (p<0,05)		t = 5,21 (p<0,001)		t = 3,01 (p<0,01)	
(4)	5,50±0,14	6,2±0,13	5,30±0,12	6,30±0,11	4,66±0,15	5,72±0,08
	t = 3,06 (p<0,01)		t = 5,95 (p<0,001)		t = 5,08 (p<0,001)	
(5)	6,11±0,09	6,14±0,07	6,7±0,14	6,1±0,08	6,7±0,09	6,19±0,12
	t = 0,17 (p>0,05)		t = 3,83 (p<0,001)		t = 3,83 (p<0,001)	
(6)	2,57±0,11	3,29±0,10	2,9±0,05	3,06±0,05	2,88±0,09	3,14±0,07
	t = 4,98 (p<0,001)		t = 2,08 (p<0,05)		t = 2,26 (p<0,05)	
(7)	1,45±0,07	1,18±0,04	1,8±0,08	1,23±0,03	1,42±0,05	1,14±0,03
	t = 3,46 (p<0,001)		t = 7,09 (p<0,001)		t= 4,44 (p<0,001)	
(0)	3,93±0,17	3,06±0,12	3,6±0,18	2,8±0,10	3,9±0,19	3,13±0,14
	t = 4,52 (p<0,001)		t = 3,85 (p<0,001)		t = 3,72 (p<0,01)	

Note: 1 – Blue, 2 – Green, 3 – Red, 4 – Yellow, 5 – Purple, 6 – Brown, 7 – Black, 0 – Grey.

ly on the psycho-emotional states of students in the special medical group (Table 1).

Data analysis revealed an improvement in the overall psycho-emotional state of students:

1. Anxiety and aggression (colour: black – 7)

Yoga: the black colour rating decreased from 1.45 to 1.18 ($t=3.46$, $p<0.001$). This reflects a significant reduction in anxiety, internal tension and hidden aggression. Yoga helps students reduce emotional tension, especially that associated with anticipation of stressful situations.

Body-oriented creative techniques: the most pronounced decrease – from 1.8 to 1.23 ($t=7.09$, $p<0.001$). This is the most pronounced effect among the techniques analysed. TOT, which includes physical practices, movement and creative self-expression, promotes the expression of suppressed emotions and the release of internal blocks, which is especially important for students with chronic stress.

Breathing training: decrease from 1.42 to 1.14 ($t=4.44$, $p<0.001$). The effect is similar to yoga in terms of values, but relatively more stable and rapid. Breathing directly regulates the autonomic nervous system, which explains the instantaneous reduction in anxiety.

2. Need for harmony and tranquillity (blue – 1)

Yoga: blue ranking decreases from 4.6 to 3.9 ($t=2.81$, $p<0.01$). This means that after class, students are more inclined towards tranquillity. Yoga, as a practice of balancing the body and mind, reinforces this need.

Body-oriented creative techniques: virtually no change (from 3.5 to 3.55, $t=2.05$, $p<0.05$ – slight decrease). BOCT does not focus on inner harmony, but rather on external self-expression in movement.

Breathing training: the most pronounced decrease – from 4.5 to 3.7 ($t=4.82$, $p<0.001$). Breathing practices deeply calm and activate the parasympathetic system, which manifests itself in a heightened desire for inner peace.

3. Activity and energy (red – 3)

Yoga: a slight increase in rank (from 6.41 to 6.64, $t=1.99$, $p<0.05$). This may indicate a slight decrease in the desire for active activity.

Body-oriented creative techniques: significant increase in rank – from 6.57 to 7.4 ($t=5.21$, $p<0.001$). Accordingly, there is a significant decrease in psycho-emotional tension, aggression, and excessive activity.

Breathing training: increase in rank from 6.46 to 6.91 ($t=3.01$, $p<0.01$). There is a decrease in activity, but less pronounced than with BOCT.

After yoga-based classes, most students in the special medical group (69%) ranked red first, indicating increased activity and an excellent emotional state. At the same time, some students (21%) ranked purple first and red second, which may be due to increased excitability and tension.

Conclusions. To improve your mental and emotional state, it is important to properly dose, alternate, and combine different types of exercise: Yoga – BOCT – BT. Moderate-intensity exercises should be included to improve aerobic endurance, but high-intensity exercises and exercises that place a heavy load on the joints and cardiorespiratory system should be avoided to prevent injury and disruption of the adaptation process. Great importance should also be attached to yoga as a means of improving your mental and emotional state, as well as relieving fatigue and muscle tension and speeding up the recovery process.

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Features of the cardiovascular response of young hand-to-hand combat athletes to physical exertion

UDC 796.8

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Abstract

Objective of the study is to evaluate the cardiovascular response of young hand-to-hand combatants with different training experience to a typical physical load.

Methods and structure of the study. The study included 48 young athletes (aged 19.8±0.62 years), systematically engaged in hand-to-hand combat 3-4 times a week. The athletes were divided into three groups by sports experience: 1 year - 19 people, 2 years - 15 people, 3 years - 14 people. The control group consisted of 17 healthy young men (20.1±0.54 years) who had never been involved in sports. Pulse rate, blood pressure, vital capacity of the lungs and endurance indicators were assessed before and after performing a standardized load. Statistical data processing was performed using Student's t-test.

Results and conclusions. With increasing athletic experience, hand-to-hand combatants showed a decrease in baseline heart rate and blood pressure, a reduction in the cardiovascular system's response to exercise, and an increase in endurance and lung capacity. In the control group, these indicators remained at a lower level and demonstrated less pronounced adaptation to exercise. The results confirm the undoubted positive effect of regular hand-to-hand combat training in terms of strengthening the cardiovascular system and increasing the overall functional reserves of the body of those involved.

Keywords: *hand-to-hand combat athletes, functional response, cardiovascular system, physical exertion.*

Introduction. Rational physical activity is an important factor in strengthening health and improving the functional capabilities of the body [3, 4]. Adequate adaptation of the cardiovascular system to physical exertion is of particular importance [1], which is especially relevant for athletes in combat sports that require high endurance and coordination of movements [2]. Hand-to-hand combat combines aerobic and anaerobic exercise, requiring the cardiovascular system and pulmonary structures to work effectively [5, 10]. The degree to which the body adapts to training loads depends on the duration and regularity of training [6].

Objective of the study is to evaluate the cardiovascular response of young hand-to-hand combatants with different training experience to a typical physical load.

Methods and structure of the study. The work was carried out as part of the implementation of the development programme of the South-Western State University, project 'Priority 2030'. The study was conducted on the basis of the hand-to-hand combat section. All subjects were full-time students of the university. The study involved 48 young men (19.8±0.62 years old) who practised hand-to-hand combat 3-4 times a week. The groups were divided according to their length of training: 1 year (n=19), 2 years (n=15), 3 years (n=14). The control group consisted of 17 healthy young men (20.1±0.54 years) who had never previously participated in sports. All participants were clinically healthy, with no signs of somatic pathology.

The functional state of the cardiovascular system was assessed by heart rate (HR), systolic (SBP) and diastolic blood pressure (DBP), measured before and immediately after physical activity. The exercise consisted of 3 sets of 30 seconds of basic hand-to-hand combat movements (strikes, blocks, movements), with a 1-minute rest interval. In addition, vital capacity

Table 1. Indicators for young hand-to-hand fighters and the control group (M±m)

Group	HR before exercise, bpm	HR after exercise, bpm	HR increase, bpm	SBP before exercise, mmHg	SBP after exercise, mmHg	VC, litres	Exercise duration, minutes
Control (n=17)	85,7±1,35	111,0±1,50	25,3±0,45	126,5±1,72	142,3±1,95	3,3±0,15	2,1±0,21
Hand-to-hand fighters, 1 year (n=19)	78,5±1,24*	97,2±1,43*	18,7±0,24**	119,2±1,54	132,1±1,73	3,6±0,14*	2,8±0,26**
Hand-to-hand fighters, 2 years (n=15)	74,3±1,06*	88,8±1,26**	14,5±0,35**	115,7±1,37*	127,0±1,58*	3,9±0,16*	3,5±0,32**
Hand-to-hand fighters, 3 years (n=14)	70,1±0,92**	81,3±1,05**	11,2±0,28**	112,4±1,13*	120,5±1,32*	4,2±0,11**	4,1±0,27**

*Note: significant differences compared to the control group: * – p<0.05, ** – p<0.01.*

(VC) was assessed using spirometry and endurance was assessed based on the time the exercise was maintained until pronounced fatigue.

Statistical data processing was performed using Student's t-test. The significance level was set at p<0.05.

Results of the study and discussion. The initial HR values for hand-to-hand fighters with 1, 2, and 3 years of experience were 78.5±1.24, 74.3±1.06, and 70.1±0.92 beats per minute, respectively, which was significantly lower than in the control group (85.7±1.35 beats per minute). Similarly, baseline SBP levels were lower in athletes (1 year – 119.2±1.54 mmHg, 2 years – 115.7±1.37, 3 years – 112.4±1.13) than in the control group (126.5±1.72 mmHg). DBP values tended to decrease in athletes as their athletic experience increased (Table 1).

After physical exertion, HR increased in all groups, but this increase decreased as athletic experience increased: 1 year – 18.7±0.24 bpm, 2 years – 14.5±0.35, 3 years – 11.2±0.28, while in the control group the increase in HR reached 25.3±0.45 bpm. The reaction of SBP and DBP to exercise was also more pronounced in the control group of young men.

VC indicators in hand-to-hand fighters with 3 years of experience were significantly higher (4.2±0.11 l) than in beginners (3.6±0.14 l) and in the control group (3.3±0.15 l). The time spent holding the load also increased with the length of training experience: 1 year – 2.8±0.26 min, 2 years – 3.5±0.32 min, 3 years – 4.1±0.27 min, which indicated an increase in endurance as athletic experience grew.

The data obtained confirm that regular sports training, in particular in hand-to-hand combat, contributes to the strengthening of the cardiovascular system, improvement of respiratory function and increase in the body's adaptive capacity to physical exertion, consistent with previous studies [7, 8]. The decrease in baseline HR and blood pressure, as well as the reduction in the severity of the response to exercise in athletes as their training experience increases, indicate the formation of stable functional reserves in the body of those who exercise [9].

Conclusions. Regular hand-to-hand combat training helps strengthen the cardiovascular system and increase the functional reserves of young athletes. With increased athletic experience, the initial heart rate and blood pressure decrease, and the cardiovascular system's response to physical exertion decreases. At the same time, as athletic experience increases, respiratory function and endurance improve. The results obtained emphasise the importance of systematic training in this type of martial arts for the formation of a stable adaptation of students' bodies to physical exertion.

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The impact of physical activity and diet therapy on improving metabolic syndrome

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Abstract

Objective of the study is to investigate the effect of dietary energy intake and physical activity levels on insulin resistance indicators in older women.

Methods and structure of the study. Content analysis of articles by domestic and foreign authors. MAXQDAAnaleticsPro software was used to analyse the data.

Results and conclusions. Insulin resistance is associated with impaired cell metabolism in response to insulin when its concentration in the human body is sufficient. This pathology is more common in men over the age of 30, while in women, insulin resistance increases several times after the age of 45-50. Today, there are many aetiological factors contributing to the development of this metabolic disorder: genetic predisposition, high insulin concentration in the treatment of type I diabetes mellitus, a sedentary lifestyle, arterial hypertension, prolonged consumption of low-calorie foods and, conversely, excessive consumption of foods containing large amounts of carbohydrates and fats, alcoholism, hormonal imbalances, taking certain hormonal medications, as well as stress factors.

Keywords: *diabetes mellitus, insulin resistance, elderly, diet, physical activity.*

Introduction. Currently, insulin resistance or metabolic syndrome is a very acute problem [1-5]. In women, this pathology most often occurs after the age of 45 [2, 3, 6, 7]. The aetiological factors contributing to the development of this syndrome include genetic predisposition, in particular a family history of diabetes mellitus, arterial hypertension, physical inactivity, age-related hormonal disorders, stress, nutritional disorders, and obesity [2, 3]. The negative impact of numerous adverse factors leads to impaired glucose uptake by tissues due to decreased insulin sensitivity caused by reduced receptor affinity [1-3]. Women who lead a sedentary lifestyle combined with poor eating habits are at risk of developing metabolic syndrome.

Objective of the study is to investigate the effect of dietary energy intake and physical activity levels on insulin resistance indicators in older women.

Methods and structure of the study. Articles published between 2000 and 2025 were subjected to content analysis. Three hundred articles by individual authors and author groups representing scientific institutions of higher education in Russia and abroad were analysed. The following methods were used: qualitative and quantitative analysis. The following programmes were used to analyse the parameters: MAXQDA and AnalyticsPro.

Results of the study and discussion. The multiple manifestations of metabolic or insulin resistance syndrome are the result of a reaction to increased

insulin concentrations. Various body systems are involved in this pathological process. Insulin resistance begins to develop if high insulin levels are maintained in the body for a long time. There are two determining factors for this: increased consumption of easily digestible carbohydrates and frequent meals. For these reasons, insulin will remain high for a long time. These two factors combine, and the problem begins to develop.

The modern concept of insulin resistance is not limited to parameters that characterise carbohydrate metabolism alone. This disorder must be considered in conjunction with atherosclerosis, lipodystrophy, heart and kidney failure, and polycystic ovary syndrome. All these processes are pathogenetically interrelated.

There are various ways to correct this condition. Among the most popular are regular physical and aerobic exercise and weight correction through dietary modification. These methods are more commonly used because one of the main causes of the global obesity epidemic is physical inactivity and an imbalance between the energy intake from food and its expenditure on vital processes [1, 3, 4].

Many scientists have proven the effectiveness of these methods [6, 7]. For example, the impact on metabolic effects by reducing or increasing calorie intake has shown that the lipid spectrum changes, as do body weight and composition [1-4], while physical activity contributes to a qualitative improvement in all metabolic processes and the psycho-emotional state of those involved.

A common approach to metabolic syndrome and insulin resistance is drug treatment aimed at maintaining normal blood glucose levels. The main drug that affects insulin resistance is metformin. This drug belongs to the class of biguanides, the main actions of which are: reduction of gluconeogenesis, inhibition of glucose absorption in the small intestine, reduction of insulin resistance and improvement of insulin secretion [1].

The key aspect of treating insulin resistance in obesity is weight loss. The basis of therapy is, first and foremost, combating physical inactivity, a balanced diet, and individual selection of the calorie content of the daily diet.

It is important that energy expenditure exceeds energy consumption while maintaining a balanced and varied diet. In combination with non-pharmacological methods, for BMI ≥30 kg/m^2, as well as for patients with BMI ≥27 kg/m^2 with complications, it is possible to use medications to reduce body weight. In cases of morbid obesity and BMI ≥35 kg/m^2 with complications, surgical treatment using various methods of bariatric surgery may be possible.

Drugs that reduce insulin resistance (biguanides, thiazolidinediones, angiotensin-converting enzyme inhibitors) are used only in cases of diagnosed prediabetes, type 2 diabetes mellitus, and arterial hypertension, and are not recommended for isolated insulin resistance in the context of obesity without the aforementioned manifestations.

Despite the fact that drug treatment methods are currently well developed, it is important to understand that the foundation of therapy and the basis for the prevention of obesity and carbohydrate metabolism disorders is lifestyle modification, i.e., physical activity and dietary changes.

The formation of a culture of nutrition is of great importance at all levels of prevention and treatment of these diseases. A number of studies have noted that acquired changes, in particular obesity, are of considerable importance for the manifestation of existing genetic defects [1].

Modifiable factors include, first and foremost, a sedentary lifestyle and inadequate diet therapy. If, at the same time, active aerobic exercise is combined with weight loss and lipid profile improvement, this contributes to a significant improvement in tissue sensitivity to insulin, a reduction in insulin resistance and a decrease in hyperinsulinemia, which makes it possible to 'break' the vicious circle of metabolic syndrome development (Figure 1).

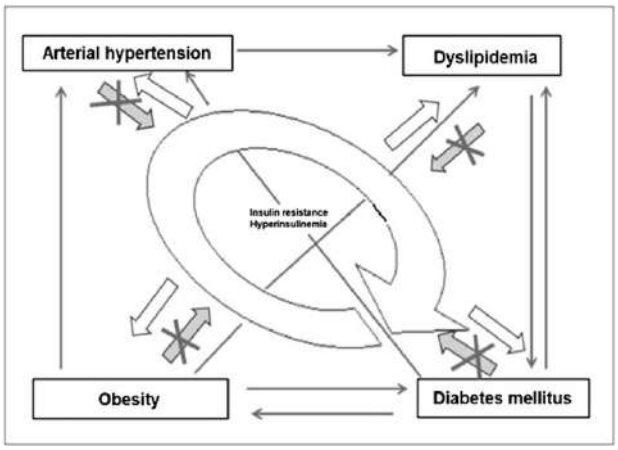

Fig. 1. The vicious circle of metabolic syndrome development

The correlation between the development of insulin resistance and the growth of trunk obesity is interesting, as it broadens our understanding of this disease. It also allows us to correct the identified disorders in a more targeted manner. When considering the types of obesity, it is noted that insulin resistance is associated with hypertrophy of fat cells and usually develops in adults.

The causes of trunk obesity are not fully understood. Age is undoubtedly important, because this type of obesity usually develops after the age of 30 and is apparently a consequence of age-related increase in hypothalamic activity and, in its manifestation, a decrease in the sensitivity of the hypothalamic-pituitary system to the inhibitory effects of cortisol, which leads to a small but chronic excess of cortisol secretion [3].

When considering dietary therapy methods for treating insulin resistance, the following approaches can be identified: hypolipidaemic, hypotensive, and hypoglycaemic. The hypolipidaemic method is characterised by a reduction in foods containing saturated fats, with the mandatory addition of fibre and sources of antioxidants. In a hypotensive diet, the main sources to be excluded are salt and foods containing calcium and sodium. A hypoglycaemic diet involves limiting fast-digesting carbohydrates and increasing complex carbohydrates. The use of various diet therapies in the study showed their effectiveness in reducing body weight in participants with metabolic syndrome.

Conclusions. Metabolic syndrome, which includes an increase in visceral fat mass and lipid metabolism disorders, is characterised by insulin resistance. Hyperinsulinemia is characteristic of a lifestyle characterised by physical inactivity, a high-calorie diet, and increased activity of the sympathetic nervous system (frequent stress). Insulin resistance is a precursor to type 2 diabetes.

To diagnose insulin resistance, it is necessary to take into account not only changes in physical indicators of the human body, but also its biochemical blood indicators. The most informative data are lipid profile (total cholesterol, LDL, HDL), blood glucose, insulin, and HOMA index calculation results. Based on the results, it is possible to diagnose insulin resistance and monitor its dynamics.

When assessing the structure of nutrition in the case of insulin resistance, it is important to consider the composition of nutrients, their effect on blood glucose levels, episodes of insulin spikes, and the frequency of hunger (a sign of insulin resistance). An individually tailored diet plan and a carefully selected combination of proteins, fats and carbohydrates can have a significant impact on well-being and the process of biochemical changes in human blood composition.

Aerobic exercise and diet are the most effective methods for reducing blood insulin levels and the symptoms of insulin resistance.

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The specific impact of different types of exercise on the physical performance of older preschoolers, taking into account gender and age differences

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Abstract

Objective of the study is to examine the annual dynamics of the impact of various types of exercise on the gender and age indicators of physical working capacity in older preschool children.

Methods and structure of the study. The second stage of the study involved preschoolers aged 5 to 6 (boys n=28 and girls n=28) and aged 6 to 7 (boys n=28 and girls n=28) attending Krasnodar 'Kindergarten No. 103'. The physical education process included exercises of various types of physical culture and health technologies, in which three variants of confidence intervals (moderate, average, high) of model indicators PWC150 were identified when performing stretching, aerobics, fitball aerobics and exercises on exercise machines.

Results and conclusions. Three levels of PWC150 model indicators of physical performance (moderate, medium, and high) of exercises of various types (stretching, aerobics, fitball aerobics, and fitness devices) for older preschoolers have been identified. It has been established that in the practice of physical education of older preschoolers, the average level of the PWC150 indicator is the most optimal when performing stretching, aerobics, fitball aerobics and exercises on exercise equipment.

Keywords: *older preschool children, physical performance indicators, gender and age differences.*

Introduction. In this article, based on the initial indicators of age-related dynamics of sexual dimorphism in preschoolers aged 5-7 years identified during the first stage of scientific work, further scientific work was continued with the aim of identifying the influence of various types of exercises on the sex-age dynamics of the process of forming model characteristics of physical working capacity during the school year. [1].

Objective of the study is to examine the annual dynamics of the impact of various types of exercise on the gender and age indicators of physical working capacity in older preschool children.

Methods and structure of the study. The research was conducted in Krasnodar 'Kindergarten No. 103'. Older preschoolers took part in the experimental studies, divided into girls aged 5-6 (n=28) and 6-7 (n=28), and boys aged 5-6 (n=20) and 5-7 (n=20), respectively.

The following types of exercises of various orientations were included in the physical education process for preschoolers (Table 1): stretching (develops flexibility and mobility in the joints), aerobics (develops general endurance and coordination of movements), fitball aerobics (develops strength, flexibility, coordination and endurance) and exercises on exercise machines (develops strength, strength endurance and agility). Exercises of various types were performed during the school year according to the schedule presented in Table 1 below.

Results of the study and discussion. Table 2 presents model indicators of physical working capacity (PWC150) in girls performing exercises of various types. Thus, in girls aged 5 to 6 years, during the academic year, when performing stretching, the PWC150 indicator increased from 228.61±7.32 to 276.22±11.48 u.e. ($p<0.01$), respectively, during aerobics classes – from 219.35±6.25 to 273.64±9.32

Table 1. Exercise planning scheme for older preschoolers, taking into account model indicators PWC_{150}

Exercises	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
stretching	+M			+A			+L		
aerobics		+M			+A			+L	
fitball aerobics			+ M			+A			+L
exercises on exercise machines	+M			+A			+L		

Note: model indicators: M – moderate, A – average, and L – large.

u.e. (p<0.001), fitball aerobics – from 253.14±5.29 to 291.54±6.35 u.e. (p<0.01) and on exercise machines from 248.35±6.52 to 306.31±8.64 u.e. (p<0.001).

In girls aged 6 to 7 years, during the academic year, when performing stretching exercises, the PWC150 index increased from 226.27±4.39 to 273.21±6.86 u.e. (p<0.001), respectively, during aerobics classes – from 246.14±5.25 to 286.72±7.64 u.e. (p<0.01), fitball aerobics – from 267.34±3.37 to 293.57±6.25 u.e. (p<0.01) and on exercise machines from 236.73±4.49 to 268 u.e. (p<0.01).

В табл. 3 представлены модельные показатели PWC150 мальчиков при выполнении упражнений различной направленности.

Thus, in boys aged 5 to 6 years, during the academic year, when performing stretching, the PWC150 index increased from 287.13±9.24 to 317.22±11.48 u.e. (p<0.01), and in aerobics classes, it increased from 252.27±7.39 to 327.25±11.26 u.e. (p<0.001), during fitball aerobics classes – from 263.75±7.48 to 291.54±6.35 u.e. (p<0.05), and during training on exercise machines – from 273.28±7.29 to 306.31±8.64 u.e. In boys aged 6 to 7 years, during the academic year, when performing stretching, the PWC150 indicator increased from 279.21±7.36 to 313.24±9.21 u.e. (p<0.01), and during aerobics classes – from 270.82±7.28 to 306.61±8.69 u.e. (p<0.001), during fitball aerobics – from 293.12±8.34 to 327.01±9.72 u.e. (p<0.05), and during training on exercise machines – from 315.39±8.46 to 386.53±10.21 u.e.

The results of the final studies on the use of exercises of different types in older preschool age allowed us to identify a significant adaptive factor in the manifestation of PWC_{150}, namely, in all four experimental exercises, regardless of their focus, there is the possibility of comprehensive development of various abilities in preschoolers: endurance, flexibility, strength, and agility. Therefore, of the three different levels of PWC_{150} model indicators we identified, the middle level is the most optimal for all age and gender groups. Thus, for girls aged 5 to 6 years, the average confidence interval of the PWC150 indicator when performing stretching is within the range of 311.49-317.22, aerobics – 321.62-327.25, fitball aerobics – 286.33-291.54, and exercise machines – 300.99-306.31 u.e.; respectively, for girls aged 6 to 7, the confidence interval for stretching is within the range of 267.28-273.21, aerobics – 282.9-286.72, fitball aerobics – 290.45-293.57, and exercise machines – 255.55-268.12 u.e.

Table 2. Model indicators for PWC_{150} girls when performing exercises of various types

Physical performance indicators			Exercises of various types, M±δ			
			stretching	aerobics	fitball aerobics	exercise machines
	girls aged 5-6					
Start of ac. y.		PWC_{150} (u.e.)	228,61±7,32	219,35±6,25	253,14±5,29	248,35±6,52
End of ac. y.			276,22±11,48	273,64±9,32	291,54±6,35	306,31±8,64
Model indicators, u.e.	Moderate		<305,740 - 311,48	<315,99-321,61	<281,19 -286,32	<295,97 – 301,29
	Average		311,49 - 317,22	321,62 - 327,25	286,33-291,54	300,99-306,31
	Large		322,96 - 338,70>	332,88 -338,51>	296,33-301,51>	311,63-316,95>
	girls aged 6-7					
Start of ac. y.		PWC_{150} (u.e.)	226,27±4,39	246,14±5,25	267,34±3,37	236,73±4,49
End of ac. y.			273,21±6,86	286,72±7,64	293,57±6,25	268,12±8,37
Model indicators, u.e.	Moderate		<261,35-267,42	<278,98-282,8	<287,33 -290,45	<259,74-263,93
	Average		267,28-273,21	282,9-286,72	290,45-293,57	255,55-268,12
	Large		279,04-284,97>	290,54-294,36>	296,77-299,397>	272,31-276,5>

Note: ac. y. – academic year.

Table 3. Model indicators for PWC_{150} boys when performing exercises of various types

Physical performance indicators			Exercises of various types, M±δ			
			stretching	aerobics	fitball aerobics	exercise machines
	boys aged 5-6					
Start of ac. y.		PWC_{150} (u.e.)	287,13±9,24	252,27±7,39	263,75±7,48	273,28±7,29
End of ac. y.			317,22±11,48	327,25±11,26	291,54±6,35	306,31±8,64
Model indicators, u.e.	Moderate		<305,740 - 311,48	<315,99-321,61	<281,19 -286,32	<295,97 – 301,29
	Average		311,49 - 317,22	321,62 - 327,25	286,33-291,54	300,99-306,31
	Large		322,96 - 338,70>	332,88 -338,51>	296,33-301,51>	311,63-316,95>
boys aged 6-7						
Start of ac. y.		PWC_{150} (u.e.)	279,21±7,36	270,82±7,28	293,12±8,34	315,39±8,46
End of ac. y.			313,24±9,21	306,61±8,69	327,01±9,72	386,53±10,21
Model indicators, u.e.	Moderate		<304,04-308,64	<296,89-301,75	<317,19 -322,15	<376,33-381,43
	Average		309,78-313,96	301,75-306,61	312,43-327,19	381,43-386,53
	Large		317,42-321,6>	310,79-314,97>	331,87336,73>	391,43-396,53>

Note: ac. y. – academic year.

For boys aged 5 to 6, the average confidence interval for PWC_{150} when performing stretching is within the range of 311.49-317.22, aerobics – 321.62-327.25, fitball aerobics – 286.33-291.54, and exercise machines – 300.99-306.31 u.e.; respectively, for boys aged 6 to 7: the confidence interval for stretching is within the range of 309.78-313.96, aerobics – 301.75-306.61, fitball aerobics – 312.43-327.19, and exercise machines – 381.43-386.53 u.e.

Conclusions. Three levels of physical fitness model indicators have been identified (moderate, average and high) PWC_{150} when performing physical education and health exercises of various types (stretching, aerobics, fitball aerobics and exercises on exercise machines) for girls and boys aged 5 to 7 years. It has been established that in the practice of preschool physical education for all age and gender groups, average levels of PWC_{150} can be used when performing physical and health-improving technologies such as stretching, aerobics, fitball aerobics, and exercises on exercise machines.

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Criteria for assessing the health status of middle-aged women

UDC 612.66

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Abstract

Objective of the study is to identify the specifics of age-related physiological changes in women's body systems in the middle-aged period, which is necessary for the scientific justification of the criteria for their recovery.

Methods and structure of the study. To identify the criteria for recovery, we used scientometric analysis of age-related physiological changes in women's bodies.

Results and conclusions. Scientometric analysis has shown a decline in the adaptive capabilities of the cardiovascular system and external respiration function after the age of 40. In addition, after the age of 45, there is a decrease in muscle mass and bone mineral density. Women's postural balance also deteriorates after the age of 40. Assessment of the condition of the cardiorespiratory system, postural balance, and body composition analysis are criteria for the physical health of women in their second mature age. Health-improving physical culture measures can have a positive effect on these criteria.

Keywords: *health criteria, state of health, middle-aged women, external respiration functions.*

Introduction. The health of Russian women is a valuable national resource, as women make up a significant working-age portion of Russia's adult population and are also a reference point for families in matters of nutrition, physical activity, and daily routines. Work, health, and illness are intricately linked, which necessitates the justification of measures to improve women's health.

According to Rosstat data, women's peak working capacity occurs between the ages of 35 and 55, or in their second mature age [10]. It is precisely from the age of 35 that there is a decrease in the generative function of the reproductive system and subsequent age-related changes that are closely related to a woman's menopause, during which the hormonal system is restructured, metabolism slows down, and the condition of the musculoskeletal system deteriorates [5, 9]. In addition to hormonal changes, the health of women in their second mature age is subject to deterioration due to physical inactivity.

We propose to consider three age groups of women: 35-44 years, 45-54 years, and 55-64 years, in order to determine the time of onset of problems in different body systems in comparison with the onset of reproductive system decline (35 years) and their consequences in older age (55-64 years).

Objective of the study is to identify the specifics of age-related physiological changes in women's body systems in the middle-aged period, which is necessary for the scientific justification of the criteria for their recovery.

Methods and structure of the study. Inclusion criteria: the study used data on the condition of the cardiovascular, skeletal, nervous, muscular and respiratory systems of women aged 35 to 64. Exclusion criteria: women of other ages, men.

Results of the study and discussion. Scientometric analysis has made it possible to determine in which systems, when, and to what extent involutional changes occur in women of middle age (Table 1).

Thus, according to literature sources, the main problems of the cardiovascular system (CVS) in women aged 35-44 arise in connection with a gradual decrease in oestrogen levels, which in turn negatively affect vascular elasticity. The adaptive capabilities of the CVS are significantly reduced [11]: an increased risk

of developing cardiovascular diseases is detected in 37.2% of women aged 40-59 and in 71.9% of women aged 60-79 [9]. Cardiovascular problems that are not detected in a timely manner in the next age group (55-64 years) provoke the development of various cardiovascular diseases, which are the cause of premature mortality.

At the age of 35, women begin to experience a decrease in bone mineral density of 0.3-0.5% per year. With the onset of perimenopause (45-54 years), the synthesis of oestrogen and collagen decreases [6], which leads to increased bone resorption, contributing to the development of osteoporosis [2].

Ten years after the onset of menopause, a slow phase of bone loss begins with thinning of the cortical layer, which leads to fractures when excessive stress is placed on the bone [13]. According to a number of authors, the prevalence of osteopenia is 23.3% in women aged 40-55 and 53.3% in women aged 56-75 [3].

As for changes in body composition, in women, body weight, including muscle mass, increases with age and peaks at 41-45 years, but then gradually decreases and there is a change in the percentage of muscle and fat in the body [13].

At the same time, a number of studies have found that age-related muscle atrophy occurs between the ages of 25 and 44 [14], and that a decrease in muscle mass in older age can lead to the development of muscle fatigue syndrome, loss of coordination, or sarcopenia.

During assessing the level of coordination in women aged 30-50 using stabilometry, significant differences were found in the indicators of the area of deviation of the centre of pressure in tests with open and closed eyes, the ratio of the length of the statokinesiogram to its area, and the Romberg coefficient among women aged 30-40 and 41-50. Deviations from the normative indicators were significantly higher in women aged 41-50, which may indicate a decrease in balance function. Women aged 55-60 show an increase in the area of the statokinesiogram with eyes open and closed and exhibit reduced stability in maintaining balance [12]. It is important to note that balance disorders are one of the most common causes of falls in older people (aged 59-79) and increase the risk of injury [15].

The first signs of external respiration involution appear at the age of 30-35 and are characterised by a decrease in lung tissue elasticity, weakness of the respiratory muscles, limited chest mobility, and decreased lung ventilation [1]. For this reason, the bronchial patency index and the patency of the small bronchi may decrease. As a result, the functioning of the respiratory system declines and, according to some studies, by the age of 55, it is 66.79% [7].

When examining middle-aged women (46-60 years old), a decrease in a number of ventilation indicators and volume-velocity characteristics of forced exhalation was noted. These changes include a decrease in vital lung capacity, mainly due to a reduction in reserve expiratory volume. The functional reserves of the ex-

Table 1. Age-related physiological changes in women at different ages [1-4, 7-9, 12, 13-15]

System	35-44 years old	45-54 years old	55-64 years old
Cardiovascular	Decreased cardiovascular adaptability, cardiac output, minute and stroke volume, increased heart rate, respiratory rate	Risk of arterial hypertension, ischaemic heart disease and atherosclerosis	Risk of myocardial infarction, myocardial rupture, cardiac aneurysm, heart valve insufficiency, premature mortality from cardiovascular disease
Skeletal	Bone loss of 0.3-0.5% per year	Bone resorption, osteopenia	Increased incidence of osteopenia, risk of osteoporosis, compression fractures
Nervous	Decreased coordination of movements with eyes open	Decreased stability in the upright position with eyes open, balance function	Risk of falling from a height, difficulty moving
Muscular	Decreased thickness of the rectus abdominis muscle	Decreased total body muscle mass	Sarcopenia, impaired coordination, limited mobility, disability
Respiratory	Decreased elasticity of the chest muscles and lung tissue, decreased chest mobility, decreased lung ventilation	Decreased ventilation parameters and forced expiratory volume and flow characteristics, loss of respiratory muscle contractility	Reduced ability to tolerate heavy physical exertion and increased recovery time, risk of respiratory diseases

ternal respiratory system, which decline with age, were also associated with a limitation of the volume-velocity characteristics of air flow in the bronchi at all levels [4].

It should be noted that age-related changes in the respiratory system in older people cause a decrease in the ability to tolerate heavy physical exertion and an increase in recovery time, as well as contributing to the risk of respiratory diseases [8].

Involutionary changes in all of the above systems reflect the importance of preventive control and assessment of their condition. Assessment of the condition of the respiratory and cardiovascular systems, analysis of body composition (muscle and bone tissue), and postural balance are criteria for physical health. It is important to note that one of the main ways to positively influence the condition of all body systems is through recreational physical activity.

Conclusions. Age-related physiological changes in women are associated with the decline of reproductive function, resulting in a deterioration in key performance indicators: the functional state of the cardiorespiratory system, body composition, decreased bone mineral density, and decreased coordination. The above indicators can serve as criteria for the health improvement of women in their second mature age and can be adjusted by means of health-improving physical culture.

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Model competitive programme for students with disabilities at the 'ready for labour and defence' festival

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Abstract

Objective of the study is to develop and scientifically substantiate the 'Ready for Labour and Defence' (GTO) Festival project, designed for students with disabilities.

Methods and structure of the study. Analysis of scientific literature, regulatory and legal acts, documentation of sports events held under the GTO physical fitness programme in the Altai Krai. Modelling of GTO competitions for people with disabilities.

Results and conclusions. To achieve this goal, the All-Russian Physical Culture and Sports Complex 'Ready for Labour and Defence' needs to ensure the involvement of citizens with disabilities in competitive activities. Existing systems for assessing competitive activity cannot be applied within the framework of the proposed Festival. The project under development makes it possible to involve students with disabilities from all nosological groups. The Festival programme provides for its implementation in an inclusive manner, ensuring accessibility and participation for all categories of students.

Keywords: *Ready for Labour and Defence, GTO, students with disabilities, health promotion, adaptive physical culture.*

Introduction. Officially, the goal of the All-Russian Physical Culture and Sports Complex 'Ready for Labour and Defence' (GTO) is to strengthen the health of the population, promote harmonious and comprehensive personal development, foster patriotism, and instil in people a conscious need for regular physical culture and sports activities.

Russian Minister of Sport Mikhail Degtyarev notes: "It is particularly important that there is a high proportion of people with disabilities among the programme's participants, which emphasises its inclusive nature." The significance of the GTO for people with disabilities and limited health capabilities (LHC) is growing every year.

At the same time, there are no competitive activities in the GTO for people with disabilities and health limitations (Table 1).

At the same time, it is this complex that enables this category of individuals to participate in the GTO physical fitness competition [3].

Objective of the study is to develop and scientifically substantiate the 'Ready for Labour and Defence' (GTO) Festival project, designed for students with disabilities.

Methods and structure of the study. Analysis of scientific literature, regulatory and legal acts, documentation of sports events held under the GTO physical fitness programme in the Altai Krai. Modelling of GTO competitions for people with disabilities.

Results of the study and discussion. The development of the project for the All-Russian Physical Culture and Sports Complex Festival 'Ready for Labour and Defence' (GTO) among students with disabilities in higher education institutions (hereinafter referred to as the Festival) was carried out as part of the All-Russian Festival of Student Youth in Adaptive Physical Culture and Sports 'Breaking Down Barriers' for higher education institutions in the Russian Federation [1].

The Festival must be organised with mandatory safety measures for participants and spectators, medical support, in accordance with the legislation of the Russian Federation.

Table 1. Sports events under the GTO physical fitness programme with competitive activities for all categories of the population of the Altai Krai

Sports events under the GTO physical fitness programme	Healthy population	Population with disabilities and LHC
Testing	Not present	not present
Festivals	Present	not present
Spartakiads	Present	not present
Regional physical culture and sports public organisation 'All-Around Sports Federation Ready for Labour and Defence of the Altai Krai' (All-Around Sports Federation GTO of the Altai Krai)	Present	not present

The Festival is held among citizens of the Russian Federation who are systematically engaged in physical culture and sports, who are students of higher education institutions (HEIs) and who have disabilities.

Participants (adults) are eligible to participate in the Festival:

- VII (18-19 years old);
- VIII (20-24 years old).

Teams are formed of 3 students with disabilities from any of the following nosological groups: hearing impairment, residual vision, total blindness, spinal cord injury, upper or lower limb impairment, cerebral palsy, short stature.

The conditions for admission of participants to the Festival are standard for any sporting event under the GTO physical fitness programme, with the addition of a copy of a valid disability certificate.

The competition programme has been developed in accordance with state requirements, which are fulfilled by participants in accordance with their age group in the GTO complex, in accordance with Order No. 117 of the Ministry of Sport of Russia dated 22

Table 2. Festival programme taking into account the nosological groups of the GTO complex

Nosological group	GTO physical fitness tests		
	Strength	Flexibility	Speed and strength
	Bending and straightening the arms while lying on the floor (number of times)	Forward bend from a sitting position on the floor with straight legs (cm)	Lifting the torso from a supine position (number of times)
For persons with hearing disabilities	Present	Present	Present in 1 minute
For persons with residual vision	Present	Present	Present in 1 minute
For persons who are totally blind	Present	Present	Present in 1 minute
For persons with spinal injuries and spinal cord disabilities	Hanging on bent arms on a horizontal bar (legs above the wheelchair, with) or bending and extending the arms from a sitting position in a wheelchair in case of cervical spine injury	Present	Hanging on bent arms on a horizontal bar (legs above the wheelchair, with) or bending and extending the arms from a sitting position in a wheelchair in case of cervical spine injury
For persons with upper limb disabilities	Squatting on both legs	Present	Present in 15 seconds
For persons with lower limb disabilities	Present	Present with a prosthesis	Present in 15 seconds
For persons with cerebral palsy	Present	Present	Present in 20 seconds
For persons of short stature	Bending and extending the arms while supporting oneself on a gymnastic bench	Present	Present in 15 seconds

Table 3. Analysis of the assessment of competitive activities in sports events organised by the GTO complex (using the Altai Krai as an example)

Sports event	Assessment
- Festivals	Natural values (time, quantity, cm, m, points, place)
- Festivals - Spartakiads	100-point scoring system
- Altai Krai GTO Multi-Event Federation (Festivals, GTO Races, GTO Games, Altai Krai Universiade, etc.)	Time

February 2023 'On the approval of state requirements for the All-Russian Physical Culture and Sports Complex 'Ready for Labour and Defence' (GTO) and Methodological recommendations for the organisation and implementation of test standards (tests) of the All-Russian Physical Culture and Sports Complex 'Ready for Labour and Defence' (GTO) for persons with disabilities and persons with limited health capabilities, approved by the Ministry of Sport of Russia on 29 May 2023.

The festival programme for all participants consists of three types of GTO physical fitness tests: strength, flexibility, and speed-strength abilities, which are presented in Table 2.

This Festival project is possible with an inclusive approach, where the team consists of both able-bodied and disabled participants. This approach will contribute to the formation of an inclusive culture among students and team support for participants with different health conditions.

To calculate the results of the proposed Festival project, we analysed the available assessments in sports events for the GTO physical fitness test in the Altai Krai (Table 3).

Studying existing models for evaluating competitive activity in inclusive sports, where we took the share of the proposed Festival as a basis, the second evaluation model (relay) is used, where the result is measured in quantitative indicators of time and space [2].

Taking the above into account, we propose a model for evaluating competitive activity in the Festival, where the results of participants are calculated by calculating the difference in percentage from the gold medal in relation to each test standard in each nosological group. The result can be either '+' or '-'.

For example, in the 'Cerebral palsy' nosological group in the flexibility test, a male participant of stage VIII showed a result of '+4 cm'. Calculation: +4 * (3 / 100%) = +133.3%, where 4 is the participant's result; 3 is the flexibility test standard for the gold medal in the corresponding nosological group for men of level VIII.

The winners and prize-winners of the Festival are determined by the best result of the sum of the percentages for all three types of GTO tests, separately for men and women.

The team score is determined by the best result of the sum of the percentages for all three types of GTO tests for all team members.

Conclusions. To achieve the GTO's objectives, it is necessary to involve citizens with disabilities and LHC in competitive activities. The existing GTO competitive activity assessment systems cannot be applied to the proposed Festival among students with disabilities. The proposed project will enable students with disabilities from all GTO nosological groups to participate. The GTO Festival programme for students with disabilities allows for its implementation within the framework of an inclusive approach.

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Algorithm for developing a system for public participation in physical culture and sports activities

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Abstract

Objective of the study is to develop a comprehensive algorithm for organising work aimed at effectively involving various categories of citizens (focus groups) in systematic physical education and sports activities. The algorithm is based on a comprehensive analysis of successful domestic experience gained during the implementation of relevant measures in the constituent entities of the Russian Federation.

Methods and structure of the study. The research was conducted by studying and analysing the results of practical activities of physical culture and sports institutions operating in the constituent entities of the Russian Federation, in accordance with the provisions of Orders of the Ministry of Sport of the Russian Federation No. 175 of 1 March 2019 and No. 171 of 3 March 2022.

Results and conclusions. It has been established that in order to involve the population in physical culture and sports activities, it is recommended to follow a phased approach. The initial stage of the proposed model is the formation of an interdepartmental working group to determine the strategy and objectives for involving the population in physical culture and sports activities. This is followed by planning based on regulatory and legal documents. The third stage involves selecting suitable types of physical culture and sports activities, taking into account the resources of the region. The fourth stage involves promoting physical culture and sports with a focus on the age and psychological characteristics of the target audience. The final stage is the implementation of innovative solutions that have been tested by successful regional projects. The above-described comprehensive algorithm for building work to involve the population in systematic physical education and sports activities is common to all categories of the population, with specific features for each focus group.

Keywords: *algorithm, sequential steps, physical culture and sport, organisation of classes.*

Introduction. In recent years, the scientific community has actively addressed a number of issues related to encouraging broad segments of the population to engage in regular physical culture and sports (PCS) [1-7]. Among the aspects studied, issues related to organising PCS activities among preschoolers, as well as people with limited physical abilities and disabilities, stand out [4]. Particular attention has been paid to the introduction of physical activity among the rural population, as well as to the principles of integrating various socio-demographic groups (families, schoolchildren, students, enterprise employees and pensioners) into the sphere of mass PCS [2, 3, 6]. A separate area of research was the assessment of the possibilities for promoting swimming among the population of all age groups through the implementation of the interdepartmental programme 'Swimming for All' [5]. Experts developed scientific and methodological recommendations, concepts for regional models and methods for effectively involving the population in physical activity [1, 7].

However, the detailed stages of forming a comprehensive system for involving various 'focus groups' of the population in systematic physical culture and

sports activities have not yet been sufficiently developed, which is why this study is so important.

Objective of the study is to develop a comprehensive algorithm for organising work aimed at effectively involving various categories of citizens (focus groups) in systematic physical education and sports activities. The algorithm is based on a comprehensive analysis of successful domestic experience gained during the implementation of relevant measures in the constituent entities of the Russian Federation.

Methods and structure of the study. The research work was carried out by studying and analysing the results of practical activities of physical culture and sports institutions operating in the constituent entities of the Russian Federation, in accordance with the provisions of Orders of the Ministry of Sport of the Russian Federation No. 175 of 1 March 2019 and No. 171 of 3 March 2022.

The work was carried out as part of the scientific and methodological support for the technical assignment of the Ministry of Sport of Russia under GZ No. 777-00010-24-00 PR, section 2, part 2 for 2024 and the planned period of 2025.

Results of the study and discussion. The summarisation and analysis of reports on the implementation of the involvement of various categories of the population in PCS activities in various constituent entities of the Russian Federation made it possible to develop an algorithm for forming a system for these activities. 56 reports on the work of the regions for 2019-2022, posted on the website of the Ministry of Sport of Russia, were studied.

The proposed algorithm for forming a system for involving various categories of the population ('focus groups') in systematic physical culture and sports activities differs significantly from existing approaches [1, 7], as it is based on an in-depth study and analysis of the practical experience of Russian Federation subjects that have previously successfully applied similar mechanisms for integrating citizens into an active lifestyle. The proposed algorithm has a number of unique features: it is practice-oriented, clear and easy to use for the target audience.

To increase the effectiveness of activities aimed at involving various categories of the population in physical culture and sports, it is necessary to follow a step-by-step approach (Figure 1).

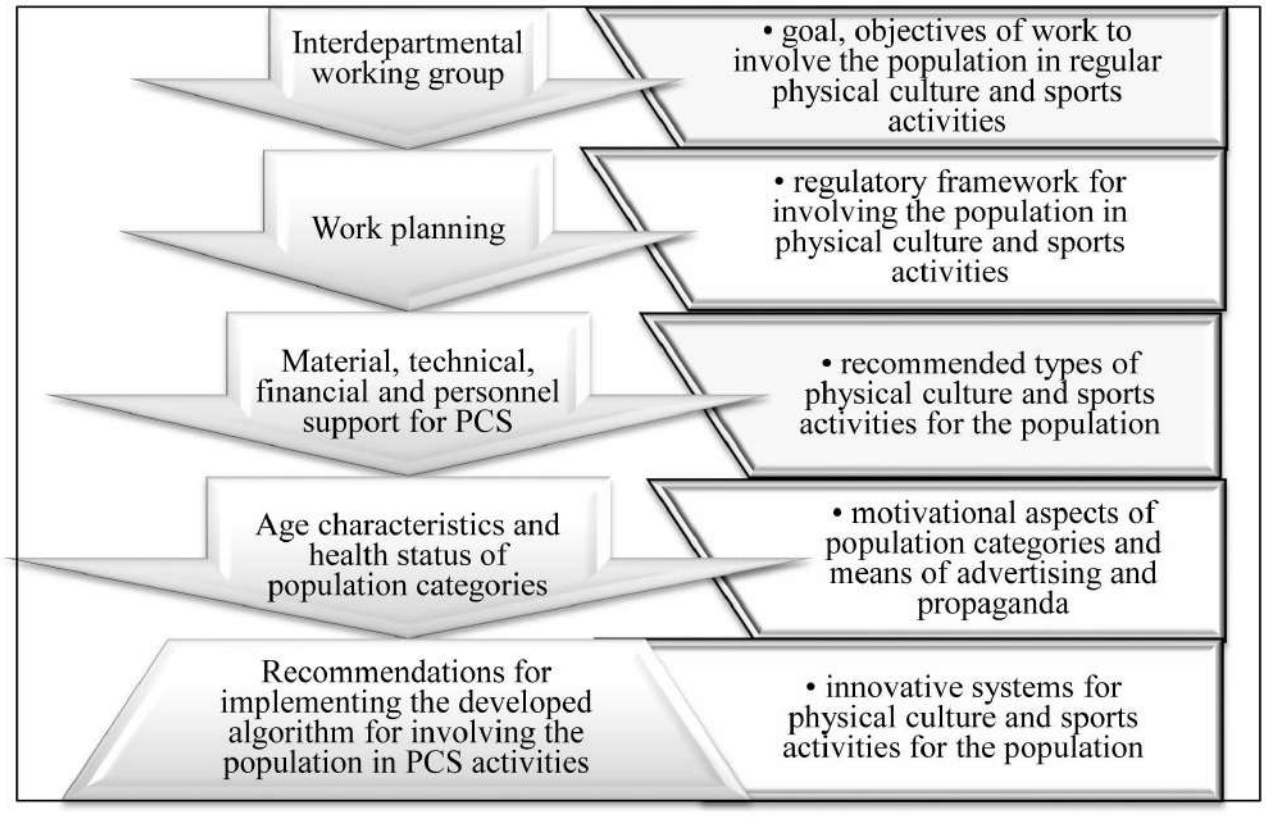

Fig 1. Algorithm for forming a system for involving the population in systematic physical culture and sports activities

The initial stage of the proposed model involves the formation of an interdepartmental working group to determine the strategy and objectives for encouraging the population to participate in physical culture and sports. This is followed by planning based on regulatory and legal documents.

The third stage involves selecting suitable types of physical education and sports activities, taking into account the region's resources. The fourth stage involves promoting physical education and sports, focusing on the age and psychological characteristics of the target audience. The final stage is the implementation of innovative solutions that have been tested by successful regional projects.

Conclusions. It has been established that in order to involve the population in physical culture and sports activities, it is recommended to follow a step-by-step approach. The above-described comprehensive algorithm for involving the population in systematic physical culture and sports activities is common to all categories of the population, with specific features for each focus group.

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Physical fitness and development of female students in the Siberian region

UDC 796. 015

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Abstract

Objective of the study is to conduct a theoretical and statistical analysis of the physical fitness and physical development of female students in their first to third years of study in the Siberian region (using Krasnoyarsk State Agrarian University as an example), on the basis of which to develop corrective organisational and methodological recommendations and implement them in physical education practice.

Methods and structure of the study. The study was conducted at the educational base of Krasnoyarsk State Agrarian University between 2024 and 2025. The sample size was 180 female students in their first to third years of study. Control groups of female students were formed using random sampling. The following methods were selected and used to organise and conduct the analytical study: analysis of scientific and methodological literature, pedagogical observation, surveys, questionnaires, physical fitness testing, measurement of physical development indicators, systematisation, abstraction, methods of mathematical statistics, etc. During the academic year, first- to third-year female students were tested for physical fitness according to the following indicators: push-ups, standing long jump, sit-ups per minute, 2000-metre run, 100-metre run, forward bend from a standing position, as well as measurements of physical development: height and weight, hand dynamometry (right and left hands) and measurement of heart rate at rest while sitting per minute. All of the above indicators were compiled and systematised in a table, on the basis of which the analysis was carried out.

Results and conclusions. During the experimental work, 6 indicators of physical fitness and five indicators of physical development were analysed. The total number of various measurements exceeded 2,000 units. The significant factual material collected made it possible to identify the dynamics and state of physical fitness and physical development of first- to third-year female students in the Siberian region (using the example of students at Krasnoyarsk State Agrarian University). The physical development indicators of first- to third-year female students increased on average: in height by 1.3%, in body weight by 1.5%, in hand dynamometry: right hand by 25% and left hand by 26.6%. In terms of physical fitness, female students showed a significant increase on average in sit-ups per minute – 21.2% and forward bend from a standing position – 36.1%, strength indicators increased by 2.3% and speed-strength indicators by 3.1%, and speed indicators in the 100-metre run improved by 1.3%. These indicators allow us to conclude that female students show significant positive dynamics in the improvement of their physical development and physical fitness. Making additional methodological adjustments to the physical education programme for female students in the Siberian region (using Krasnoyarsk State Agrarian University as an example) will increase the effectiveness of the growth in physical development and physical fitness indicators for females by their third year of university.

Keywords: *physical fitness, physical development, female students, Siberian region, dynamics.*

Introduction. Student years are an important part of the formation and development of young people's mental and physical potential. During this period, students actively develop professional competencies for their future careers and continue to build their physical health. Physical health as a whole determines professional activity and working capacity in future life. Therefore, during the process of higher education, it is necessary to pay significant attention to the harmonious physical education of young students as a necessary condition for effective professional activity in the future. However, as practice shows, university gradu-

ates have low levels of physical fitness, physical development, etc. This trend is especially common among female students, with up to 60% of the total female student population showing low levels of physical fitness and development, which is directly related to reproductive health functions. All of this together determined the topic of the study, which aims to improve the effectiveness of physical education for young people, and in particular for female students at universities.

Objective of the study is to conduct a theoretical and statistical analysis of the physical fitness and physical development of female students in their first to third years of study in the Siberian region (using Krasnoyarsk State Agrarian University as an example), on the basis of which to develop corrective organisational and methodological recommendations and implement them in physical education practice.

Methods and structure of the study. The study was conducted at the educational base of Krasnoyarsk State Agrarian University between 2024 and 2025. The sample size was 180 female students in their first to third years of study. Control groups of female students were formed using random sampling. The following methods were selected and used to organise and conduct the analytical study: analysis of scientific and methodological literature, pedagogical observation, surveys, questionnaires, physical fitness testing, measurement of physical development indicators, systematisation, abstraction, methods of mathematical statistics, etc. During the academic year, first- to third-year female students were tested for physical fitness according to the following indicators: push-ups, standing long jump, sit-ups per minute, 2000-metre run, 100-metre run, forward bend from a standing position, as well as measurements of physical development: height and weight, hand dynamometry (right and left hands) and measurement of heart rate at rest while sitting per minute. All of the above indicators were compiled and systematised in a table, on the basis of which the analysis was carried out.

Results of the study and discussion. First- to third-year female students from Krasnoyarsk State Agrarian University participated in the research, with a sample size of 180 people. The average age of first-year students was 17.5±0.5 (years), second-year students were 18.6±0.8 (years), and third-year students were 19.8±0.5 (years). During 2024-2025, an analysis of the dynamics of physical fitness and physical development of female students was conducted. The collected statistical data are presented in Table 1.

The collected and processed statistical data show that, in general, female students experience positive changes in their physical fitness and physical development during their university studies. This allows us to conclude that systematic practical physical education classes at the university have an impact on the physical health of female students. At the same time, however, many indicators in female students develop on the basis of natural age-related physiological development, but this is insignificant and ranges from 1.5% to 2.5%.

Table 1. Dynamics of physical fitness and development indicators for female students in years 1–3 in the Siberian region (based on the example of Krasnoyarsk State Agrarian University)

No.	Physical development and fitness indicators	Year of study, ± σ			Increase in%	P
		1	2	3		
1	2	3	4	5	6	7
	Body height, cm	166,6±4,2	167,3±4,4	168,7±4,2	1,3%	p<0,05
	Body weight, kg	60,8±7,1	60,7±6,4	61,7±9,8	1,5%	p<0,05
	Heart rate, at rest while sitting, beats per minute	83,8±9,8	83,5±8,8	83,3±9,8	-0,6%	p>0,05
	Hand dynamometry, kg:					
	Right hand:	14,8±2,9	15,3±4,2	18,5±4,2	25%	p<0,05
	Left hand:	12,01±2,0	13,8±2,9	15,2±3,2	26,6%	p<0,05
	Arm curls in a push-up position, number of times	8,9±2,4	9,9±2,2	9,1±3,2	2,3%	p<0,05
	Standing long jump, cm	152,8±12,1	159,1±12,5	157,6±8,6	3,1%	p<0,05
	Sit-ups per minute from a lying position, number of times	23,6±3,9	29,1±3,9	28,6±5,1	21,2%	p<0,05
	2000 m run, min/sec	14.20±1.37	15.00±1.10	14.55±1.50	-2,5%	p>0,05
	100 m run, sec	18,3±0,8	18,1±1,1	17,8±1,2	1,3%	p<0,05
	Forward bend from a standing position, cm	6,1±2,77	5,7±2,9	8,3±3,2	36,1%	p<0,05

Thus, in order to enhance the process of physical development and fitness, it is necessary to improve the content of physical education programmes for female students in higher education institutions by introducing more modern forms and teaching technologies.

Conclusions. An analysis of the physical development and physical fitness of female students in their first to third years of study in the Siberian region (using Krasnoyarsk State Agrarian University as an example) showed a positive trend of improvement: physical development increased by 13.6% ($p<0.05$) and physical fitness by 10.3% ($p>0.05$). At the same time, we see that these figures (3% - 5%) reflect the natural biological growth and development of a young organism. In this regard, it is necessary to improve the content of physical education programmes based on modern means and sports technologies, which will significantly enhance the pedagogical impact on the physical health of female university students.

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Fitness technologies in the comprehensive formation of the mobility of the musculoskeletal system and general endurance of female university students

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Abstract

Objective of the study is to justify and develop a set of exercises based on fitness technologies for improving the mobility of the musculoskeletal system and overall endurance of female university students and to recommend them for practical use.

Methods and structure of the study. The study was conducted at Altai State Pedagogical University in 2024-2025 among first- and second-year female students. A total of 70 female students participated in the study. The following research methods were selected to gather factual material: analysis of scientific and methodological materials on the research topic, interviews, questionnaires, abstraction, generalisation, physical fitness testing, pedagogical observations, collection of practical material and its processing using mathematical statistics methods.

Results and conclusions. The preliminary analytical material presented shows that important indicators of physical fitness, such as spinal mobility and overall endurance of female students, are at a low level, and it is necessary to improve the content of physical education for female students at the university based on the design of fitness technologies. The introduction of fitness aerobics exercise complexes into the physical education programme for female university students will help to increase their motivation for physical activity.

Keywords: *fitness technologies, comprehensive training, musculoskeletal mobility, general endurance, female students, university.*

Objective of the study is to justify and develop a set of exercises based on fitness technologies for improving the mobility of the musculoskeletal system (MSS) and overall endurance of female university students and to recommend them for practical use.

Methods and structure of the study. The study was conducted at Altai State Pedagogical University in 2024-2025 among first- and second-year female students. A total of 70 female students participated in the study. The following research methods were selected to gather factual material: analysis of scientific and methodological materials on the research topic, interviews, questionnaires, abstraction, generalisation, physical fitness testing, pedagogical observations, collection of practical material and its processing using mathematical statistics methods. The selected and compiled empirical material contributed to the development of appropriate exercise routines based on fitness technologies aimed at improving the mobility of the musculoskeletal system and overall endurance of female university students in physical education classes.

Results of the study and discussion. A preliminary analysis of the spinal mobility indicators of female students (forward bend from a standing position, cm) =6.7±1.5 and overall endurance (2000 m run, min/sec) =12.37±1.3 shows that the results obtained by females in forward bend from a standing position correspond to the GTO standard – VI below the bronze badge, and in the 2000 m run – only

to the values of the bronze badge. The preliminary analytical material presented shows that important indicators of physical fitness, such as spinal mobility and general endurance of female students, are at a low level, and it is necessary to improve the content of physical education for female students in higher education institutions based on the design of fitness technologies. Modern fitness technologies help to increase female students' motivation for physical activity, unlike classic and standard exercises. The combination of modern fitness equipment and musical accompaniment allows for a more effective, interesting and varied approach to developing the physical fitness of female students at the university. One of the most accessible and affordable types of fitness technology is fitness aerobics. Fitness aerobics classes develop both good mobility of the musculoskeletal system and overall aerobic endurance. Performing fitness aerobics exercise routines for 15-20 minutes during the main part of the class will significantly improve the mobility of the musculoskeletal system and the overall endurance of the students.

Conclusions. The introduction of fitness aerobics exercise complexes into the physical education programme for female university students will help to increase their motivation for physical activity and solve an important task of the physical education process – to prepare not only competent specialists, but also physically fit people for their future work.

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Ways to improve the effectiveness of tourist training grounds on the terrain in the ‘distance-walking’ discipline group

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Abstract

Objective of the study is to design a tourist training ground taking into account the characteristics of the terrain and to justify its operational potential in the system of additional education for young tourists.

Methods and structure of the study. Comparative analysis of classic tourist training grounds; a training ground was created in the village of Siza (Arsky District, Tatarstan) using the design method.

Results and conclusions. An innovative, practice-oriented model of a tourist training ground is presented, distinguished by its versatility, accessibility, multifunctionality, and organic integration with the natural landscape. 7 key advantages are highlighted and justified. This methodology brings training closer to real camping conditions, forming sustainable practical skills, and can be used in tourist and local history clubs, sections, and camps.

Keywords: *sports tourism, training ground, crossing, young tourists, distance.*

Introduction. In recent years, there has been an increase in the number of tourist training grounds designed to improve skills in distance walking and hold sports tourism competitions. Increased interest among students in the discipline of ‘distance walking’ has contributed to the creation of school tourist training grounds based in educational organisations. In some regions, specialised training grounds have appeared for organising sports camps and holding All-Russian competitions [2].

Issues related to improving the efficiency of tourist training grounds and refining methods for the initial training of students in terrain with natural obstacles remain relevant. The standardisation of tourist crossings makes it possible to study the functional indicators of the cardiovascular system of athletes of different levels of training during physical exertion [3].

There are several types of modern tourist training grounds: indoor tourist simulators, universal outdoor facilities, high-altitude training grounds, and combined training grounds [4].

All training ground models have methodological support and have proven their effectiveness through competition results and the sporting achievements of trainees [1]. However, it should be noted that the widespread use of artificial obstacles has led to the division of sports tourism into hiking and distance training, disrupting the traditional relationship between hiking and the skills of overcoming natural obstacles.

Objective of the study is to design a tourist training ground taking into account the characteristics of the terrain and to justify its operational potential in the system of additional education for young tourists.

Methods and structure of the study. A comparative method was used to analyse classic tourist training grounds and design a new one in natural conditions using modern approaches. The possibilities of using individual and combined obstacles were studied, taking into account the objectives and level of preparedness of the participants.

Using the design method, a tourist training ground was equipped on the terrain of the village of Siza in the

Arsky municipal district of the Republic of Tatarstan. The crossings are supported by wooden posts with horizontally located attachment points designed for three parallel routes.

For a comprehensive analysis of the training ground's effectiveness, distance options ranging from first to fourth grade of difficulty were designed, and the possibilities of equipping the stages with various crossings for individual and team passage were studied.

Results of the study and discussion. Unlike abstract traditional approaches, the proposed model of a tourist training ground on the terrain ensures maximum practical orientation and efficiency. The distinctive features of the new model of a tourist training ground in natural conditions are its versatility, accessibility to all tourists, multifunctionality, connection to the natural terrain, location of crossings, and potential for use in combination with various types of recreational activities (Figure 1).

The training ground equipped in the village of Siza in the Arsky District of the Republic of Tatarstan offers the following key advantages:

1. Versatility and variability of stages – the training ground allows you to simulate a variety of situations for overcoming natural obstacles, adapting the difficulty to the level of preparedness of the students. A natural ravine 6-8 metres deep with a distance of 20 metres between supports allows you to flexibly plan stages in different parts of the distance. At the complex stage, six obstacle options can be set up: descent and ascent along handrails, vertical descent and ascent, a suspended crossing and a crossing along parallel handrails. Some obstacles are overcome using a block principle – several consecutive stages without losing safety in a potentially dangerous area.

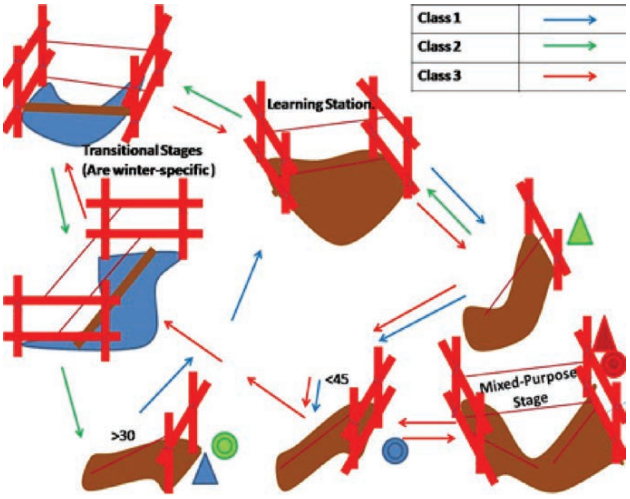

Fig. 1. Tourist training ground on the terrain (Siza village, Arsky District, Republic of Tatarstan)

2. Linking stages to natural terrain. Using the natural landscape helps trainees develop the skills to overcome real hiking obstacles. The skills acquired in natural conditions give a significant advantage for making effective decisions in real hikes. The training ground includes three types of stages for practising climbing and descending techniques:

- Grass slope (40 m, steepness up to 30°) — for beginner hikers;

- Rocky and loose slope (20 m, steepness 30-60°) — for hikers with experience in 1-2 category competitions;

- Clayey steep slope (12 m, steepness 80-90°) — for experienced hikers, requiring complex technical skills.

In addition, the training ground includes natural water obstacles (10-15 m), swampy areas, thickets and narrow paths. The entire distance, except for the start and finish areas, is located on rough terrain with a height difference of 23 metres.

3. Optimal route organisation (distance and conditions). A methodically constructed sequence of obstacles simulates real hiking conditions. The terrain uses natural trails with key areas cleared for safety, which trains both obstacle-overcoming techniques and the distribution of forces on rough terrain. It is possible to expand the training ground to the nearest ravine and forest. The proximity (up to 1 km) of areas for orienteering and ski trails ensures year-round use. In winter, it is possible to lay a ski trail for organising obstacle courses with skis in accordance with hiking practice. The compact location of the stages allows for planning local routes with a return to the ski trail, although additional adaptation of the terrain is required for full winter use.

4. Local tasks of the stages. A feature of the training ground on natural terrain is the ability to use the same type of obstacles to solve local tasks, which implements the principle of integrated training. This allows you to simulate competitive distances on your 'home' training ground. Variability in training is achieved by changing: the nature of the obstacles (dry ravine, water barrier, pit); length (6-25 m); type of slope surface (grassy, clayey, rocky); height of the railing from the ground (1-8 m).

Each obstacle (ascent, descent, crossing) solves a specific training task, allowing for the targeted practice and evaluation of individual technical elements.

5. Recreational component of the stages. The recreational focus of the training ground on natural terrain, although it seems to contradict sporting objectives, plays a key role in attracting young tourists to school clubs and the system of additional education.

The parameters of the stages (slope steepness, length of sections, their relative location) are selected with safety and the creation of a positive atmosphere in mind, which increases student motivation. In accordance with the rules of sports tourism, the main focus is on teaching proper belaying and self-belaying — the foundation for safely completing the distance. On a training ground with natural terrain, young tourists acquire skills in conditions that are as close as possible to a real route, learn self-control, interaction with partners and rational distribution of forces.

6. Flexibility in formatting stages. The multifunctionality of the training ground allows you to quickly change the sequence of obstacles depending on current conditions (weather, group status, identified errors), which makes training adaptive. Each stage can be modified during the lesson: replace a suspension bridge with parallel railings, transform a descent into a steep descent, and a climb into an inclined bridge upwards. This flexibility allows the tourist to choose the method of passage depending on their skills and condition, and the teacher to plan different distance options without losing teaching time.

7. Parallel skill development at one stage. Our design allows you to practise movements in both directions along parallel routes at one stage. This is especially effective for beginners when mastering the 'ascent-descent', 'suspension-rope crossings' and 'pendulum-swamp' blocks. By performing actions in the opposite direction, young hikers can identify mistakes more quickly, realise the importance of safety measures, and find the best ways to overcome obstacles. This approach ensures high-intensity training with the possibility of several students working simultaneously, forming mutual safety skills and developing teamwork.

Conclusions. The developed methodology, which utilises a training ground on natural terrain, brings initial tourist training closer to real hiking conditions, forming sustainable practical skills. The training ground provides versatility and variability of stages with their attachment to natural terrain and optimal distance between them, which effectively simulates the conditions of hiking. The results of this work can be used when planning programmes for tourist and local history clubs, sections and camps, increasing the safety of classes and the technical preparedness of participants.

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Organisation of physical rehabilitation and abilitation of preschoolers with severe multiple developmental disabilities

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Abstract

Objective of the study is to develop and substantiate a pedagogical model of physical rehabilitation and habilitation of preschoolers with severe multiple developmental disabilities (SMDD) based on an assessment of their physical development, motor abilities and typological characteristics.

Methods and structure of the study. Analysis of scientific literature and modern approaches to physical rehabilitation of children with SMDD; a ascertaining experiment in three specialized institutions of preschool education; modeling of the rehabilitation and habilitation process.

Results and conclusions. The theoretical and methodological foundations of physical rehabilitation and habilitation of children with SMDD have been determined, criteria for a comprehensive assessment of physical development and motor abilities have been developed, diagnostic tools have been identified, and four typological groups of children with SMDD have been identified. A model has been developed, the conceptual basis of which is a functional approach aimed at increasing the adaptive capabilities of the body and the formation of motor skills necessary for the daily activities of children with SMDD.

Keywords: *physical rehabilitation, physical habilitation, severe multiple developmental disabilities, preschool age.*

Introduction. The issue of physical rehabilitation and habilitation of children with SMDD is becoming particularly important in the context of current trends in the development of special education systems. According to statistics, the prevalence of SMDD ranges from 1.0 to 2.5% of the child population, with a steady upward trend in the number of children in this category [2].

Severe multiple developmental disabilities are a combination of two or more psychophysical disabilities (intellectual, sensory, motor, speech) that significantly impede normal development and require special learning conditions. The complex nature of these disabilities makes the tasks of physical rehabilitation and habilitation for these children particularly difficult.

The preschool period is sensitive for the formation of motor skills, but in children with SMDD this process is difficult due to a pronounced lag in physical development and motor function disabilities [1]. Existing physical education programmes often do not take into account the complexity of the problem, and preschool institutions often lack the conditions for full physical education and rehabilitation support. Studies show the need to develop innovative physical rehabilitation techniques that take into account the individual characteristics of children with SMDD [2, 3, 5]. It is especially important to scientifically substantiate a systematic approach that integrates medical, psychological, and pedagogical technologies into a single rehabilitation space in a preschool institution [2, 5, 6].

Objective of the study is to develop and substantiate a pedagogical model of physical rehabilitation and habilitation of preschoolers with severe multiple developmental disabilities (SMDD) based on an assessment of their physical development, motor abilities and typological characteristics.

Methods and structure of the study. Analysis of medical, psychological, pedagogical, and scientific literature on the research topic; systematic analysis

of contemporary approaches to physical rehabilitation and habilitation of children with SMDD; a diagnostic experiment to identify the initial level of physical development and motor abilities of children with SMDD (based on three compensatory preschool education institutions in Kazan); modelling of the rehabilitation and habilitation process in preschool education institutions.

Results of the study and discussion. Based on an analysis of contemporary scientific approaches [1-6], conceptual principles for the physical rehabilitation and habilitation of children with SMDD were formulated (see Figure 1).

Unity of diagnostic, corrective, developmental and preventive tasks
Consideration of the structure of the disability and mechanisms for its compensation
Focus on a functional approach to evaluating effectiveness
Interdisciplinary interaction between specialists
Integration of medical, psychological and pedagogical technologies
Systematicity and continuity
Involvement of parents as active participants in the process

Fig. 1. Conceptual provisions of the rehabilitation and habilitation process

The general sample of the study included 68 children with SMDD aged 4 to 7 years (mean age 5.7±0.9 years), of whom 39 were boys (57.4%) and 29 were girls (42.6%). All children were diagnosed with a combination of two or more developmental disorders of varying aetiology and severity:

- moderate to severe intellectual disabilities – 68 children (100%);
- motor disorders – 54 children (79.4%);
- visual impairments of varying degrees – 37 children (54.4%);
- hearing impairments – 15 children (22.1%);
- autism spectrum disorders (ASD) – 21 children (30.9%);
- epileptic syndrome – 18 children (26.5%).

At the next stage, a comprehensive examination of children with SMDD was carried out using the developed diagnostic tools (see Table 1). Physical development, functional state of the body, nature of the formation of basic movements, psychomotor development, and adaptive skills were assessed.

The test results confirmed significant delays in the physical and motor development of children with SMDD:

- physical development indicators in 82% of children were below age norms;
- functional indicators of the cardiorespiratory system showed a decrease in the functional reserves of the body in 76% of children;
- gross motor skill impairments were observed in 91% of children;
- poor fine motor skill development was noted in 97% of children;
- movement coordination impairments of varying severity were identified in 100% of children;
- reduced muscle strength indicators were observed in 85% of children.

Based on the data obtained, a cluster analysis was performed, which allowed us to identify **four typological groups of children with SMDD**, differing in the nature and severity of motor disorders, the preservation of sensory systems, and the level of psychophysical development:

1. Group with predominant motor disorders (31% of children) – children with pronounced disorders of the musculoskeletal system combined with intellectual disorders.

2. Sensory-motor group (24% of children) – children with a combination of visual/hearing, motor, and intellectual disorders.

3. Group with impaired voluntary movement control (27% of children) – children with intellectual

Table 1. Methods for diagnosing the psychophysical development of children with SMDD

Methods for testing physical and functional development	Psychodiagnostic methods
- Anthropometric measurements (height, body weight, chest circumference, vital capacity)	**- Neuropsychological examination** (modified version of A.R. Luria's method for preschoolers with SMDD)
- Testing of physical qualities using adapted tests	**- Assessment of psychomotor development** using the method developed by N.M. Ozeretsky, modified by M.O. Gurevich and N.I. Ozeretsky
- Assessment of the functional state of the body (heart rate, blood pressure, Stange and Genchi tests)	**- Vineland Adaptive Behaviour Scales** **- Stott Observation Chart** (modified version)

impairments and autism spectrum disorders, characterised by stereotypical behaviour and problems with voluntary movement control.

4. Group with multiple combined pathologies (18% of children) – children with a complex of severe disorders, including epileptic syndrome, requiring constant support.

Conclusions. The proposed typology, reflecting the specifics of motor disorders in children with SMDD, made it possible to differentiate approaches to their physical rehabilitation and habilitation, to develop a comprehensive model, whose conceptual basis is a functional approach focused on improving the body's adaptive capabilities and forming the motor skills necessary for the daily activities of children with SMDD.

The model has a four-component structure (diagnostic, content-planning, organisational and assessment blocks), ensuring the integrity of rehabilitation. The diagnostic block identifies the individual potential of the child through the author's assessment methodology. The content and planning block provides for the development of differentiated programmes taking into account typological groups. The organisational block integrates traditional and innovative methodologies adapted to the needs of each group. The assessment unit monitors the effectiveness of the programmes and makes adjustments. An important advantage of the model is that it can be implemented in a preschool setting with the teamwork of specialists from different fields and the active participation of parents.

The completed stage of the research opens up prospects for the implementation and practical testing of the developed innovations in the context of an organised pedagogical experiment.

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Study of the functional performance of students in a special medical group after coronavirus infection

UDC 57.033

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Abstract

Objective of the study is to investigate the effect of moderate-intensity walking on heart rate variability in students who have been assigned to a special medical group and have had coronavirus infection.

Methods and structure of the study. The study was conducted at the Department of Medical and Biological Foundations of Physical Culture at Surgut State University. The study of heart rate variability was carried out using the Varicard 3.0 software and hardware complex. The sample consisted of 31 people, including 15 young men and 16 young women, with an average age of 19.6±3.7 years.

Results and conclusions. The study revealed the positive effect of a six-minute walk of moderate intensity on the functional indicators of the autonomic nervous system (ANS) of students in a special medical group who had recovered from COVID-19.

Keywords: *coronavirus infection, students, autonomic nervous system, sympathicotonia, parasympathicotonia, eytonia, functional training, walking, special medical group.*

Introduction. The relevance of this article is due to the importance of finding innovative approaches and the need to develop methodological recommendations for reducing, eliminating, and preventing the consequences of COVID-19. Currently, there is a wide variety of data on the negative impact of the virus on human physical, mental and social well-being. It is noted that the COVID-19 pandemic has created a complex scenario for global health. Millions of people have various complications and functional disorders associated primarily with damage to the respiratory system [2]. Studies on this issue indicate that people with mild coronavirus infection complain of functional impairments when returning to work or school, and more than 50% of those who have recovered report a decrease in tolerance to physical activity. The manifestations of the new coronavirus infection affect not only the pulmonary system, but also the cardiovascular and nervous systems and the musculoskeletal system [4].

When studying the impact of physical exercise on the health of students who have had the disease, it was found that many people, even after recovery, need rehabilitation from post-COVID syndrome and the serious consequences of the infection [3]. A number of publications emphasise that physical exercise is an important part of recovering from a serious illness caused by COVID-19. It has a beneficial effect on the cardiovascular, respiratory, nervous and other systems of the body, improving their function and maintaining overall physical performance [1].

Assessing the functional performance of students who have had the disease is an integral part of the physical education process at universities. One of the indicators for study is heart rate variability (HRV), which takes into account the individual characteristics of the student, the climatic and weather conditions of their place of residence, and the nature of the academic workload they performed on the eve of or immediately before diagnosis.

Objective of the study is to investigate the effect of moderate-intensity walking on heart rate variability in students who have been assigned to a special medical group and have had coronavirus infection.

Methods and structure of the study. The study was conducted at Surgut State University. The sample included 31 students, 15 males and 16 females, with an average age of 19.6±3.7 years. All students had recovered from COVID-19 and were assigned to a special medical group for physical education classes.

Heart rate variability was studied using the Varicard 3.0 software and hardware complex. The subjects were divided into three groups based on data on their initial vegetative tone. There were 11 people in the parasympathicotonic (vagotonic) group, 12 in the sympathicotonic group, and 8 in the eytonic group. The following indicators were analysed: heart rate, cardiac interval variation amplitude (MxDMn), total level of neurohumoral regulation (TP), state of the sympathetic (LF) and parasympathetic (HF) divisions, energy-metabolic level (VLF), stress index (SI), and indicator of regulatory system activity (IRSA). Testing algorithm: the student was diagnosed while lying on a couch, then walked on a treadmill at a speed of 5 kilometres per hour. The angle of inclination was from zero to three degrees. The experiment lasted 14 weeks. The results were processed using Student's t-test statistical data processing method.

Results of the study and discussion. To date, there is no consensus on the interpretation of HRV results. In our case, the study was based on the 'Classification of predominant types of vegetative regulation of heart rhythm according to heart rate variability analysis' compiled by N.I. Shlyk [5].

The heart rate in the group of individuals with parasympathetic tone corresponds to generally accepted reference values and did not change after exercise. The heart rate in students from the sympathetic tone group decreased slightly. In the eytonic group, the heart rate increased (Table 1).

The variation range of cardiac intervals increased in sympathetic students but decreased in the euthonic group. In parasympathetic students, it remained unchanged. The TP indicator, which determines the total power of the spectrum, normally varies in the range from 7000 ms^2 to 10000 ms^2. In our case, students in all groups showed values below normal before and after the control intervention, which may indicate a general deterioration in neurohumoral regulation.

Second-order vasomotor waves indicate the state of the sympathetic division of the autonomic nervous system. It is generally accepted that "normally, the proportion of vasomotor waves in the lying position should be less than that of respiratory waves (HF, ms2). In students who are parasympathicotonic and eytonic, the indicator decreased as a result of exposure, while in the group of sympathicotonic students, it increased twofold. In the eytonic group, the results confirmed that the regulatory processes are carried out with the participation of some non-specific mechanisms.

Table 1. Heart rate variability indicators for students in the special medical group (M±δ)

Indicators M±σ	Parasympathotonics (n=11)		Sympathotonics (n=12)		Eitonics (n=8)	
	Before	After	Before	After	Before	After
Heart rate, beats per minute	71,7 ±7,1	72,6 ±8,8	86,6 ±6,7	83,0 ±4,9	76,4 ±4,4	80,7 ±6,4
Cardiointerval variation range indicator (MxDMn, ms)	365,7 ±96,9	365,7 ±116,9	193,0 ±59,5	223,1 ±58,9*	256,4 ±61,9	227,3 ±79,5
Overall level of neurohumoral regulation (TP, ms^2)	4717,8 ±2867,3	4567,3 ±2507,7	1272,8 ±892,4	1715,6 ±981,9*	1979,5 ±1038,6	1214,7 ±1186,0
State of the sympathetic division (LF, ms^2)	1570,3 ±1624,6	1170,5 ±507,7	295,7 ±116,2	481,9 ±193,0*	770,1 ±480,8	581,4 ±676,3
State of the parasympathetic division (HF, ms^2)	2170,4 ±2133,3	2538,7 ±1561,3	388,4 ±171,8	717,6 ±79,3*	597,8 ±337,9	282,0 ±230,3
State of the energy metabolism level (VLF, ms^2)	426,8 ±115,9	488,2 ±369,5	257,1 ±384,0	252,2 ±98,1	380,9 ±253,9	170,8 ±134,9
Stress index (SI, u.e.)	60,9±32,1	62,2±60,9	248,7 ±99,3	176,3 ±91,8*	128,9 ±68,5	208,7 ±226,8
Indicator of regulatory system activity (IRSA)	4,0±1,7	4,0±1,1	4,3±1,4	3,8±1,5	2,5±0,6	3,5±1,6

** statistically significant at p ≤0.05*

The state of the parasympathetic division was assessed based on the values of first-order respiratory waves – HF ms^2. A decrease in the indicator indicates a shift in the vegetative balance towards the predominance of the sympathetic division. If the absolute value of HF drops or rises sharply, then we can talk about a sharp predominance of central or autonomic regulation. This situation was identified in all three groups, but only in the eytonic group did it decrease sharply, while in the other two groups it increased. Thus, the mechanisms of central or autonomic regulation were activated in all subjects.

The VLF criterion is a sensitive indicator of metabolic processes and accurately reflects energy-deficient states. An increase in this indicator was observed only in the vagotonic group, indicating a hyperadaptive response, while a decrease in the other groups indicated an energy deficit that arose after exercise.

The statistical indicator stress index is closely related to the activity of the sympathetic division of the autonomic nervous system, as well as to the centralisation of heart activity control. Only the parasympathicotonic group had a stress index within the reference values. The indicators for the sympathicotonic and eytonic groups were significantly higher, indicating the presence of stress.

The IRSA values in the parasympathicotonic and sympathicotonic groups at the beginning of the exposure corresponded to a state of moderate tension. In order to adapt to environmental conditions, students' bodies will need additional functional demands. First and foremost, this concerns adaptation to study, adverse climatic and environmental factors, as well as emotional stress. Eytonic individuals exhibited a state of optimal tension in their regulatory systems.

Conclusions. The study confirmed the effectiveness of a 6-minute moderate-intensity walk on the heart rate variability of students who had recovered from coronavirus infection. In our opinion, it is necessary to expand the aerobic exercise programme by including short periods of moderate exercise during the class. To this end, we recommend introducing the mandatory use of 6-minute walks in various forms in physical education classes for students in the special medical group: walking on a treadmill at different angles (personalised, depending on the student's pathology); climbing a step platform with changes in walking pace; classic walking around the perimeter of the hall at a moderate pace.

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Distribution of finances in the field of physical culture and sport using the example of the Ural Federal District

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Abstract

Objective of the study is to identify sources of funding in the field of physical culture, in particular sports infrastructure facilities, and areas of financial resource allocation at the regional level.

Methods and structure of the study. Statistical and factor analysis, dynamic method, expert assessment method, and formulation of abstract logical content.

Results and conclusions. It is determined that the financing of physical culture in the Ural Federal District is a complex but dynamic process that combines the ambitions of industrial regions and the challenges of depressed territories. Despite the disparity in resources, the district has demonstrated success in building infrastructure and supporting mass sports. Strengthening inter-regional cooperation, attracting private capital and targeted support for areas with low living standards will be a key condition for further progress. Financing physical education in the Sverdlovsk Oblast is a strategic area that unites the efforts of the state, business and society. Thanks to systemic investments, the region not only improves the health of the population, but also brings up new champions. However, in order to achieve maximum effect, it is important to continue to diversify sources of funds and pay attention to the development of sports in small towns and villages.

Keywords: *infrastructure facilities, physical culture and sport, financing, regional level, mass sport.*

Introduction. The Ural Federal District (UrFD), which comprises six constituent entities of the Russian Federation, including the industrial giants of the Sverdlovsk and Chelyabinsk Oblasts, as well as the resource-rich Khanty-Mansi Autonomous Okrug and Yamalo-Nenets Autonomous Okrug, demonstrates a variety of approaches to financing physical culture and sport. The development of this sphere not only improves the health of the population, but also supports social stability in regions with a high proportion of working-age people. In this article, we will look at how resources are distributed, what projects are being implemented, and what difficulties the district faces [11].

Objective of the study is to identify sources of funding in the field of physical culture, in particular sports infrastructure facilities, and areas of financial resource allocation at the regional level.

Methods and structure of the study. Statistical and factor analysis, dynamic method, expert assessment method, and formulation of abstract logical content.

Results of the study and discussion. Funding for physical culture in the Urals Federal District comes mainly from the budgets of the constituent entities of the Russian Federation [4]. Regions with strong economies (Khanty-Mansi Autonomous Okrug, Yamalo-Nenets Autonomous Okrug, Sverdlovsk Oblast) allocate significant amounts. For example, in 2023, spending on sport in the Khanty-Mansi Autonomous Okrug exceeded 4 billion roubles, in the Yamalo-Nenets Autonomous Okrug – 3.2 billion, and in the Sverdlovsk Oblast, funding exceeded 2.5 billion roubles. These funds are used for the construction and repair of facilities, support for sports schools and the organisation of events. Participation in national projects (Demography, 'Sport – a Way of Life')[1] allows up to 20-30% of funds to be attracted for the construction of facilities. Companies in the fuel and energy com-

plex (Gazprom, Rosneft) and metallurgical holdings (MMK, UMMC) sponsor the construction of sports complexes and the holding of tournaments. This is done directly to attract capital investment in the sports industry. Sport is a fairly favourable arena for finding new consumers for a product, advertising and promoting it. It also has a positive effect on the perception of product or service advertising and the formation of a positive attitude among potential customers, unlike other PR channels [8].

In small towns and villages, their own funds are directed towards the renovation of sports halls and the organisation of local events [10]. The following areas are recognised as measures to prioritise spending on physical culture and sport: the creation of infrastructure in large cities in the Urals Federal District – multifunctional complexes are being built: ice palaces (Chelyabinsk), open-type sports and recreation complexes (Tyumen), swimming pools (Yekaterinburg). In 2022, the multifunctional complex 'Palace of Martial Arts' opened in Yekaterinburg.

In rural areas, the focus is on renovating old gyms and installing outdoor exercise equipment [1]. Regional competitions (Ural Ski Trail, Golden Puck) are funded, as well as programmes for people with disabilities. Projects such as Sport in Schools are being implemented, where educational institutions receive grants to purchase equipment. Regions are investing in Olympic training centres (for example, Yunost in the Sverdlovsk Oblast).

A striking example of sports infrastructure that has been created and put into operation is the Biathlon Academy in Khanty-Mansiysk, a modern complex built with the support of the Yugra government, which has become the training base for the Russian national team [2].

The Arena Tyumen stadium, which was renovated with federal and regional funds, hosts Premier League

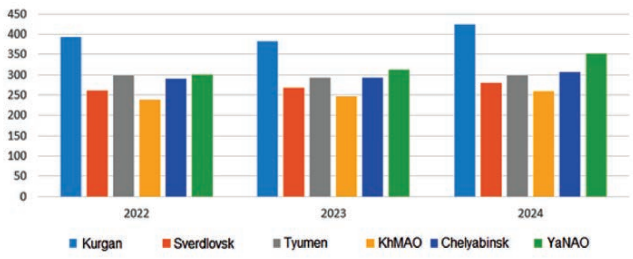

Fig. 1. Sports infrastructure facilities per 100,000 inhabitants by region in the Urals Federal District, units

mini-football matches. The 'Sporting Trans-Urals' programme in the Kurgan Oblast, thanks to which 50 playgrounds for workout and courtyard football have been created in three years.

The number of sports facilities per 100,000 residents in the region is shown in the Figure 1.

In terms of the dynamic development of sports infrastructure facilities, the Kurgan Region has been the leader over the past three years, although the amount of financial support for these facilities during the specified periods is significantly lower than in the Sverdlovsk Oblast and Khanty-Mansi Autonomous Okrug. In 2024, the Kurgan Oblast also became the leader in terms of the dynamic development of sport in the region. This was achieved thanks to the large-scale commissioning of renovated school stadiums and mini-stadiums, as well as the construction of modular school sports halls and new sports grounds [9]. Thanks to the infrastructure created, which attracted both state and local funding, as well as funds from the population through participatory budgeting, the Kurgan Oblast is attracting more citizens, and athletes are achieving high results. In the Chelyabinsk Oblast, the pace of development of mass sports has accelerated, which is happening in parallel with the creation of new sports infrastructure. At the same time, the Chelyabinsk Oblast is not a single-sport region; both summer and winter sports are successfully developing there, and approximately 3 billion roubles will be allocated to infrastructure development by the end of 2024, which exceeds spending on sport in the Sverdlovsk Oblast. The Khanty-Mansi Autonomous Okrug and the Yamalo-Nenets Autonomous Okrug prefer to allocate spending on sports infrastructure in accordance with their development programmes [3].

However, problems with the financial support and development of physical culture and sports between the regions of the Urals Federal District remain unresolved: firstly, there is a disproportion between the regions, with the wealthy KhMAO and YANAO spending 5-7 times more on sports than, for example, the Kurgan Region. Secondly, there is a shortage of personnel, as small towns and villages lack coaches, especially for winter sports. Thirdly, there are climatic difficulties, as in the northern regions of the Urals Federal District (Yamalo-Nenets Autonomous Okrug), short daylight hours and extreme temperatures limit the opportunities for outdoor activities [5]. And fourthly, the wear and tear of sports infrastruc-

ture facilities reaches almost 40% for all sports facilities in old industrial cities, and they require major repairs [6].

As a measure to support the physical culture and sports industry, the authorities plan to involve businesses in the management of facilities (for example, fitness clubs based in school gyms). The introduction of platforms for online registration in sections and monitoring attendance will speed up the process of enrolling children in sports schools, ensure the monitoring of progress and control attendance at classes [7].

Conclusions. Funding physical culture in the Ural Federal District is a complex but dynamic process, combining the ambitions of industrial regions with the challenges of depressed areas. Despite inequality in resources, the district is demonstrating success in creating infrastructure and supporting mass sport. The key conditions for further progress will be strengthening interregional cooperation, attracting private capital, and providing targeted support to areas with low living standards. Funding physical culture in the Sverdlovsk Oblast is a strategic direction that unites the efforts of the state, business, and society. Thanks to systematic investment, the region is not only improving the health of its population, but also nurturing new champions. However, in order to achieve maximum effect, it is important to continue diversifying sources of funding and to pay attention to the development of sport in small towns and villages.

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Participation of private organisations in the development of physical culture and sport at regional level

UDC 796.062

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Abstract

Objective of the study is to determine ways to increase the involvement of non-governmental organizations in the development of physical culture and sports at the regional level (using the example of the Sverdlovsk oblast).

Methods and structure of the study. Theoretical and empirical assessment methods were applied. The research is based on the study and analysis of statistical materials from the statistical observation form No. 1-FC, data from the Ministry of Physical Culture and Sports of the Sverdlovsk Oblast, the Federal Tax Service, federal and regional regulatory and strategic documents in the field of physical culture and sports for the period from 2017 to 2024.

Results and conclusions. The research revealed approaches to increasing the involvement and effectiveness of non-governmental organizations in the development of physical culture and sports in the Sverdlovsk Oblast, based on the need to improve legal regulation, amend legislation, remove financial and organizational restrictions for non-governmental organizations, etc.

Keywords: *physical culture and sports, private organizations, regional level, legal regulation.*

Introduction. Currently, research aimed at increasing the role of the state in supporting organisations involved in the development of physical culture and sport is being updated in the Russian Federation [1]. Non-governmental organisations are a poorly studied subject, as Russian legislation does not provide a definition or list of such organisations. In this regard, we identified the need to identify groups of non-governmental organisations, analyse their activities and identify ways to involve commercial and non-commercial organisations in the effective achievement of industry indicators.

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Results of the study and discussion. Non-governmental organisations have the distinctive feature that they do not perform state tasks and functions, but can contribute to them. The involvement of non-governmental organisations in the development of physical culture and sport involves the identification of specific groups. To achieve this goal, we have identified two groups of organisations involved in the development of physical culture and sport in the Sverdlovsk Oblast, depending on the main purpose of their activities in relation to profit-making: non-profit organisations (regional sports federations; socially oriented non-profit organisations); commercial organisations (small and medium-sized businesses; commercial physical culture and sports organisations, including fitness centres; large businesses).

1. Non-profit organisations:

Regional sports federations. An analysis of the current state of development of regional sports federations as of 2024 revealed that 140 sports are being developed in the Sverdlovsk Oblast, for which public organisations are accredited. It should be noted that, in accordance with Order No. 996 of the Ministry of Sport of the Russian Federation dated 8 October 2024 'On the Approval of the List of Basic Sports' [2], 47 basic sports are being developed in the Sverdlovsk Oblast. Despite the fact that 'the development of a sport' is the main statutory goal of sports federations (in accordance with Federal Law No. 329-FZ of 4 December 2007 'On Physical Culture and Sport'), not all sports federations have the organisational and financial resources to achieve this goal. In this case, it is advisable to amend Federal Law No. 329-FZ of 4 December 2007 'On Physical Culture and Sport' to clarify the powers of sports federations in connection with the duplication of transferred functions and powers in the formation of state tasks for regional centres for training national sports teams in the following types of state work included in the regional list (classifier) of state (municipal) services and work: 'organisation and conduct of official sporting events' and 'organisation of events for the training of national sports teams'; redistribution of part of the functions of sports federations to state (municipal) physical culture and sports organisations, including regional sports training centres (in the event of failure by sports federations to fulfil their main statutory objective, including failure to meet the targets of the sports development programme); development and implementation of mechanisms for forming and issuing social orders to sports federations for the development of sports.

Socially oriented non-profit organisations (hereinafter referred to as SONPOs). In accordance with Resolution No. 428-PP of the Government of the Sverdlovsk Oblast dated 15 June 2023 'On Approving the Procedure for Providing Subsidies from the Regional Budget to Support Socially Oriented Non-Profit Organisations Providing Publicly Beneficial Services in the Field of Physical Culture and Mass Sports' in 2023 20 SONPOs were granted subsidies for the implementation of 30 projects for a total amount of 11,340 thousand roubles (in 2017, four SONPOs received state support for the provision of socially useful services to the population [3]). Thus, in 2023, one project received support of no more than 400 thousand roubles. This limitation of funds for the implementation of projects and activities in the field of physical culture and sport does not allow, in some cases, to achieve the maximum social effect. In this regard, it is proposed to increase annually the amount of funds allocated to support socially oriented non-profit organisations that provide socially useful services in the field of physical culture and mass sports.

2. Commercial organisations:

Small and medium-sized businesses (regardless of the type of activity). According to data from the Federal Tax Service, as of 10 July 2024, there were 80,112 legal entities and 122,279 individual entrepreneurs operating in the Sverdlovsk Oblast. Currently, there are no transparent and understandable mechanisms for these organisations to participate in the development of physical culture and sport, regardless of their type of activity, with the subsequent receipt of benefits and support from the state. In this regard, it is proposed to promote and scale up the experience of interaction between commercial organisations and the non-profit sector, primarily with charitable foundations, within which businesses have the opportunity to reduce their tax burden by supporting the activities of foundations, and the foundations themselves receive the necessary resources to support and develop activities in the field of physical culture and sport.

Commercial physical education and sports organisations, including fitness centres. According to federal statistical data from Form 1-FK 'Information on Physical Culture and Sports,' in 2023, there were 287 fitness clubs operating in the Sverdlovsk Oblast (in 2021, there were 249). The number of people attending fitness clubs is increasing every year. In 2023, this figure was 217,035 people (9.1% of the total number of people attending), and in 2021, it was 155,531 people (7.8% of the total number of people attending). Since 2022, citizens have been able to receive tax deductions for physical education and health services. One of the conditions is that the organisation must be included in the list of physical education and sports organisations approved by the Ministry of Sport of the Russian Federation. The list for 2024 includes 50% of fitness clubs (141 out of 287, of which 70 are physical culture and sports organisations and 71 are individual entrepreneurs) that meet the formal criteria, which in turn allows customers to receive a tax deduction for classes at these clubs. However, not all organisations are keen to participate in this process and do not meet the requirements for inclusion in the list of the Ministry of Sport of Russia. In this regard, the following is required: the development of mechanisms for the participation of non-state physical culture and sports organisations in the performance of state works and services in the

field of physical culture and sports, including within the framework of state programmes, interdepartmental programmes, and additional educational programmes for sports training; improving cooperation between fitness centres and the state on the use of sports facilities belonging to fitness industry organisations, as well as their human resources, for the organisation of military-applied physical training programmes and comprehensive rehabilitation of participants in special military operations; introducing a system of standardisation and certification of services and state control.

Large businesses. The region actively attracts private investment for the construction of sports infrastructure and support for professional sports clubs. Support for sport in the Sverdlovsk Oblast amounts to up to 5 billion roubles.

Among the organisations investing in the development of sports infrastructure are: Gazprom's Social Initiatives Support Fund, Rosatom State Corporation, Evraz Holding Limited Liability Company, Ural Mining and Metallurgical Company Open Joint Stock Company, Russian Copper Company, Pipe Metallurgical Company, RSG-Academic, Fisht Corporation, mobile operator Motive, non-profit organisation Fund of Governor's Programmes of the Sverdlovsk Oblast.

With the involvement of private investment: 15 sports facilities and 10 ice arenas have been built, and boxing centres in two municipalities have been equipped with equipment and inventory.

Large corporations in the region also actively support professional sports clubs:

- Pipe Metallurgical Company (TMC) – general sponsor of the Ural Football Club;
- Ural Mining and Metallurgical Company (UMMC) – owner of the UMMC basketball club, sponsor of the Avtomobilist hockey club.
- Ural Airlines – sponsor of the Ural Football Club;
- EVRAZ – mining and metallurgical company – general sponsor of the Uralochka Volleyball Club;
- Gazprombank Open Joint Stock Company – sponsor of the Avtomobilist hockey club;
- Ceramic Products Plant Joint Stock Company – sponsor of the Avtomobilist hockey club;
- Sima-Land – sponsor of the Ural Football Club, Avtomobilist Hockey Club, Uralochka Volleyball Club, and Sima-Land Basketball Club, which includes UrFU-Sima-Land (student team) and Sima-Land KES (school team).
- Russian Copper Company (RCC) – sponsor of the Avtomobilist hockey club. RCC also pays great attention to the development of martial arts in the region – the RCC Martial Arts Academy has been established.

The amount of funds allocated to support regional professional teams reaches 5.2 billion roubles.

However, with regard to cooperation between the state and business in terms of material and technical support, there is currently a reluctance among private investors to participate in the selection process for subsidies from the federal budget for the implementation of projects to create sports infrastructure facilities.

To solve these problems, it is necessary to expand state support mechanisms at the federal and regional levels, including the possibility of allocating targeted subsidies for the development of corporate sports, the use of large corporations' sports infrastructure facilities for the organisation of physical education and sports activities for various categories of the population, as well as encouraging the use of public-private partnership mechanisms and international private law in the form of offset contracts for the purchase of sports equipment and inventory.

Conclusions. The study substantiates the need to apply specific solutions for each group of organisations, proposed for the development of physical culture and sport and based on the need to improve regulatory and legal regulation, amend legislation, remove financial and organisational restrictions for non-governmental organisations, etc.

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The role, problems and prospects of inclusive sports development in the special Olympic movement

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Abstract

Objective of the study is to assess the role of inclusive sports within the Special Olympic Movement and identify the prospects for its development in Russia, taking into account current trends, difficulties and resources.

Methods and structure of the study. A sociological survey of 117 organizers and participants of the inclusive programs of the Special Olympics of Russia (2021-2025): an electronic questionnaire for participants of the unified movement, coaches, coordinators, parents; as well as interviews with representatives of regional offices, coaches and experts.

Results and conclusions. The survey results showed that inclusive sports increases motivation, develops communication, leadership skills and independence in people with intellectual disabilities, and promotes tolerance among their peers. The main difficulties are the lack of qualified personnel, heterogeneous infrastructure, and individual cases of prejudice. The positive experience of a number of regions confirms the scaling potential of inclusive programs. The support of the Vladimir Potanin Foundation ensured the opening of 80 inclusive schools in 15 regions, the launch of educational courses and educational events, which significantly expanded the opportunities and quality of inclusive sports in Russia.

Keywords: *inclusive sports, Special Olympic Movement, Vladimir Potanin Charitable Foundation, athletes.*

Introduction. In recent years, the issue of inclusive sports has become particularly important in the context of the formation of an open, humane and socially responsible society. Inclusive sport is considered worldwide as not only a tool for the physical and mental recovery of people with disabilities, but also as a powerful mechanism for their social integration, development of tolerance and respect in interaction with society.

Since its inception, the Special Olympic Movement has focused on providing opportunities for people with intellectual disabilities to participate in sports, but over the past decades, the concept's development vector has increasingly shifted towards unified and inclusive forms of activities and competitions that unite athletes with and without disabilities. The formats of inclusive sports based on the Special Olympics contribute to the destruction of stereotypes, the expansion of the spectrum of socialization, the realization of the personal development potential of people with intellectual disabilities and are in great demand in modern educational, educational and rehabilitation practice [1, 2, 4].

Objective of the study is to assess the role of inclusive sports within the Special Olympic Movement and identify the prospects for its development in Russia, taking into account current trends, difficulties and resources.

Methods and structure of the study. A sociological survey of 117 organizers and participants of the inclusive programs of the Special Olympics of Russia for 2021-25:

- Survey (electronic questionnaire among participants of the unified movement programs, coaches, coordinators and parents of athletes);

- High-quality interviews with representatives of the regional offices of the Special Olympics of Russia, coaches and experts.

Results of the study and discussion. The survey results showed that over the past 5 years, the share of inclusive ("Unified") sports teams, including people without disabilities, in the structures of the Russian Special Olympics has increased from 14% to 36% [1].

According to the survey, 88% of coaches and 72% of families believe that inclusive forms significantly increase the motivation of people with intellectual disabilities, as well as tolerance and the level of social responsibility among their normatively developing peers. 67% of coaches noted that it is integration into inclusive teams that allows athletes with disabilities to significantly improve their communication and leadership skills, show independence and build self-confidence.

Expert interviews revealed ***the following difficulties:***

- a lack of qualified personnel capable of working using inclusive training methods;
- heterogeneous infrastructure (not all schools and sports clubs are equipped for simultaneous classes for children with and without disabilities);
- individual manifestations of negativity and prejudice by parents and teachers who have no experience interacting with inclusive groups.

Nevertheless, the positive experience of regional initiatives (Moscow, Bashkortostan, Tatarstan, and others) indicates a high potential for replication of successful inclusive programs at the federal level [2].

Based on the generalization of expert opinions, ***the following promising areas have been identified:***

- conducting educational programs for coaches and judges on inclusive sports;
- developing standard methods for including students with disabilities in sports sections of educational institutions;
- actively involving the media in popularizing positive practices and success stories of inclusive teams;
- strengthening cooperation between the Special Olympics, the Paralympic Movement and by ordinary sports federations.

In recent years, the contribution of the Vladimir Potanin Charitable Foundation has become a key factor in the development of inclusive sports and the dissemination of the best practices of the Special Olympic Movement in Russia. It was the foundation's support that allowed not only to expand the infrastructure and methodological base, but also to strengthen regional initiatives, ensuring equal opportunities for people with intellectual disabilities to participate in inclusive sports programs.

Since 2021, in partnership with the Special Olympics of Russia, the Vladimir Potanin Foundation has been implementing the large – scale Inclusive Sports for All program, which aims to create conditions for children with special needs and their peers to play sports together. Thanks to the foundation, it was possible:

- To open 80 inclusive sports schools in 15 regions of the country, which created a stable infrastructure base for inclusive sports at the regional level and ensured the availability of adaptive programs for children and youth.

- Launch an educational course on the platform of the Volga State University of Physical Education, Sports and Tourism. Over the past three years, more than two thousand specialists have been trained in inclusive sports, improving the quality and competence of the staff of the inclusive and adaptive education system [3].

- To carry out a series of educational and integration events aimed at forming a positive attitude towards inclusion, developing the volunteer movement and supporting parents, teachers, specialists and young athletes.

Conclusions. Thanks to the systematic support of the Potanin Foundation, inclusive sports within the framework of the Russian Special Olympics programs have become more accessible to many children and families. The emphasis is placed not only on competitive, but also on mass, educational and integration components, which expands the horizons of socialization, physical education and self-realization of people with intellectual disabilities.

The strategic partnership between the Vladimir Potanin Charitable Foundation and the Special Olympics of Russia has become the basis for new large-scale inclusive sports practices, promotes the development of inclusive communities, attracts professional and public resources, and forms a model of successful public and private cooperation for the benefit of each participant in the inclusive movement. The prospects for the development of inclusive sports are directly related to interdepartmental cooperation, the professionalization of the coaching staff and the humanization of the educational environment.

The development of inclusive forms of sports within the framework of the Special Olympics not

only improves the quality of life of people with disabilities, but also is an instrument of patriotic, civic and moral education for the whole society. Inclusive sport in the system of the Special Olympic Movement is becoming the most important platform for the exercise of equal rights, the realization of the potential of each person, regardless of the specifics of development. The prospects for the development of inclusive sports are directly related to interdepartmental cooperation, the professionalization of the coaching staff and the humanization of the educational environment.

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