Theory & Practice of Physical Culture

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

The curator and his team in the conditions of a sports university

The main organizational structure of the educational process at the university is the study group. A curator is assigned to each student study group to ensure the unity of education and upbringing of university students, increase the effectiveness of educational and educational processes, and influence the teaching staff on the formation of the personality of future graduates.

The curator carries out his activities in cooperation with the department, faculty and other structural divisions of the university, takes into account the personal and age characteristics of students of the supervised study group, works closely with teachers conducting classes in the group, promotes the creation of business friendly relationships and unity of requirements of the teaching staff to students, establishes contact with the dean's office, public organizations, if necessary, with the parents of the students.

In a sports university, the functions of a curator are complemented by the need to involve students in sports activities, characterized by a focus on achieving high sports results, fulfilling discharge standards in various sports. The results of sports work are reflected in the indicators of the rating and status of the university, which strengthens the range of duties and responsibilities of the curator of the student group.

One of the important functions of a curator is educational work. It includes such areas as the formation of self-awareness, students' value attitude to life, the need for its design; fostering respect for the law, the norms of collective life, the development of civil and social responsibility as the most important personality traits; identification and development of natural inclinations and creative potential of each student, their implementation in various fields of activity and communication, etc. Given that the transfer of values is more successfully implemented within the framework of communication between the mentor and the student, educational work is largely left to the curator.

It is known that educational activities are the main focus in the training of a future specialist. Given the priority of this educational task, the curator is responsible for monitoring the academic performance of students.

Among the functions of a curator at a sports university, it is necessary to highlight the organization of systematic sports activities of students. In this regard, the focus of managerial attention is focused on increasing motivation to play sports, students visiting sections in the structure of the sports club, involvement in competitive and training activities. Thus, the need to select a student responsible for sports work as an asset of the group is actualized, with the delegation of appropriate powers to him.

A student group is a social collective that is being formed through educational activities – excursions, visits to theaters, exhibitions, museums, etc.; involvement in competitions of various kinds at the level of the course, faculty, university. The solution of these tasks should be entrusted to the student organizer of leisure activities.

The curator, as the head and leader of the student group, should understand that he is fully responsible for the socio-psychological climate in the supervised group, the attitude of students to their academic duties, and for their compliance with internal regulations, while the active student group should be aware of the importance of their support to the curator and responsibility for team building and mutual assistance.

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
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Contents

The evolution of physical attributes in elite ski racers aged 17 to 20 during the olympic training period

UDC 796.92

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Abstract

Objective of the study was to investigation of the development of physical attributes in elite ski racers aged 17 to 20 during the Olympic training period.

Methods and organization of research. The research involved 11 athletes from the junior Russian national ski team, aged between 17 and 20, with a training experience ranging from 5 to 8 years. These athletes, with qualifications ranging from CMS to MS, participated in a series of comprehensive tests as part of the NMO program, which was conducted at the ROC Innovation Center and the Federal State Budgetary Institution FNC VNIIFK. The tests were conducted at the beginning and end of the preparatory period for the 2022-23 and 2023-24 sports seasons. The examination protocol included assessments of the athletes' explosive strength in the upper and lower body, as well as their speed and strength endurance in the upper body. The study employed a variety of research methods, including ergometry with test protocols on a strain gauge platform (performing jumping exercises at maximum power) and a SkiErg ergometer, Concept-2 (USA), which replicates the movement patterns of simultaneous strokes. Additionally, heart rate monitoring and methods of mathematical statistics were employed. The implementation of test protocols, instruments, and methods for monitoring the studied parameters was based on methodological guidelines developed for assessing the development of the key physical attributes of athletes in the national teams of Russia and their immediate reserves.

Results and conclusions. The findings of the comparative examination of the analyzed parameters suggest that a distinctive characteristic of the development of the key physical attributes among ski racers at the conclusion of the preparatory phase of their second year of training is a multilevel rise in the absolute and relative values of the explosive strength of the upper and lower limbs (work in one movement: Aabs. +2,3% and Altn. +1,8%), the legs (strength gradient: Chabs. +3,5% and Jotn. +3,0%), and the hands (power in the 5 PMR test: Nabs. +4,3% and Retn. +3,9%). Simultaneously, the disparities in relation to the model level of the 2022 Olympian are being eliminated, with a pronounced manifestation in the level of explosive arm strength (-7,3% and -7,1%), approaching the lower limit of the model level. However, there remains a significant lag in the level of explosive leg strength (-13,4% and -9,6%) and speed and strength endurance of the arms (-13,5% and -9,5%), particularly in absolute terms, which reflects their dependence on the overall size of the body.

Keywords: *cross-country skiers, age period 17-20 years, stages of the Olympic cycle, physical qualities, dynamics of indicators.*

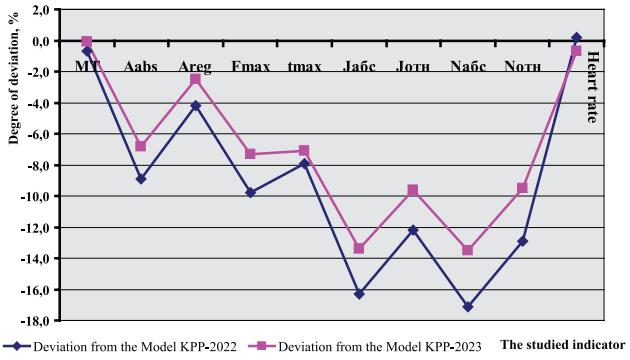
Introduction. The results of studying the characteristics of the development of the leading physical qualities and abilities of cross-country skiers in the age period of 16-20 years in the annual training cycle made it possible to establish that both at the beginning and at the end of the first year of the preparatory period, physical qualities are characterized by a low level of absolute and relative values of the indicators of explosive strength of the muscles of the arms (ESM) and legs (ESM) and speed-strength endurance of the arms (SSE), which are significantly inferior to the level of model characteristics for adult athletes [1]. Thus, the degree of discrepancy in relation to the model level (in the 2022 KPP) for the absolute (Aabs.) and relative (Arel.) values of the HRV was -8,9% and -4,2%, respectively, for the value of the FGR (force gradient, Jabs. and Jrel.) was -16,3% and -12,2%, and for the value of the SSVR (power in a 5-minute test, Nabs. and Nrel.) was -17,1% and -12,9%. The need for a systematic study of the dynamics of the development of physical qualities of cross-country skiers in the age period of 17-20 years is due not only to the heterochronicity of the age-related development of the qualities and abilities themselves [1, 2], but also to the

fact that the emerging trend of disqualifying Russian athletes, including juniors, from participation in international competitions may lead not only to a decrease in the intensity of the functioning of energy supply systems and the neuromuscular apparatus in the conditions of competitive, but also training activities and, as a consequence of this, lead to a decrease in functional and motor (motor) potential in general.

Objective of the study was to investigation of the development of physical attributes in elite ski racers aged 17 to 20 during the Olympic training period.

Methods and structure of the study. According to the standardized program, at the beginning and end of the preparatory period of two sports seasons 2022-23 and 2023-24, comprehensive examinations were conducted of 11 athletes of the Russian junior national cross-country skiing team aged 17-20, with qualifications from candidate master of sports to master of sports. The study of the dynamics of the development of physical qualities was carried out on the basis of the following research methods: anthropometry, ergometry with testing procedures on a strain gauge platform (performing jumping exercises from two legs with arm swings from a static position corresponding to the start of the push-off (angle in the knee joint 120o) with maximum power) and a SkiErg, Concept-2 (USA) ski ergometer, which allows simulating the work of the arms when moving with a simultaneous step-less stroke (called in the English-language literature «double poling» [5, 6]) with competitive intensity in two modes: a single push-off with the arms with maximum power (test 1) and 5-minute work in competitive mode (test 2). The use of test procedures, means and methods for monitoring the studied physical qualities and indicators of body systems was carried out on the basis of methodological recommendations developed for highly qualified athletes of the Russian national teams and was carried out at the ROC Innovation Center and the Federal State Budgetary Institution Federal Scientific Center of Physical Culture within the framework of stage-by-stage comprehensive examinations at the beginning and end of each preparatory stage of the two-year training [3].

Results of the study and discussion. As a result of the conducted research, data were obtained that allow for a comparative analysis of the dynamics of the formation of leading physical qualities at the end of the preparatory period of two stages of the Olympic training cycle in terms of the magnitude of year-over-year changes in absolute values and the degree of deviation from the model level developed for the XXIV Winter Olympic Games 2022 in Beijing [4].



The degree of deviation of the indicators of explosive strength of arms, legs and speed-strength endurance of arms at the end of the preparatory period of two seasons of the Olympic cycle relative to the 2022 Olympian model

The established differences in the studied indicators, presented in the table and in the figure, indicate that a characteristic feature of the formation of explosive arm strength was that with a positive dynamics of year-over-year increase in the absolute (Aabs. + 2,3%) and relative (Arel. + 1,8%) value of work performed in one movement with maximum power, the studied indicators remain behind the model level (ML) in Aabs. = - 6,8% and in Arel. = - 2,5%. There remains a multi-level lag in the development of indicators of explosive leg strength, which is manifested in the degree of deviation from the MU in the absolute and relative value of the strength gradient (Jabs. = -13,4% and Jrel. = -9,6%), with positive year-over-year growth dynamics of the studied indicators (+3,5% and +3,0%, respectively). It should be noted that the year-over-year increase in the strength gradient indicators was ensured by a priority increase in maximum strength (Fmax=+2,8%) against the background of a slight decrease in the time to reach the peak level (tmax=-0,7%), indicating a more conservative dynamics of increasing the speed component of the strength gradient. A multi-level lag is also noted in the degree of deviation from the maximum limit in the development of the speed-strength endurance indicators of the arms: in the absolute and relative value of the work power achieved in the 5-minute test (Nabs. = -13,5% and Nrel. =-9,5%), with positive year-over-year dynamics (+4,3% and +3,9%, respectively), against the background of a decrease in the response of the cardiovascular system to the performed load (HRmax.=184,6 beats/min, Δ=-1,7 beats/min; -0,9%).

Conclusions. The results of the comparative analysis of the studied parameters show that the peculiarity of the dynamics of the development of the

Differences in absolute values and the degree of deviation of indicators of development of physical qualities at the final stage of snowless preparation of the preparatory period of sports seasons 2022/23 and 2023/24 of the Olympic cycle relative to the model of Olympian-2022 (Beijing)

Study indicator	Weight	Explosive power						Speed-strength endurance of arms		
		Hands		Legs						
		Aabs.	Arel.	Fmax	tmax	Jabs.	Jrel.	Nabs.	Nrel.	Heart rate
Mean (KPP2022)	71,5	34,83	0,488	167,9	0,210	798,55	11,16	1400,0	19,61	186,4
Standard Deviation	6,2	2,85	0,037	17,6	0,003	89,73	0,74	123,9	1,16	5,6
Mean (KPP2023)	71,9	35,64	0,497	172,6	0,209	826,63	11,50	1459,8	20,36	184,6
Standard Deviation	6,3	3,03	0,042	17,8	0,002	90,74	0,86	117,4	1,60	3,1
Olympian Model -2022 (Beijing)	72,0	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
Deviation from Model in 2022	-0,7	-8,9	-4,2	-9,8	-7,9	-16,3	-12,2	-17,1	-12,9	0,2
Deviation from Model in 2023	-0,1	-6,8	-2,5	-7,3	-7,1	-13,4	-9,6	-13,5	-9,5	-0,7

leading physical qualities of cross-country skiers at the end of the preparatory period of the second year of the Olympic training cycle is the multi-level year-by-year increase in the absolute and relative values of the explosive strength of the arm muscles (work in one movement: Aabs. +2.3% and Aotn. +1.8%), legs (strength gradient: Jabs. +3.5% and Jotn. +3.0%) and speed-strength endurance of the arms (power in the 5PMR test: Nabs. +4.3% and Notn. +3.9%). At the same time, the elimination of differences in relation to the model level of the 2022 Olympian occurs with a dominant manifestation in the level of explosive strength of the arms (-7.3% and -7.1%, approaching the lower limit of the MU) and the preservation of a pronounced lag in the level of explosive strength of the legs (-13.4% and -9.6%) and speed-strength endurance of the arms (-13.5% and -9.5%), mainly in absolute value, reflecting its dependence on the total size of the body. The obtained results allowed us to formulate the position that the development of physical qualities of 17-20 year old cross-country skiers (in relation to adult athletes) in the second year of the Olympic training cycle occurs mainly due to an increase in absolute and relative values, manifested in the level of explosive strength of the arms, reaching definitive values and maintaining significant differences in relation to the level of indicators of explosive strength of the legs and speed-strength endurance of the arms, which act as a limiting factor in readiness for implementation activities in competitive conditions.

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The effect of upstroke on monofin swimming speed in young athletes in underwater sports

UDC 612.087

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Abstract

Objective of the study was to assess the impact of the upward movement on the swimming technique in a monolast and the rate of distance covered by athletes aged 12-13 who participate in underwater sports.

Methods and structure of the research. Submarine athletes aged 12 to 13 years (10 girls and 10 boys) took part in the scientific work. All athletes were conditionally divided into two groups of 10 people (5 girls and 5 boys): group A - athletes making equally powerful downward and upward strokes when swimming in a monofin, group B - athletes making only a powerful downward stroke. The following methods were used in the work: method of assessing time indicators, method of mathematical statistics.

Results and conclusions. Examining the swimming style and the time it takes for athletes to complete the distances, it is evident that the athletes in group A exhibit a superior performance and a more consistent technique compared to those in group B. In conclusion, young swimmers aged 12 to 13 who participate in underwater sports are already competing at the national level as part of regional teams. Clearly, at this age, the swimming technique and time taken to complete the distances are of utmost importance. Athletes who glide effortlessly across the water, using a monolast stroke, swim much faster. This is because their movement is smooth and effortless, allowing them to effortlessly glide across the surface of the water. In contrast, swimmers who use a monolast stroke only downward bend their knees to lift the flipper, creating a submerged dive with their hands. This technique results in a pause between strokes, a lack of smoothness in the swimming motion, and a time performance that is significantly inferior.

Keywords: *underwater swimmers, competitions, swimming technique, monofin, sports result, gliding, sports distance.*

Introduction. Underwater sports are a rapidly developing sport. A set of sports disciplines associated with the athlete's stay partially or completely under the surface of the water. The basis of underwater swimming is diving and swimming along the surface of the water for a certain distance in the shortest time in a monofin. Also, underwater sports are characterized by descents under water using special equipment, devices, apparatus and equipment [1, 2]. The appearance of the monofin in the early 1970s led to the breaking of all world records.

A monofin is sports equipment, a type of fins, which is a single structure set in motion by both legs at the same time. The technique of swimming in a monofin is called dolphin. The athlete in a monofin has his arms motionless extended forward, clasping his hands together, cutting through the water or holding a cylinder, the head is fixed between the biceps in a streamlined position. The wave-like movements of the body begin at the shoulders, with maximum amplitude towards the hips, the legs are barely bent to transmit the movement to the monofin [3].

Objective of the study was to assess the impact of the upward movement on the swimming technique in a monolast and the rate of distance covered by athletes aged 12-13 who participate in underwater sports.

Methods and structure of the research. Submarine athletes aged 12 to 13 years (10 girls and 10 boys) took part in the scientific work. All athletes were conditionally divided into two groups of 10 people (5 girls and 5 boys): group A - athletes making equally powerful downward and upward strokes when swimming in a monofin, group B - athletes making only a powerful downward stroke. The following methods were used in the work: method of assessing time indicators, method of mathematical statistics. To evaluate the time indicators, the best results shown in the season at 50 and 100 meter distances were taken from the athletes under study. The method of mathematical statistics was used

to establish the dependence and justify the obtained results. During the study, a correlation analysis of the dependence between the sports result and swimming technique was carried out. The results were processed using Microsoft Word and Microsoft Excel.

Results of the study and discussion. Sports training is an important stage in preparing athletes for competitions. Only with a competent structure of the training process taking into account swimming technique, it is possible to show high sports results in competitions. In this study, the results of athletes with different swimming techniques of group A and group B at distances of 50 and 100 meters swimming with fins were considered. The results of the athletes are presented in Tables 1, 2.

Table 1. Results of Group A athletes in 50 and 100 meter finswimming

Test subject athlete	50 meters swimming with fins	100 meters swimming with fins
No. 1 girls	21.2	45.7
No. 2 girls	20.8	46.2
No.3 girls	21.6	47.0
No. 4 girls	20.9	47.4
No. 5 girls	21.30	48.0
No. 6 young men	19.8	42.8
No. 7 young men	20.1	43.9
No. 8 young men	20.8	44.5
No. 9 young men	20.7	45.6
No. 10 young men	21.0	46.7

Table 2. Results of group B athletes in 50 and 100 meter finswimming

Test subject athlete	50 meters swimming with fins	100 meters swimming with fins
No.1 girls	22.2	49.9
No. 2 girls	22.4	50.4
No. 3 girls	22.0	50.9
No. 4 girls	22.6	51.2
No. 5 girls	23.1	51.4
No. 6 young men	21.5	47.1
No. 7 young men	22.4	47.6
No. 8 young men	22.0	47.9
No. 9 young men	22.5	48.1
No. 10 young men	22.7	49.0

Analyzing the results of the athletes in Tables 1 and 2, we can say the following: athletes of group A have faster results than athletes of group B, both among girls and boys.

In order to determine how much underwater athletes need to perform a stroke in a monofin both up and down, we conducted a correlation analysis of the relationship between the sports result (the best result in the season at a distance of 50 and 100 meters) and swimming technique.

The correlation relationship between the sports result and swimming technique is presented in Table 3.

Table 3. Comparative analysis of the relationship between sports results and swimming technique

Distances	Correlation coefficient girls	Correlation coefficien young men
50 meters	0,84	0,85
100 meters	0,79	0,82

Note: (r<0,30) – low correlation; (r from 0,31 to 0,50) – weak correlation; (r from 0,51 to 0,70) – average correlation; (r from 0,71 to 0,80) – good correlation; (r from 0,81 to 0,90 and higher) – strong correlation.

Analyzing the results presented in Table 3, the following conclusion was made: girls have a strong degree of dependence of the sports result in 50 meters with swimming technique (r=0,84) and a good degree of dependence of the sports result in 100 meters with swimming technique (r=0,79). Boys have a strong relationship between the sports result in 50 and 100 meters with swimming technique (r=0,85, r=0,82).

Conclusions. Athletes who practice underwater sports at the age of 12-13 years already take part in all-Russian competitions as part of regional teams. It is obvious that swimming technique and time shown on distances are very important at this age. Athletes who overcome the water surface, making a stroke with a monofin down and up, swim much faster, as they have a smooth glide on the surface of the water. Athletes who make a stroke with a monofin only down, bend their knees to lift the fin up, thereby diving under the water with their hands. Such athletes have a pause between strokes, the swimming technique does not have a smooth glide and is similar to a pendulum, the athletes' time is much worse.

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Analysis of strength indicators of the muscles of the lower extremities: an instrumental method

UDC 796.051.2

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Abstract

Objective of the study was to adapt an instrumental method for assessing the strength of the leg extensor muscles and test its effectiveness in various sports.

Methods and structure of the study. To assess the strength and speed-strength capabilities of the leg extensor muscles in female athletes, the computer tensodynamography method was used, consisting in recording and analyzing the «strengthtime » curve. Based on the obtained tensodynamometric curves, the maximum isometric muscle strength (F_{max}) demonstrated in the described movement, the time (t_{max}) during which the maximum effort was achieved were determined. The following were calculated: the differential index (gradient) of strength (I), characterizing the rate of its increase to the maximum ($I = F_{max} / tmax$), the force achieved in 0,1 s, as well as strength indicators relative to the body weight of the athletes. The experiment involved female athletes aged 15-17 (n = 36), specializing in short and middle distance running, as well as in ice hockey.

Results and conclusions. An instrumental method for assessing the strength characteristics of the leg extensor muscles has been improved and tested. Its use for pedagogical control over the dynamics of athletes' condition in sports practice conditions has shown a positive effect. The dynamometric characteristics of the leg extensor muscles in the isometric mode obtained using the instrumental method have authenticity criteria and are recommended as tests for assessing the level of special strength training of female athletes of different specializations. Multiple regression equations have been developed for predicting the probable sports result and establishing the proper values in control exercises that determine the planned sports result, which can be used in practice for individual correction of the training process of female athletes.

The dynamometric measurements of the leg extensor muscles, obtained using the new method in an isometric mode, have been validated as reliable indicators. They are recommended as tests for assessing the level of athletes' special strength training across various disciplines. To predict athletic performance and set appropriate benchmarks for control exercises that contribute to achieving the desired athletic result, multiple regression equations have been created. These equations can be used in practice to tailor the training process for individual athletes.

Keywords: *method, strength abilities, female athletes, extensor muscles, regression equations, tests.*

Introduction. The implementation of the idea of managing the training process requires diverse and comprehensive information about the athlete's condition [1, 5, 6]. Such information also includes a quantitative characteristic of the individual's ability to demonstrate muscular effort in a limited time. It is impossible to determine certain strength manifestations and the process of their changes over time using pedagogical tests. The most effective and rational way to assess the nature of the development of muscular effort in athletes of various specializations and qualifications, as well as to track the dynamics of the development of strength indicators is to use the computer tensodynamometry method, which allows not only to obtain detailed and accurate dynamometric indicators of the subjects, but also to quickly process and analyze the results.

Objective of the study was to modify an instrumental approach for assessing the power of the leg extensor muscles and assess its efficacy in different athletic disciplines.

Methods and structure of the study. For instrumental control of the strength and speed-strength capabilities of various muscle groups of female athletes, the method of computer tensodynamography was used, consisting in recording and analyzing the curve of muscle strength development over time. This instrumental technique allows us to assess the level of special strength training of female athletes based on a set of specific data characterizing the individual's ability to demonstrate «explosive» efforts that are inaccessible to direct measurement using traditional means. The approach to measuring the speed of voluntary tension of the leg extensor muscles proposed by Yu.V. Verkhoshansky [1] and improved by us on the basis of a modern electronic base was taken as a basis.

The measuring complex includes two main units: mechanical and electronic. The design of the first provides the subjects with a comfortable standard sitting position for maximum effort and its stable reproduction during repeated testing, and the small dimensions, weight of the structure and its disassemblability make it possible to transport it to training camps, which significantly expands the potential of research. An industrial sensor of the DACELL LOAD CELL company (Korea) was used as a force recorder. The electronic unit is represented by a computer, in which the developed program ensures coupling with the sensor, allows monitoring the modulation of the muscle strength manifestation curve and the rate of its change on the monitor, makes it possible to carry out express processing and save the obtained data in the form of tables.

Tensodynamograms of the strength manifestation of the leg extensor muscles in the knee and hip joints were recorded and processed. In the isometric mode, the setting was given to show the absolute arbitrary force (Po) without taking into account time, in the explosive isometric mode – to quickly achieve maximum force in the shortest period of time. According to the obtained tensodynamometric curves, the maximum isometric muscle force (Fmax) manifested in the described movement, the time (tmax) during which this maximum was reached were determined, the differential indicator (gradient) of force (I) was calculated, characterizing the rate of increase in force to the maximum (I = Fmax / tmax), the force achieved in 0,1 s, as well as strength indicators relative to the body weight of the athletes. The latter characteristics are very informative, since a high level of absolute strength does not guarantee the proper percentage of its use during muscle contraction under time pressure, and the manifestation of strength characteristics largely depends on the individual's weight. To measure the strength characteristics of the lower limb muscles, the angle in the knee joint (110o) was set using a goniometer-protractor when changing the distance of the platform for the foot and was chosen as meeting the criteria of reliability and reproducibility for such studies [1, 6]. All recorded characteristics were determined for the right and left legs, and the arithmetic mean value of the characteristics of both legs was taken into account during further processing.

Results of the study and discussion. Table 1 shows the dynamometric characteristics of the leg extensor muscles in the isometric mode in female athletes of different specializations. It is evident that short-distance runners have higher indicators for all analyzed characteristics, especially the gradient of strength relative to body weight. Hockey players are ahead of middle-distance runners in absolute indicators, but are inferior to them in the magnitude of strength characteristics relative to body weight, while having the highest range of variation of characteristics.

It should be emphasized that physical training occupies an important place in modern hockey. It is noted that a hockey player must have high absolute and explosive strength, speed, in order to be able to effectively carry out a short shift, while implementing complex coordination techniques [2, 5]. The outstanding Soviet coach A.V. Tarasov describes the hockey player's model as follows: «A high-class hockey player is a physically versatile athlete who has pronounced speed, strength qualities, explosive reaction speed» [7, p. 3].

It is significant that the strength gradient in female athletes has a relatively low variability: the variation coefficient does not exceed 5%. This is due to the fact that the realization of strength potential occurs in two ways: by increasing strength indicators and reducing the time to achieve it. Analysis of individual values has shown that among representatives of different specializations there are athletes with high muscle strength values and athletes capable of extremely rapid development of effort, for whom the time to achieve maximum effort does not exceed 0,15 s. Since studies show [cit. according to 6] that the strength gradient correlates with the composition of muscle fibers, it can be assumed that the speed of voluntary tension of the leg extensor muscles indirectly characterizes the ratio between the fast and slow motor units of the muscles performing this movement. The characteristics

Table 1. Strength characteristics of the lower limb muscles in female athletes of different specializations $\bar{X} \pm \sigma$)

Power characteristics	Short distance runners (n=13)	Middle distance runners (n=11)	Hockey players (n=12)
Absolute muscle strength, kg	143,7±5,1	129,8±4,3	136,8±7,5
Absolute muscle strength relative to body weight, conventional units	2,48±0,25	2,36±0,22	2,25±0,64
Manifestation of force in 0,1 s, kg	69,8±3,1	54,3±2,5	59,2±4,8
Manifestation of force in 0,1 s relative to body weight, conventional units	1,21±0,12	0,99±0,11	0,97±0,16
Maximum muscle strength in explosive effort, kg	126,3±6,2	112,1±3,5	116,8±6,1
Time to reach maximum force, s	0,29±0,03	0,38±0,01	0,36±0,05
Force gradient, kgf/s	434,5±13,2	292,1±11,5	324,4±15,1
Force gradient relative to body weight, conventional units	7,48±1,1	5,36±1,0	5,31±1,3

assessing the strength capabilities of the muscles of the lower extremities were tested for informativeness (validity), reliability and consistency. To determine the informativeness, statistical analysis was used, which revealed a significant correlation between the test indicators and the athletic performance of female runners and the time it took to skate forward for a distance of 17,7 to 27,5 m for female hockey players [4]. To determine reliability, the double testing method (test-retest) was used, and to check consistency, the correlation coefficient was calculated between the results obtained in different studies when testing the same subjects. The degree of connection (rtt) between the test results in all cases exceeded 0,95, indicating excellent reliability and consistency (objectivity) of the data [3]. Thus, the dynamometric characteristics of the leg extensor muscles in isometric mode obtained using the instrumental method meet metrological requirements and are recommended as tests for assessing the level of special strength training of female athletes of different specializations. Using short-distance runners as an example, multiple regression analysis was used to identify the functional dependence of sports results on individual indicators of special training, which takes into account the mutual compensation of various factors that determine sports achievements. The regression equations Y = Bo + B1X1 + B2X2 + B3X3 + B4X4 +... + BnXn can be used to predict the probable sports result (Y) and establish the required values in control exercises (X), which determine the planned sports result [3]. The results of the regression analysis are presented in Tables 2 and 3 in the form of regression coefficients calculated on a natural scale, which makes it possible to express the assessed characteristic in units of its measurement.

The multiple determination coefficients (D) given in the tables show the percentage of variation in the sports result due to the combined effect of the independent variables (arguments) included in the equation. It should be noted that the multiple correlation

Table 2. Coefficients of the regression equation of the type $Y=B_o+B_1X_1+B_2X_2+B_3X_3$ *for calculating the result in 100 m running (Y) based on the strength gradient indicator (*X_1*), the result of the standing long jump (*X_2*) and the shot throw (4 kg) from bottom to front (*X_3*) (for female athletes of the 2nd sports category)*

B_o	B_1	B_2	B_3	R	S	D
16,304	-0,004	-0,106	-0,095	0,924	0,23	85,4

Table 3. Coefficients of the regression equation of the type $Y=B_o+B_1X_1+B_2X_2+B_3X_3+B_4X_4$ *for calculating the result in 100 m running (Y) based on the time of running 60m from a low start (*X_1*), the result of the triple jump from a place (*X_2*), the force gradient indicator (*X_3*) and the manifestation of force in 0,1 s (*X_4*) (for athletes of the 1st sports category)*

B_o	B_1	B_2	B_3	B_4	R	S	D
5,311	1,610	-0,310	-0,004	-0,016	0,936	0,18	87,6

coefficients (R) are quite high (0,924-0,936), characterizing the closeness of the relationship between the dependent variables and the set of analyzed fitness indicators. The use of the developed equations in practical activities makes it possible to significantly individualize the training of female athletes and thereby increase their effectiveness.

C**onclusions.** An instrumental method for assessing the strength characteristics of the leg extensor muscles has been improved and tested. It can be used for pedagogical control of the dynamics of athletes' fitness throughout the training macrocycle in order to identify its trends depending on the content of training effects and their predominant focus. The use of this method for monitoring the relationship between the specified training load on various structural units of the annual cycle and the dynamics of the state of special strength fitness of female athletes has shown good results in the conditions of sports practice [8], which is of fundamental importance for the implementation of the idea of managing the training process.

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Psychophysiology of gymnasts: specifics of sports specialization

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Abstract

Objective of the study was to investigate the psychological and physiological traits of the young athletes from the Tyumen region who participate in cheerleading, gymnastics, and aerobics, aged between 12 and 14, and 15 and 17.

Methods and structure of the study. A psychophysiological analysis was conducted on female athletes from the Tyumen region who participate in cheerleading, gymnastics, and aerobics. The assessment of their psychophysiological characteristics was conducted during the 2023-2024 sports season, utilizing the UPFT 1/30 – Psychophysiologist device and the psychomotor test module.

Results and conclusions. It was found that the members of the regional cheerleading team tend to have a set of traits associated with a weak nervous system, while the members of the gymnastics team tend to have a medium-weak nervous system, and the members of the aerobics team tend to have a strong nervous system. At the same time, the members of the cheerleading and aerobics teams tend to have a very high level of functional mobility of their nervous processes, while 40% of the gymnastics team members had a low level in this regard. Despite these differences, all the members of the teams share a tendency towards inhibition of nervous processes, which suggests that the members of the Tyumen region national teams in gymnastics are resilient to stress.

Keywords: *gymnastics, psychophysiology, cheerleading, sports reserve, aerobics, female gymnasts.*

Introduction. Issues of support and guidance for talented youth, including in sports, have always occupied a special place on the agenda of the Government of the Russian Federation, and in recent years, in connection with the introduction of sanctions on the participation of citizens of our country in international competitions, they have become extremely relevant.

The field of sports is unique, since in addition to strengthening health and developing the physical qualities of a person, it is one of the effective means of forming traditional spiritual and moral values in young people. Most often, one of the first types of physical activity for children is gymnastics due to the diverse beneficial effects on the child's body and the development of an arsenal of basic motor actions. However, further specialization involves the formation of such a level of physical fitness and psychophysiological status in athletes that, to a greater extent, meet the requirements of a particular type of gymnastics (sports, rhythmic gymnastics, acrobatics, cheerleading or aerobics).

For example, the level of functional mobility of nervous processes often determines the predisposition of athletes to quickly master new complex coordination movements and constructive interactions with a partner. The type of nervous system and the shift in the balance of nervous processes towards inhibition or excitation predetermine the stability of the performance of gymnastic combinations [1, 2]. In team gymnastics disciplines, the functional asymmetry of the hemispheres of the athletes' brains (right-handed/left-handed) requires high-level personalized creation of the exercise composition from the coaches-choreographers to design a single and understandable con-

cept of the movement pattern for the viewer, otherwise this only leads to chaos on the court and a decrease in the competitive assessment [3]. At the same time, premature retraining of left-handers when mastering specialized motor actions can lead to a slowdown in the biological development of the body. At the same time, based on the level of athletic skill, experience in competitive activities, as well as the social status and role of the athlete in the team, we can talk about differences in the psychophysiological cost of performing a competitive exercise by each athlete, that is, not only from the standpoint of human biological energy expenditure, but also from the standpoint of psychological stress of the central nervous system, which will predetermine the type of warm-up, duration and methods of mental preparation before going out on the platform, the speed of fatigue, the nature of rest before the next load [4]. Thus, the study of the psychophysiological characteristics of athletes, including in sports gymnastics, allows coaches to take into account the genetic predispositions and age-related changes of their students for early correction of the training process based on the personal psychophysiological data of athletes.

Objective of the study was to investigate the psychological and physiological traits of the young athletes from the Tyumen region who participate in cheerleading, gymnastics, and aerobics, aged between 12 and 14, and 15 and 17.

Methods and structure of the study. The study of psychophysiological indicators of girls – members of the Tyumen region national teams in sports gymnastics was conducted in the 2023-2024 season at specialized training bases using «UPFT 1/30 – Psychophysiologist» and a module of psychomotor tests. The study involved 25 female athletes aged 12 to 17 years, of which 8 girls are cheerleaders (4 girls aged 12-14, 3 of the 1st sports category, 1 of no category, and 4 girls aged 15-17 (3 of CMS, 1 of no category), 7 are gymnastics (4 of 12-14 years, 2 of the 1st sports category, 2 of CMS, and 3 of 15-17 years (2 of MS, 1 of CMS), 10 are sports aerobics (5 of 12-14 years of the 1st sports category, 5 of 15-17 years, all candidates for Master of Sports). It should be noted that of the 25 girls, 80% study at schools and colleges with a «good» grade, 16% with an «excellent» grade (8% cheerleaders and sports aerobics each), and only 4% with an «excellent» grade «satisfactory» (gymnastics).

Results of the study and discussion. At the beginning of the psychophysiological study with members of the Tyumen Region national teams in sports gymnastics, an assessment of subjective well-being was conducted, according to the results of which it was determined that 75% of girls from cheerleading, 80% of sports aerobics and 85% of sports gymnastics defined their well-being as good, the rest of the girls of the regional teams were in satisfactory health. In the complex visual-motor reaction test in response to a light combination, only girls from sports gymnastics were able to give the maximum number of correct reactions (20 pcs.) among girls aged 15-17, 19 correct reactions were performed by aerobic athletes and 18 correct answers were given by girls from cheerleading (Figure 1A). At the same time, girls from cheerleading

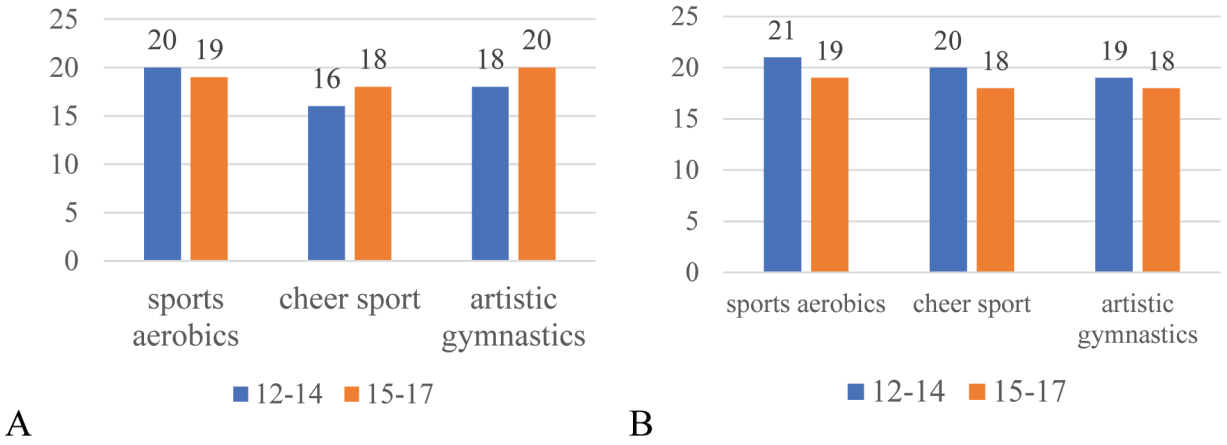

Figure 1. Results of testing female gymnasts using the methods «complex visual-motor reaction» – A and «reaction to a moving object» – B.

demonstrated the best average time of a complex visual-motor reaction – 478,5 ms, while aerobic athletes needed an average of 561 ms, and gymnasts – 630 ms. Among girls aged 12-14, the most accurate were aerobic athletes – 20 correct responses to the light combination, gymnasts – 18 responses, and cheer leaders – 16 responses. At the same time, cheer girls aged 12-14, as well as their older teammates, showed the best average time of a complex visual-motor reaction of 558 ms, gymnasts coped with the response in an average of 600 ms, and aerobic athletes aged 12-14 needed the most time – 719 ms. Analysis of the results of testing girls aged 15-17 using the «reaction to a moving object» (RMO) method showed that aerobic athletes had a slight advantage in the number of correct reactions (19 pcs.) compared to the number of correct reactions of cheer girls and artistic gymnastics (18 each). It should be noted that in all types of gymnastics (presented in the study), girls aged 12-14 coped better with the RDO method than their older teammates. Thus, aerobics girls aged 12-14 performed 21 correct responses to a moving object, cheerleaders and gymnasts – 18 and 19 responses. In addition, not a single girl from the Tyumen Region national teams aged 12-17 was found to have a shift in nervous processes towards excitation (Figure 1B).

As a result of testing girls aged 15-17 using the «functional mobility of nervous processes» method, a significant advantage was determined for athletes involved in cheerleading and sports aerobics, who were able to give 262 (144 correct and 118 incorrect) and 260 (142 correct and 118 incorrect) responses to light stimuli, while girls involved in sports gymnastics demonstrated 184 responses (102 correct and 82 incorrect). Thus, we can say that cheerleading and sports aerobics classes are aimed to a greater extent at developing the ability of athletes to quickly respond to changes in external conditions and more easily «switch» to a new task (Figure 2A). The results of the tapping test showed that among girls aged 15-17, cheerleaders were able to perform the greatest number of wrist movements in 30 seconds – 199 pcs., aerobics demonstrated a similar result of 194 touches, and the girls from artistic gymnastics had lower indicators by 20 touches (179 pcs.), compared to the result of cheerleading girls. Among girls aged 12-14, the picture is similar, the indicators of cheerleading and artistic aerobics girls do not differ significantly (188 and 190 touches), and the indicators of girls in artistic gymnastics were lower by 18 touches (172 pcs.). At the same time, in the «tapping test» method, the dynamics of indicators in each five-second segment of the method is more important than the number of maximum movements.

Thus, only the girls in sport aerobics and gymnastics achieved higher results by the second five-second segment (from 31 to 33 and from 30 to 32 sec), after which the gymnasts' results decreased by one touch in each subsequent segment, while the aerobics girls maintained the same work tempo of 33 touches from the 5th to the 25th second. The cheerleaders demonstrated a significantly higher result in the first segment of work – 37 touches, significantly exceeding the average result in sport aerobics and gymnastics (31 and

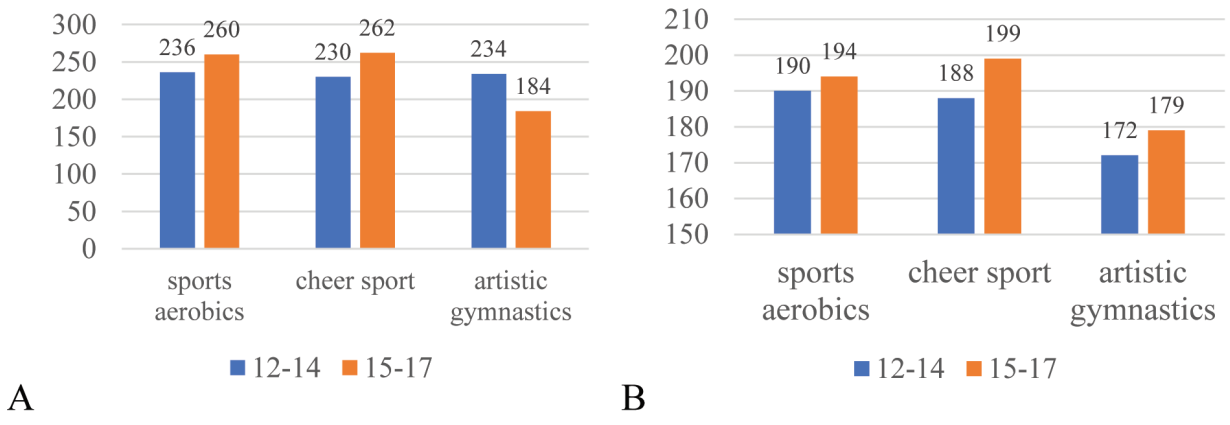

Figure 2. Results of testing female gymnasts using the methods «functional mobility of nervous processes» – A and «tapping test» – B.

30), however, the difference between the first and final segments was more significant (from 37 touches to 31) than that of the girls in sport gymnastics (from 30 to 27). Only the girls in sport aerobics showed an increase in results between the first and final segments (from 31 to 32 touches).

Conclusions. Thus, the girls of the Tyumen Region Cheerleading Team, based on a combination of indicators, can be characterized as athletes with a very high level of functional mobility of nervous processes, a weak nervous system, higher speed, but insufficient accuracy of complex visual-motor reactions relative to the results of girls in artistic gymnastics and aerobics.

In the Tyumen Region Cheerleading Team, girls correspond to the average level of functional mobility of nervous processes, have a moderately weak nervous system, high accuracy rates, but low speed of complex visual-motor reactions. Girls of the Tyumen Region Cheerleading Team are characterized by a very high level of functional mobility of nervous processes and have a strong nervous system, and at the age of 12-14 years have higher accuracy rates of complex visual-motor reactions compared to their peers in cheerleading and artistic gymnastics. It should be noted that all the examined girls had a shift in nervous processes towards inhibition, which indicates restraint and emotional stability of the gymnasts of the regional national teams. These results will allow the formation of a database of psychophysiological indicators of the best gymnasts of the Tyumen region, and will also form the basis of an educational and developmental digital service with a virtual assistant for coaches, athletes and their parents in sports gymnastics.

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Features of using the situational method for training police officers in the use of combat techniques

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Abstract

Key words: *police, physical training, combat fighting techniques, situational method.*

Introduction. In accordance with the provisions of the "Procedure for organizing the training of personnel to fill positions in the internal affairs bodies of the Russian Federation", the need for training employees of internal affairs bodies in the tactics of using combat techniques in situations of official activity has been determined [1]. In this regard, there was a need to search for and theoretically substantiate the possibility of using the situational method in the physical training of police officers.

Purpose of the research – identifying the possibilities and features of using the situational method for training police officers in the use of combat fighting techniques.

Research methodology and organization. The study will be conducted from 2020 to 2024 at the Tyumen Institute for Advanced Training of the Ministry of Internal Affairs of the Russian Federation. The study used scientific methods: analysis and generalization of scientific and educational literature, abstraction, modeling of educational situations.

Results and its discussion. At different stages of the research, the following were developed: a sensorimotor method, a situationally integrated methodology for teaching combat fighting techniques [2]. The features of using the situational method for training police officers in the use of physical force are: 1. The preparation of a training situation of the use of physical force by police officers includes three stages: the design stage, the technological stage and the reflection stage. 2. Educational situations are examined in comprehensive classes, with the participation of teachers of physical, tactical and legal training disciplines. 2. The training situations are structured according to levels of difficulty with increasing levels of confusing factors that complicate the actions of police officers. 3. The bank of situations is constantly replenished and updated.

Conclusion. The results of the study revealed the effectiveness of training police officers in the situational use of combat techniques. The prospect for further self-development of the system of physical training of police officers will be the design and use of various variable situations of the use of physical force.

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Preparatory and introductory exercises in fire training of police officers

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Abstract

Key words: *police, physical training, fire training, preparatory exercises, introductory exercises.*

Introduction. In educational institutions of the Russian Ministry of Internal Affairs system, as part of the implementation of the main programs of professional training of persons first accepted into the internal affairs bodies for the position of "Policeman", training sessions on firearms training are provided [1]. An analysis of the practice of teaching firearms training revealed the need to develop the use of preparatory and introductory physical exercises aimed at training police officers in the use of service weapons [2].

Purpose of the research – development of sets of preparatory and introductory physical exercises aimed at training police officers in the use of service weapons.

Research methodology and organization. The study was conducted in 2024 at the Tyumen Institute for Advanced Training of Employees of the Ministry of Internal Affairs of Russia. The study used scientific methods: analysis and generalization of scientific and methodological literature and experience in teaching fire training, systematization and classification of preparatory and preliminary physical exercises.

Results and its discussion. As a result of the study, a set of preparatory and introductory exercises was developed aimed at training police officers in the use of service weapons. Preparatory exercises in fire training of patrol police officers are considered by us as physical exercises aimed at preparing the employee's motor apparatus to perform shooting exercises from service weapons. We consider preparatory physical exercises in fire training for patrol police officers as physical exercises similar in structure to individual movements included in the motor action of shooting from a service weapon. The developed sets of physical exercises were tested in fire training classes as part of the implementation of professional training programs for individuals for the position of "Police Officer".

Conclusion. The results of the study revealed the effectiveness of a set of preparatory and introductory exercises aimed at training police officers in the use of service weapons. The students in the experimental group demonstrated a higher level of proficiency in service weapons at the final lesson (18.6% more than in the control group).

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Improving the athletic training of open water swimmers: the role of multicomponent training

UDC 796.015

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Abstract

Objective of the study was to evaluation of the effect of multifaceted variations in training regimens on enhancing the physical and tactical abilities of swimmers in open water.

Methods and structure of the study. The research is grounded on the assumption that training with programs that consider multi-faceted environmental alterations, particularly incorporating open water training, can substantially enhance the physical endurance, tactical abilities, and psychological resilience of swimmers.

In this investigation, the performance of two groups of swimmers was assessed: the first group adhered to the conventional program in the pool, while the second group incorporated open water sessions with various exercises. A total of 40 swimmers, with diverse levels of training and expertise in open water swimming, participated in the experiment.

Results and conclusions. The study's outcomes support the theory that incorporating training in open water enhances the abilities of swimmers. These results can be applied to create novel training methods designed to maximize the training of swimmers in open water environments.

Keywords: *open water swimming, adaptive training, multi-component variability, athletic performance, tactical skills, psychological resilience, drafting.*

Introduction. Open water swimming requires athletes to be highly trained and able to adapt to constantly changing environmental conditions. Unlike pool swimming, where conditions are static, open water presents many additional challenges, such as changing temperatures, waves, and currents. In a pool, athletes have the ability to control their speed using visible cues such as the bottom, tiles, lanes, and ropes. In open water, such cues are generally absent, making it difficult to estimate speed and requiring additional training to maintain it. Despite the importance of these factors, the impact of multi-component variability in training routes on swimmers' performance has not received sufficient attention in the scientific literature. Pool training, although beneficial for developing technique and strength, cannot fully simulate open water conditions. Open water places special demands on swimmers, such as adapting to varying temperatures, waves, and currents, which significantly affect swimming technique and tactics. In addition, the lack of visual reference points in open water makes speed control and navigation more difficult, which requires additional skills and training from athletes.

Today, marathon swimmers neglect new methods, especially in Russia, and continue to train only in pools, limiting themselves to traditional training methods.

Thus, the scientific novelty of this study lies in determining the methodological potential of open water training for its subsequent inclusion in marathon swimmers' training programs.

Objective of the study was to evaluation of the effect of multifaceted variations in training regimens on enhancing the physical and tactical abilities of swimmers in open water.

Literature review. Training in different water bodies, such as seas, lakes and rivers, helps to improve the adaptive abilities of swimmers. Foreign researchers, such as Finlay and Knechtle, note an important indicator: swimming in salt water with waves requires different techniques and efforts compared to swimming in freshwater lakes [6, 7].

Water temperature and the nature of the current can significantly affect the physical parameters of swimmers. Macaluso notes that training in conditions of different temperatures and currents helps swimmers better prepare for extreme conditions, reducing the risk of hypothermia or overheating and improving thermoregulation [8].

Comparative studies (Knechtle et al., 2010; Finlay et al., 1995) show that swimmers who use a variety of training routes demonstrate better results compared to those who train on monotonous routes [6, 9]. During such training, swimmers can master the basics of proper drafting, which will save energy and increase swimming speed, as well as quickly and efficiently take turns.

Training in changing conditions helps swimmers develop stress resistance and confidence [1]. Bradford notes that constant changes in the training environment can reduce anxiety before competitions and improve the ability of swimmers to maintain concentration in stressful situations [3].

Valkoumas I, Gourgoulis V, Aggeloussis N, Antoniou P. and other authors, based on experimental studies, prove that resistance swimming programs improve the continuity of movement and can be considered an effective form of training, increasing the stroke frequency and, consequently, swimming speed [10]. A study by British authors (C.D. Bradford, S.J. E. Lucas, D.F. Gerrard, J.D. Cotter.) is devoted to the extent to which swimming in warm water (temperature 33°C) helps swimmers adapt to heat conditions and improves their physical performance. The study showed that swimming in warm water is ineffective in improving physical performance and adapting to heat conditions [4].

The scientific literature shows that open water swimming has its own characteristics: Gregory Shaw 1, Anu Koivisto, David Gerrard, Louise M Burke point out that "different locations have changing environmental conditions, including water and ambient temperature, humidity, solar radiation and unpredictable tides. In addition, the duration of most open water workouts (1-6 hours) creates unique physiological challenges with thermoregulation, hydration status and muscle fuel stores [5]. The main physiological characteristics of open water swimmers are the ability to swim at a high percentage of speed (80-90%) for many hours. Moreover, to maintain high speed for many hours, endurance swimmers need high propulsion efficiency and low energy expenditure [2].

Methods and structure of the study. The effectiveness of training for two groups of swimmers was analyzed: the first group trained according to a standard program in the pool, and the second group included open water training using various exercises. The goal of the experiment was to determine how open water swimming affects performance and endurance.

A total of 40 swimmers of different levels of training, specializing in open water swimming, took part in the experiment. Participants were divided into two groups: a control group (20 people) and an experimental group (20 people). To check the level of training, we conducted tests that included standard exercises:

1. A 400 m freestyle test. Participants must swim 400 m for a time.

2. An open water swimming test (800 m). An open water swimming test, where swimmers must cover 800 m taking into account external conditions such as waves and currents.

3. Special exercises for stroke technique. Conducting training with an emphasis on the technique of various swimming styles (freestyle, breaststroke, etc.).

After determining the level of the swimmers, they were divided into two groups, each of which was trained according to a specific program. For the experimental study, the following exercises were selected for the group training in open water:

1. Progressive and regressive tasks (increasing and decreasing speed every 5 minutes for 25 minutes).

2. Tasks with different breathing options (every 3/4 of the stroke).

3. Swimming with fins and paddles for long distances.

4. Alternating swimming styles (dolphin with crawl).

5. Maximum acceleration (400 m) to simulate competitive starts and finishes.

6. Orientation on the water using buoys and new routes.

7. Swimming on the waves and with the current.

The second group followed a standard training program in the pool, which included general developmental and highly specialized exercises.

Results of the study and discussion. During the experiment, the results were collected using heart rate monitors and trackers to measure time and speed.

Group A (pool):

- Average speed per 100 meters: 1:30 min.
- Time per 400 meters: 6:00 min.
- Heart rate in the extreme zone (maximum): 180 beats per minute.

Group B (open water):

- Average speed per 100 meters: 1:25 min.
- Time per 400 meters: 5:50 min.
- Heart rate in the extreme zone (maximum): 170 beats per minute.

Comparing the results, it can be seen that Group B, which trained in open water, demonstrated greater speed and endurance compared to Group A. It can be concluded that open water swimming helps improve physical fitness and technique due to the variety of training and conditions (working with the current, waves, orientation, etc.). Based on the data obtained, it is possible to recommend including open water swimming in the training process of swimmers to improve their performance and adapt to real competition conditions. Open water training creates more versatile and resilient swimmers, better prepared for various physical loads and competition conditions.

The results of the study confirm the hypothesis that the inclusion of open water training helps to improve the performance of swimmers. It is especially important to note that the multi-component variability of training contributes not only to physical fitness, but also to the development of important psychological qualities, such as stress resistance and self-confidence.

The study showed that the development of internal speed and distance assessment skills is a key factor for successful performance in open water. Swimmers who included open water training were able to significantly improve their physical skills and condition, which ultimately led to an improvement in their athletic performance.

Conclusions. Thus, open water training may become an additional means of developing professional swimmers' training. An integrated approach to training, including a variety of conditions and routes, contributes to a significant improvement in the physical and psychological fitness of athletes, which ultimately leads to an increase in their athletic performance. Modern training methods should take into account the need to adapt to changing environmental conditions, which will increase the motivation and willingness of swimmers to use new training methods.

One of the main limitations of this study is the limited sample size, which may affect the generalization of the results to a wider population of swimmers. In addition, differences in the training level of the participants may have affected the results and their interpretation. The influence of external factors, such as weather conditions and water temperature, on swimmers' performance in open water should also be taken into account.

For further research, it is recommended to expand the sample to include swimmers with different levels of experience, as well as conduct long-term experiments to assess the stability of the obtained results over time. The study of additional psychological aspects, such as stress levels and self-esteem, may also have a significant impact on understanding the factors that contribute to success in open water swimming.

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Development of motor actions in young judokas: strategies for increasing efficiency

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Abstract

Objective of the study was to scientifically support the application of confounding factors of both external and internal origins to enhance the performance of young judo athletes in controlling their movements.

Methods and structure of the study. The research was conducted at the Igor Makarov Judo School in Gomel. The study involved 11- to 13-year-old judo athletes who participated in an eight-week pedagogical experiment. The experimental group (n=14) was subjected to additional exogenous and endogenous loads during training, while the control group (n=15) followed a standard program designed for youth schools of this age range.

The assessment of the agility level of the young athletes included a series of tests that simulated movements commonly used in training and competition scenarios, both in familiar and unfamiliar environments.

Results and conclusions. It was discovered that incorporating confounding factors into the training regimen of young judoists aged 11 to 13 years is a successful strategy for enhancing the specific physical exertion experienced by the participants, fostering the activation of latent capabilities and psychophysiological functions during physical activity. The examination of the outcomes demonstrated an enhancement in the experimental group's capacity to assess the time required to complete a particular task and to minimize time wastage in unforeseen circumstances, as well as an improvement in their ability to swiftly adapt their motor program and anticipate spatial and temporal changes in the environment.

Keywords: *young judokas, confusing factors, motor actions, agility, testing, familiar and unfamiliar conditions.*

Introduction. The effectiveness of motor control in training and competitive activities of judokas largely depends on the level of development of agility and coordination of athletes [7, 9]. It should be emphasized that the concepts of agility and coordination are not identical, although closely related. Agility is the ability to perform effective motor actions in unexpected and complex situations that require resourcefulness and adequate motor reactions [1]. In this case, the factor of surprise, which requires resourcefulness from an individual, making appropriate decisions in the shortest possible time, is the leading one in determining this quality [3, 6]. At the same time, the concept of «coordination» is the ability to perform effective actions with a complex dynamic and spatio-temporal structure in known, more or less practiced conditions, devoid of the factor of surprise and unpredictability [5, 6]. It is noted [8] that the ability to coordinate and effective motor activity without the presence of the factor of surprise differs from the ability demonstrated in unexpected and changeable situations and requiring the manifestation of agility. In order to develop agility, it is recommended to use various types of disturbing factors in the training process of athletes, which are understood as various disturbances that act as interference in the conditions of activity and lead to partial or complete discoordination of movements [2]. According to S.N. Nikitin [4], the development of agility should be an important part of the content of the training process, especially at the initial stages of long-term improvement, which helps to increase the efficiency of controlling motor actions in various types of martial arts. To determine the agility coefficient, the author proposed the formula: CI = t2 / t1, where: CI is the agility coefficient, t1 is the time of performing a motor action in familiar conditions (sec); t2 is the time of performing a motor action in unfamiliar conditions (sec). At the same time, monitoring the effectiveness of the training program, which is aimed at developing agility and is based on the use of various motor tasks filled with unexpected situations that re-

quire quick and adequate decisions, also requires the use of specific tests for this [5].

Objective of the study was to scientifically support the application of confounding factors of both external and internal origins to enhance the performance of young judo athletes in controlling their movements.

Methods and structure of the study. The research was conducted at the Igor Makarov Judo School in Gomel. Young judokas aged 11-13 took part in the eight-week pedagogical experiment. In order to stimulate the development of motor actions necessary in judo, a set of exercises was developed based on the use of disturbing factors that complicate and hinder the activity of various functions of the young athletes' bodies during fights. In the experimental group (EG, n=14), additional exogenous loads (sparring with partners of contrasting weight categories, changing the size of the tatami, a tough manner of conducting a fight, non-standard actions of the opponent, the presence of parents at training, various sound stimuli and mechanical interference during a fight, etc.) and endogenous (emotional state of the athlete, mood, progressive fatigue, etc.) were used as disturbing factors. We proceeded from the fact that the use of confusing factors promotes the involvement of reserve capacities of psychophysiological functions of young athletes in motor activity and, as a result, increases their ability to perform adequate motor actions in unexpected and variable situations. The control group (CG, n=15) trained according to the program developed for the Youth Sports School of this age range, and monitoring the level of agility of young athletes included two tests, which provided for a combination of movements performed in familiar and unfamiliar conditions. The motor program of the first test included recommendations [5] for assessing the agility of martial artists, and the exercises themselves used in the test were developed by us and were specific for judokas of this age. The test was based on the material of various motor actions characteristic of judo and consisted of two parts (Figure 1). In the first part of the test, it was necessary to move to each of the sequentially placed points (from the first to the eighth) in turn, returning to the starting point, where the subject had to assume a prone position, jump back to a standing position, and only then move to the next point. The subjects were familiar with the program of the first part of the test in advance and could test it (familiar conditions).

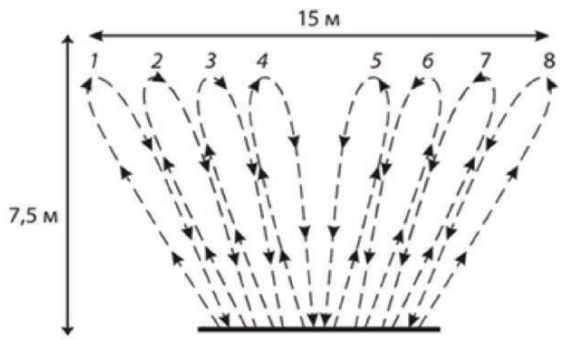

Figure 1. Testing area
Motor actions: 1 – forward roll, backward roll; 2 – Burpee; 3 – bridge run; 4 – jumping from prone position; 5 – jumping from foot to foot; 6 – touching chips; 7 – uchikomi without a partner to the right and left; 8 – forward jump from a standing squat, 180° turn, forward jump; - - - – athletes' movement trajectory during testing.

The program of the second part of the test is identical to the first, however, the movements to each of the points could be carried out in any sequence. The single requirement was to complete the program of all eight points, which was significantly complicated by the fact that four athletes were tested simultaneously, forming individual schemes for passing different points and thereby creating unforeseen situations (unusual conditions) for each other. The test required not only attention, concentration, reaction speed and working memory, but also the manifestation of characteristic features of dexterity – in space and time, static-dynamic stability, the ability to quickly correct the motor program, spatio-temporal anticipation. The second test was based on the motor action of the specific SJFT test proposed by S. Sterkowich [9]. Three judokas of the same weight category take part in the test, which is carried out on the tatami. The judoka being tested stands in the center of the tatami, and the sparring partners are in a three-meter radius from him (Figure 2). On the command «Hajime», the subject begins throwing his partners «Ippon Seoinage» and carries out 10 such throws, which must be performed at maximum speed and technically correctly (usual conditions).

The program of the second part of the test is identical to the first, however, when performing the throw, the free partner changes his location, moving in a circle with a radius of 3 m. After performing the throw, the subject must return to the center, and only then to the other partner (unusual conditions).

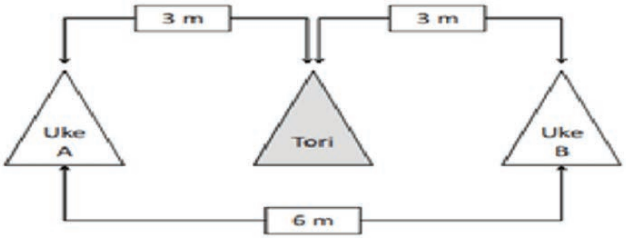

Figure 2. SJFT test execution

Changes in the efficiency indicators of motor control of young judokas aged 11-13 years at the beginning and end of the pedagogical experiment

Confounding factors	Experimental group (n=14)			Control group (n=15)		
	Start ($\bar{X} \pm m$)	The end ($\bar{X} \pm m$)	p	Start ($\bar{X} \pm m$)	The end ($\bar{X} \pm m$)	p
First test						
Familiar conditions, s	36,32±3,17	31,61±2,74	>0,05	35,97±2,97	34,91±2,87	>0,05
Unusual conditions, s	40,66±3,47	34,15±3,86	<0,05	40,43±2,76	38,90±2,99	>0,05
Agility coefficient, conventional units	1,12±0,15	1,08±0,04	>0,05	1,12±0,04	1,11±0,07	>0,05
Second test						
Familiar conditions, s	68,41±2,79	64,47±2,80	>0,05	68,17±3,78	66,58±3,09	>0,05
Unusual conditions, s	74,77±3,97	67,09±3,25	<0,05	74,15±3,49	72,02±3,24	>0,05
Agility coefficient, conventional units	1,09±0,05	1,04±0,03	<0,05	1,09± 0,03	1,08±0,03	>0,05

Results of the study and discussion. The use of various exogenous and endogenous distracting factors, applied three times a week for 20 minutes during sparring, demonstrated their effectiveness in developing control over motor actions of young judokas (see table). Analysis of the results obtained in the first test revealed an improvement in the EG reaction to a quick and adequate assessment of the situation and the ability to make a prompt motor response depending on the actions of other partners over two months. Thus, the performance of actions in unusual conditions decreased by 6.51 s in this group, and in the CG only by 1.53 s. At the same time, the dexterity coefficient improved by 0.04 conventional units in the EG, and by 0.01 conventional units in the CG. The latter indicates that in the control group there were less significant changes in the ability of young athletes to promptly correct the motor program, spatio-temporal anticipation, reaction speed and working memory.

In the second test in the EG, a decrease in the agility coefficient by 0,05 conventional units is observed, which indicates a decrease in time losses in unusual conditions. In other words, young judokas training with the use of various confusing factors began to react faster to a change in the environment, unlike in the CG, where the agility coefficient remained virtually unchanged. It should be emphasized that in the EG, the time to complete the second part of each test (unusual conditions) at the end of the experiment became even slightly better than it had been in the first part of the test (usual conditions).

Conclusions. The analysis of the obtained results allowed us to identify an improvement in the experimental group of judokas aged 11-13 years in the ability to measure the time for performing a certain task and reduce time losses in unusual conditions, optimize the athletes' capabilities for prompt correction of the motor program and spatio-temporal anticipation when changing the environment. At the same time, the widespread use of exogenous and endogenous factors in the process of training young martial artists is an effective means of increasing the specific load on the body of those involved, promotes the involvement of reserve capabilities and psychophysiological functions in motor activity and, as a result, increases their ability to adequate motor actions in unexpected and variable situations during competitive fights.

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Managing the competitiveness of hockey players of the sports reserve

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Abstract
This study examines the issues of effective organization of long-term training of hockey players of the sports reserve. The practical aspect of the study is related to the solution of the problem of maintaining the competitiveness of athletes in the conditions of their transition to professional hockey teams, close in requirements to the sport of the highest achievements. The methodological basis of the study is modern ideas about the laws of the process of formation of sports mastery of Yu.V. Verkhoshansky, as well as the «concept of the system-forming factor» of the theory of functional systems of P.K. Anokhin.

Keywords: *hockey, sports reserve, sports skills, competitiveness, long-term preparation.*

Introduction. The process of training hockey players of the sports reserve takes up to eight sports seasons, requires a complex technological infrastructure, but, most importantly, the presence of external and internal organizational and methodological conditions that provide the necessary balance of cooperation and competition.

In specialized literature, there is a concept of "Coopetition" (literally: cooperation + competition, competitive cooperation), introduced to describe cooperative competition [13, 7]. In professional sports, a certain balance of competition and cooperation is achieved through the presence of informal agreements and established rules. At the same time, it is not always possible to fully ensure the proper level of competition due to the fact that the process of developing sports skills is a structurally holistic phenomenon with its own characteristics.

An appeal to the causes of this problem made it possible to identify a number of the most significant trends that significantly affect the training of the sports reserve in modern conditions: (1) a decrease in the qualitative and quantitative characteristics of the recruitment of hockey players; (2) increased processes of sports migration at the level of children's and youth hockey; (3) complication of the sports training system in hockey; (4) shortage of qualified coaching personnel [14].

In terms of the listed trends, effective training of hockey players of the sports reserve is associated with solving four categories of dynamic programming problems: (1) creation of favorable conditions for specific functional restructuring, mainly determining the level of development of the leading motor abilities of hockey players; (2) selection of optimal modes of influences for improving the leading motor abilities, mainly determining the success of sports activities in accordance with the individual characteristics of the hockey player; (3) maintaining an optimal level of physical fitness during the sports season; (4) changing external conditions and switching modes of training influences, ensuring the solution of the three previously listed problems [1, 2].

Yu.V. Verkhoshansky notes that «programming is a more advanced form of planning, a way of solving complex problems by breaking them down into simpler subtasks» [3]. In relation to sports training in hockey, the dynamic aspect of programming the train-

ing process is manifested in the application of control actions aimed at achieving the optimal state of individual components of athletes' and team's readiness in response to changes in external factors and conditions. The main condition for the successful solution of dynamic programming problems in managing the competitiveness of hockey players of the sports reserve is the choice by the coach of the most effective actions at different levels: metabolic, homeostatic, behavioral and social [10, 11, 12]. The issue of the priority of the results of behavioral and social activity in sports is explained by P.K. Anokhin from the standpoint of the functional system dominant in a specific type of activity [11]. For example, a sports result can also be stage-by-stage, ensuring the receipt of other final, socially significant needs [8]. It is at the metabolic and homeostatic levels that active adaptation of the organism occurs as a result of the emergence of contradictions in the system of external and internal relations of the athlete's organism.

Methods and structure of the study. The theoretical substantiation of the problem of managing the competitiveness of hockey players of the sports reserve was carried out from the standpoint of the methodology of functional systems. The use of structural and system analysis made it possible to compare the results of the behavioral level of training of hockey players with the general patterns of the formation of sports skills [6]. Since management involves the implementation of the decision-making function, the study used the method of quantitative analysis of the properties and relationships of various components of hockey players' training with the functional state [9]. The study assessed the relationship between the results of control tests reflecting the special physical training of hockey players and the indicators characterizing the processes of aerobic support of muscle activity (maximum oxygen consumption, anaerobic metabolism threshold). The results obtained were compared with the indicators characterizing game activity. The comparative analysis showed that most hockey players experience a decrease in game performance from the 5th to the 7th month from the beginning of the preparatory period. This phenomenon is especially pronounced among newcomers to youth teams. It is obvious that the transition to professional hockey for most young hockey players is associated with the fulfillment of significant requirements for physical fitness.

In specialized literature, the deterioration of performance indicators is associated with a decrease in the aerobic capabilities of hockey players due to the specific nature of competitive activity and the difficulties of maintaining the level of aerobic performance achieved during the preparatory period [4]. We believe that the factors that determine the differences in the duration, start and end time of the decrease in aerobic performance require additional study and analysis. In sports practice, such analysis usually involves solving problems of forecasting, developing model characteristics, programming and complex control [13].

In addition, the information obtained during the analytical work was used to describe the results of various levels of sports activity: metabolic, homeostatic, behavioral and social. The quantitative and qualitative characteristics of these levels reflect the specific process of transition of the system of internal and external relations of the hockey player's body from one state to another, during which conditions are provided for the development of the hockey players' athletic skills. For this study, the issues of functional specialization of the hockey players' body, physical, technical and tactical training were of interest [8]. In this regard, the study was carried out on indicators characterizing changes in special motor abilities, functional adaptation, technical and tactical preparedness in the 2022–2023 and 2023–2024 seasons based on materials and documents disclosing the main parameters of the educational and training process and the results of competitive activities of hockey players of the sports reserve of the SKA hockey club system .

Results of the study and discussion. The theoretical and methodological result of the conducted research (analytical reviews of scientific literature) was the clarification of the concepts of «competitiveness», «management», «programming» from the point of view of adaptation of the conceptual apparatus for the implementation of interdisciplinary research.

In a broad sense, the concept of «competitiveness» can be formulated as the ability of a certain object or subject to surpass competitors in given conditions [5]. Managing a hockey team as a complex dynamic system involves the possibility of considering the competitiveness of an individual hockey player or group as a readiness to withstand the requirements of professional activity, the ability to perform successful actions both in relation to opponents and teammates in the conditions of changing external factors.

Possessing a systemic vision, the coach acts as an operator of a complex of biophysical, psychologi-

cal and social characteristics inherent in hockey players. The decision on the nature of the impacts and the choice of the dominant functional system involves the use of an algorithm of actions aimed at obtaining intermediate and target results based on direct or compensatory adaptation mechanisms.

Conclusions. Thus, the management of competitiveness of hockey players of the sports reserve should take into account the following conditions: (1) functional and motor specialization is provided by the systems of metabolic and homeostatic levels, which requires taking into account individual and age characteristics, sensitive and critical periods of development; (2) physical training programs for each age group and a certain period of long-term training should ensure the formation of an additional motor reserve to maintain compensatory mechanisms when mastering complex technical methods and actions; (3) in the process of mastering technical methods, it is necessary to take into account the individual capabilities of hockey players; (4) the tactical component of training becomes the most capacious and effective resource of the coach from the point of view of competitiveness management, while requiring longer formation.

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Aerobic and anaerobic training: effects on cognitive function in adolescents

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Abstract

Objective of the study was to determine the impact of bioenergetic factors on the physical performance of young athletes during cognitive tasks of different difficulty levels.

Methods and structure of the study. The research project included a group of young athletes aged 13 to 14, who participated in cycling and running competitions over medium and long distances. The study involved 97 participants. The cognitive load was simulated using a two-minute task with letter tables in two modes: «autotemp» and «maximum tempo».

Results and conclusions. It has been shown that high aerobic, anaerobic glycolytic and anaerobic alactic capacity are associated with favorable changes in FS under conditions of intense cognitive load. The results of the study give reason to believe that the complex use of aerobic and anaerobic physical activity in the process of sports improvement creates the prerequisites for increasing stress resistance and optimizing the physical activity of the body of young athletes not only during muscular, but also intense cognitive activity.

Keywords: *aerobic and anaerobic capacity, functional state, cognitive performance, cross-adaptation, adolescent athletes.*

Introduction. According to scientific research, physical performance (PP) and the body's bioenergetic capabilities largely determine the success of human adaptation to the effects of various unfavorable factors, including those of a psychosocial nature [1, 11, 4, 3, 9]. There is reason to believe that at different age periods, the influence of aerobic and anaerobic components of PP on the physiological, behavioral and subjective aspects of the functional state (FS) of the body may differ significantly due to the heterochronic and nonlinear development of key physiological systems and bioenergetic processes [4, 6, 8, 2]. In this regard, the ontogenetic aspect of studies of nonspecific cross-effects of adaptation to endurance loads, manifested in conditions of psychosocial stress and intense cognitive activity, is of particular interest. However, despite the available information, it must be acknowledged that there is a lack of work devoted to studying the «total» effect of the impact of the level of development of aerobic and anaerobic capabilities on changes in human FS during intense cognitive loads.

Objective of the study was to determine the impact of bioenergetic factors on the physical performance of young athletes during cognitive tasks of different difficulty levels.

Methods and structure of the study. The study involved young athletes aged 13-14 involved in cycling and running medium and long distances (n=97). The cognitive load model was a two-minute work with letter tables in the following modes: 1) «auto pace»; 2) «maximum pace». Based on the results of completing the test tasks, the volume of work (A) and the productivity coefficient (Q) were calculated. The -potential (OP), which characterizes the FS of the central nervous system, was recorded using a setup for studying the ultraslow biopotentials of the brain. The reactivity of the OP and the spontaneous relaxation time (SR)

were determined. Taking into account the duration of the test procedures, which limited the number of recorded R-R intervals, a time analysis of the heart rate variability was used. The average duration of the R-R interval (RRNN), mode (Mo), mode amplitude (AMo), spread of cardiointervals (MxDMn), standard deviation (SDNN), stress index (SI) and peak heart rate (HR) were calculated. Systolic (SD) and diastolic (DD) blood pressure were recorded in accordance with the recommendations of the Society for Psychophysical Research. The mean pressure (SBP), double product (DP), Myznikov index (MI), and circulatory efficiency index (MP/HR) were calculated. To determine the psychophysiological «price» of activity, Q/SI, Q/HR, Q/DP, A/SI, A/HR, A/DP were found. To diagnose anxiety, the Kondash, Phillips, Luscher tests, Hornblow visual analog scale (HAVS) were used; well-being (W) and mood (M) - the SAN test. Aerobic (factor A), anaerobic glycolytic (factor B) and anaerobic alactic (factor C) abilities were diagnosed based on complex assessments, including four informative indicators, identified as a result of factor analysis. Subsequently, dispersion analysis of three-factor orthogonal complexes was performed, allowing to evaluate the influence of each factor separately (A, B, C) and their interaction (AB, AC, BC, ABC).

Results of the study and discussion. It was found that bioenergetic capabilities have a pronounced effect on the physical fitness of young athletes under intense cognitive loads (table): with regard to 46 physiological, behavioral and subjective indicators, the null hypothesis is refuted at a high significance level ($p<0,05-0,01$). It was shown that the differences between the group means of the complex of variables under consideration are not random and are largely determined by the level of development of the bioenergetic components of physical fitness. Aerobic capabilities significantly affect seven, anaerobic glycolytic – two, anaerobic alactate – four physical fitness indicators (see table). It is evident that the aerobic component of physical fitness affects the greatest number of the studied parameters, which is consistent with the results of comparing adolescent athletes who differ in individual indicators of aerobic performance – VO_{2max}

Significant influence of aerobic (factor A), anaerobic glycolytic (factor B), anaerobic alactate (factor C) components of performance on the physical fitness indicators of young athletes

Indicator	Factors	Influence, (h_x^2), %	Indicator	Factors	Influence, (h_x^2), %
MxDMn0, ms	A+B+C	11,03*	SD0, mmHg	A	6,71**
MxDMn1, ms	A+B+C	12,05*	SD1, mmHg	B	7,10*
MxDMn2, ms	A+B+C	11,48*	SD1, mmHg	C	6,20*
SDNN1, ms	A+B+C	10,56*	SD2, mmHg	B	6,10*
AMo0, %	A+B	5,90*	HR2, bpm	A+B+C	17,40**
AMo1, %	A+B+C	12,02*	A2, characters	A+C	8,54*
AMo2, %	B+C	10,63*	Q2, rel. units	A+C	10,60**
AMo2, %	A+B+C	19,26**	A/SI1, rel. units	A+B+C	16,87**
HRV, min	A+C	8,07*	Q/SI1, rel. units	A+B+C	14,68**
DP0, mmHg	A+C	9,89*	A/HR2, rel. units	A+C	7,79*
DP1, mmHg	A+C	8,36*	A/SI2, rel. units	A+B+C	10,87*
DP2, mmHg	A	4,04*	A/DP2, rel. units	A+C	6,36*
DP2, mmHg	A+B+C	11,16*	Q/HR2, rel. units	A+C	10,14**
SI1, rel. units	A+B+C	10,54*	Q/DP2, rel. units	A+C	9,16**
SI2, rel. units	A+B+C	12,45*	ZASHT, mm	C	7,18*
RRNN2, s	A+B+C	10,40*	C, score (before lessons)	A	8,23**
Mo2, s	A+B+C	15,53**	H, score (before lessons)	A	3,81*
OP1, mV	A+B+C	13,77**	H, score (before lessons)	A+B+C	9,34*
OP2, mV	A+C	10,86**	C, score (after lessons)	A	9,66**
SBP0, mmHg	A	5,80*	A, score (after lessons)	B+C	11,60*
SBP1, mmHg	C	5,60*	H, score (after lessons)	A	4,63*
SBP2, mmHg	C	7,91*	School anxiety, score	A+B	8,76*
SP/HR2, rel. units	A+B+C	17,52**	Social stress, score	A+B+C	10,96*

***Note**: 0 - background state; 1 - work in auto-tempo mode; 2 - work in maximum tempo mode. *, ** - statistically significant effect at $p<0.05$ and 0.01, respectively.*

and PWC_{170} (see figure). In this case, the differences were manifested in relation to 20 and 14 indicators, respectively.

Pronounced functional effects were noted in relation to the mutual influence of the considered components of the FS (see the table). The interaction of ABC was significant in relation to 19, AC – 10, BC – two, AB – two variables. The strength of the influence of factors for various FS indicators was in the range from 4,0 to 19,3%, and the total effect of several combinations of factors reached 29,9%. The obtained results show that the combination of high levels of development of aerobic and anaerobic capabilities provides a pronounced functional effect in relation to the physiological, subjective and behavioral aspects of the FS. The positive interaction of the bioenergetic components of the FS is reflected in the indicators of psychophysiological cost, efficiency and vegetative support of cognitive activity, as well as the emotional state.

It is assumed that the specificity of the FS of the body under conditions of intense cognitive activity, caused by the peculiarities of the development of aerobic and anaerobic components of the FS, is manifested at different structural and functional levels of the organization of the living system [1, 2, 7]. Apparently, adaptive changes in the body of young athletes who use loads in the process of sports training that develop aerobic and anaerobic endurance, determine the formation of universal adaptive reactions that increase resistance to the combined effects of various unfavorable factors.

The key mechanisms for the formation of positive cross-effects of adaptation are: the development of general algorithms for the rapid deployment of programs for the «reassignment» of vegetative and motor elements that form a common final path for any adaptive reaction; improvement of the activity of the antihypoxic defense system, activated during physical and cognitive loads [1]. The existence of differences between adolescent athletes with different FR in relation to psychophysiological reactivity to cognitive load indicates the peculiarities of the functioning of the modulating system of the brain. An important mechanism of the optimizing effect of a high level of FR on the FS is probably an increase in functional capabilities and a change in the nature of the interaction of the main stress-realizing and stress-limiting systems.

There is evidence that physical exercise helps improve brain function at the structural, functional and molecular levels. At the molecular level, these changes are represented by mechanisms that contribute to increased brain plasticity (BDNF, NGF, IGF-1, VEGF); at the structural level – to improved synaptic plasticity and activation of neurogenesis; at the functional level – to behavioral development (improved performance efficiency, inhibitory control, cognitive flexibility, decreased anxiety, depression, increased stress resistance). It is important to note that the reactivity of the autonomic nervous, sympathetic-adrenal, hypothalamic-pituitary and cardiovascular systems during psychosocial stress and intense cognitive loads is closely related to the magnitude of physiological changes under physical work conditions [11, 1, 10, 5, 9].

Conclusions. It has been established that the bioenergetic components of the FR have a significant effect on the physiological, subjective and behavioral aspects of the FS of young athletes aged 13-14 years under intense cognitive load. High aerobic, anaerobic glycolytic and anaerobic alactate productivity of the body, both separately and in interaction, cause a decrease in the psychophysiological «price» and an increase in the effectiveness of intense activity, an improvement in well-being and mood, and a decrease in anxiety.

The results obtained give reason to believe that the complex use of loads of various metabolic orientations in the process of sports improvement can contribute to the formation of stress resistance and the «limitation» of excessive psychophysiological reactivity.

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Complex of test exercises: the key to success in children's sports

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Abstract

Objective of the study was to create and demonstrate the efficacy of a set of assessment tasks for children, tailored to their developmental stage and aligned with their sensitive developmental period.

Methods and structure of the study. The current phase of advancement in youth sports and the system of training sports reserves is marked by the rapid development of young athletes, with training loads that do not align with age-appropriate periodization, and a high level of expectations, which significantly affects their success and longevity in their careers, as well as the quality of their achievements. To address these issues, the authors suggest a testing approach that focuses on identifying the content and structural elements of children's physical activity, which is represented by a comprehensive set of eleven exercises.

Results and conclusions. Following the evaluation of eight groups of participants, the researchers have determined that in the process of training athletes, the most crucial aspect is the implementation of carefully chosen training methods and the development of training programs that take into account the age-related characteristics, predispositions, and sensitive periods of young athletes.

The effective selection of athletes, as well as the alignment of training programs and sports training systems with the sensitive periods and individual predispositions of young athletes, will contribute to the advancement of the country's sports reserve and the enhancement of the social image of the high-performance sports sector as a whole.

Keywords: *youth sports, testing methods, motor activity, sensitive periods, cognitive abilities, potential.*

Introduction. The development of youth sports and the system of training the sports reserve is of key importance for the future interests and welfare of the nation, social transformations, the development of human potential and the formation of a healthy civil society in general, as well as the achievement of the strategic goals of the state.[1, 2] According to the Ministry of Sports of the Russian Federation, by the end of 2023, the share of citizens systematically engaged in physical education and sports, taking into account citizens who engage in them independently, is 69.3%.[3] However, successes and achievements in the field of sports, to a greater extent, depend on how effective the approaches and methods are used by specialists in training young athletes.

A competent specialist applies a rational system for selecting athletes based on the growth of individual indicators of young athletes, can correctly assess the general condition and promptly notice trends and possible problems of further improvement and development of young athletes, takes into account the patterns of building educational, training and competitive activities, introduces innovative technologies.

Thus, ensuring the rights of children, maintaining

1 Order of the Government of the Russian Federation of December 28, 2021 No. 3894-r on «approval of the Concept for the Development of Children's and Youth Sports in the Russian Federation until 2030 and the action plan for its implementation». [Electronic resource] Available at: http://static.government.ru/media/files/BzNG3VRui0oPR1XemJKbuIZ6U eXTwTD2.pdf (date of access: 24.01.2024).

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3 Statistics of physical education and sports in the Russian Federation. Ministry of Sports of the Russian Federation. Available at: https://sportrf.gov.ru/ (date of access: 28.03.2024).

their health and ensuring the necessary level of efficiency of the training process in youth sports largely depends on the degree of compliance with the sensitive period, functional capabilities, age and individual characteristics of each ward, the means and methods of training used by the coach-teacher (trainer).

However, today, youth sports can be characterized by a forced system of training young athletes in order to achieve the highest results. According to Maksimenko I.G. The following problems can be identified: a decrease in the age physiologically acceptable for starting to engage in sports; the lack of methods for training athletes that take into account sensitive periods of training and are based on the principles of athletic longevity; a decrease in the age physiologically acceptable for starting competitive activity; the lack of special methodological training for children's coaches and, as a consequence, the transfer of existing principles of the system of training adult athletes to children's and youth sports; a competition calendar that does not correlate with the sports experience and biological age of young athletes; a high level of overload; injuries; loss of motivation due to early burnout in young athletes; and other pedagogical, logistical, hygienic and medical risk factors [1, p. 57].

Objective of the study was to create and demonstrate the efficacy of a set of assessment tasks for children, tailored to their developmental stage and aligned with their sensitive developmental period.

Methods and structure of the study. In order to eliminate negative factors, it is necessary to organize the process of training young athletes, taking into account, first of all, the characteristics of their health and sensitive periods, without forgetting about other factors. In the system of long-term training of athletes ready to move on to high-performance sports, a special place should be given to the applied approach to periodization and the substantive component of the long-term training process, in which the most important place is occupied by the structure and content of motor activity and sports training of children of different ages, adolescents, athletes in early and late adolescence [1]. However, according to the opinion of experts in the field of development of children's and youth sports, the content of motor activity of preschool children aged 5-6 years should be based on the age-related developmental characteristics of children. According to I.G. Maksimenko, the key aspect of the formation of the nervous system of children is the conduct of training, including elements of various motor activity, the development of many motor skills not associated with a narrow specialization in a certain area of sport. Conducting complex training aimed at systematic development in accordance with age periodization is a positive factor in creating prerequisites for determining the inclinations and abilities of children to play sports, for successful preparation at the initial stage of long-term improvement. And it is difficult to disagree with this [1, 2]. We see that children at the age of 7-8 years, in accordance with the peculiarities of the development of the central nervous system, are already capable of perception and the simplest analysis of movements. Therefore, the educational and training process should be based on complex and simple exercises focused on studying the basics of sports techniques, various outdoor games, including movements in different directions, rotations, jumps, various acrobatic actions, high-speed and strength exercises, the use of objects and equipment of different weights, sizes, etc. A set of educational and training tools that develop various skills and abilities of children is effective for the formation of their kinesthetic and perceptual capabilities, visual and muscle memory, attention, speech. As a result of the simplest load, the child learns to feel, perceive, and also control his movements, coordinate himself in the process of performing the exercise.

Let us agree that children aged 7-8 years at the current level of neurological development, «can during the training process set up an effective interaction of the functioning of the central nervous system, the motor apparatus and the autonomic systems, thereby increasing the level of cognitive development and forming motor experience»1 [1, Art. 242]. Physical exercises affect the work of the circulatory and lymphatic systems, increasing the pulse and providing the brain with more oxygen. Physical activity increases the production of growth hormones, which ensure the creation of new brain cells.

In support of the above and on the basis of the implementation of the federal experimental (innovative) platform «Development of a model for creating a system for selecting talented athletes in new-type organizations in the territory of the Russian Federation», an experiment was conducted that included operational control and ongoing examination of the physical, functional and psychological preparedness of children engaged in sports training at various stages.

The use of a set of test exercises implies monitoring and measurement of physical fitness parameters,

1 Every year 200 thousand athletes give up further sports career. Senate Inform [Electronic resource]. Available at: https://senatinform.ru/news/ kazhdyy_god_200_tysyach_atletov_otkazyvayutsya_ot_dalneyshey_sportivnoy_karery/ date of access: 24.01.2024).

Table 1. Types of exercises for testing children

№	Types of exercises	Clarifications
1	20m Run	From a high start
2	Long Jump	From a standing position
3	Dynamometry	-
4	Lifting the Torso from a Supine Position	With bent legs
5	Forward Bend	From a standing position
6	Falling Ruler	-
7	Shuttle Run 3×10m	Minimum 2 people
8	Running to Numbered Medicine Balls	-
9	Bondarevsky Test	-
10	Walking There and Back	Rack of an inverted gymnastic bench
11	10m Run	With running around 3 uprights

Table 2. Results of the analysis of input and final testing data

Group	Age, years	Number of trainings, pcs.	Exercise number													Group average, %	Average for all groups, %
			1	2	3		4	5	6	7	8	9		10	11		
					P	L						P	L				
1	5-6	8	-1.33	1.49	-	-	54.64	33.3	5.65	13.52	-20.50	-23.87	-31.67	-3.52	0.97	2.61	10.64
2	7-8	5	1.84	0.79	-	-	3.69	14.29	-0.28	1,60	4.15	46.66	161.57	2.83	8.81	22.36	
3	5-6	8	2.48	3.08	2.33	2.72	13.21	10.07	15.29	3.50	9.81	17.62	21.14	5.80	4.85	8.61	
4	7-8	8	5.28	2.31	1.35	4.12	24.05	18.34	0.45	2.07	3.36	1.58	1.22	3.02	3.25	5.96	
5	5-6	8	2.22	2.94	-9.12	-7.02	3.97	31.13	19.00	2.92	5.64	43.03	29.93	9.52	13.09	11.33	
6	7-8	8	5.92	2.45	1.24	-1.52	4.47	9.57	28.05	3.87	4.54	14.47	20.46	4.96	1.55	7.70	
7	7-8	8	0.53	3.92	-	-	1.33	13.51	48.39	-32.20	-8.43	68.11	117.87	-12.94	-0.16	18.18	
8	5-6	8	36.40	1.97	47.06	41.10	-25.96	-62.42	22.22	3.06	17.04	-7.41	-1.66	32.01	5.49	8.38	

such as: strength indicators, endurance, flexibility, speed qualities, coordination of movements. Functional fitness reflects the work of the main systems of the body (digestive, cardiovascular, respiratory, etc.) when performing specific sports loads. Psychological preparedness is assessed by studying the psychological characteristics of athletes, such as motivation, concentration, stress resistance, etc.

Initially, in the groups of 5-6 and 7-8 year olds participating in the experiment, an entrance test was conducted to assess the initial physical and functional preparedness. The testing consisted of 11 exercises (Table 1).

The choice of these exercises is due to the possibility of assessing the physical qualities that should be developed at this age. In addition, during the implementation of the experiment, special training programs were introduced into the educational and training activities of sports groups of children aged 5-6 and 7-8 years. The main goal of the training programs is to improve the quality of physical fitness, maintain health, and develop the physical and psychophysical qualities of children, since the training programs included sets of exercises for the development of physical and psychophysical qualities that are important at this age.

Results of the study and discussion. As a result of the implementation of a set of educational and training programs, final testing was conducted, which assessed changes in the physical, functional, psychological and cognitive preparedness of those involved. During the analysis of the results of the entrance and final testing, data from children who regularly attend training sessions to develop physical qualities (attendance of more than 75% of the training sessions) were taken into account (Table 2).

As a result of the data analysis, the following results were obtained: in the first group of students, the average group result of improvement in test exercise per-

formance indicators was 2,6%, that is, for each of the 11 exercises, the final testing indicators were, on average, 2,6% better than the indicators obtained during the initial testing; in the second group of students, the average group result was 22,36%; in the third group of students – 8,61%; in the fourth group of students – 5,96%; in the fifth group of students – 11,33%; in the sixth group of students – 7,7%; in the seventh group of students – 18,18%; in the eighth group, the average group result of improvement in test exercise performance indicators was 8.38%. The overall average result of improvement in test exercise performance indicators was 10.64%, that is, for each of the 11 exercises, the final testing indicators were, on average, 10,64% better than the indicators obtained as a result of the initial testing. The obtained results of the analysis of the data from the entrance and final tests have a sufficient range of indicators, which proves the different abilities of children.

Conclusions. The use of a set of test exercises based on age periodization and corresponding to the sensitive period of children helps to increase the efficiency of the sports selection system.

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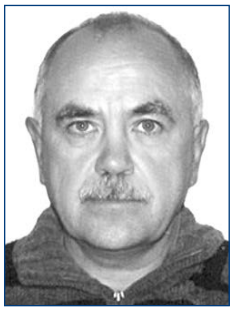
Methodological aspects of using essential oils in training young sprinters

UDC 796



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Abstract

Objective of the study was to based on the evaluation of the impact of essential oils on the physical condition and athletic abilities of athletes, we aim to create a framework for incorporating essential oils into the train-ing regimen of young sprinters.

Methods and structure of the study. The state of the muscles in terms of their functional activity was evaluated based on myotometry data. Additionally, specific performance indicators were measured, such as the maximum time for bi-cycle ergometric work at PWC170 power and the time taken to run a control dis-tance of 100 meters.

Using video recording, the running step indicators were measured on segments of 30-40 meters and 80-90 meters. The results were analyzed using the Dartfish computer program (Switzerland). The program calculated the running speed V, the time for each step T, the reference time t, the flight time tp, the frequency of steps (pace) f, and their length l.

Results and conclusions. The impact of essential oils enhanced the capacity for muscle relaxation while preserving the ability to reach peak performance. The maximum time spent on the bicycle ergometer increased at the PWC170 level. The time taken for the control run at a distance of 100 meters was improved. This was due to positive changes in the parameters of the running stride at the end of the distance, which helped maintain the running speed. The study identified a set of guide-lines for the use of essential oils in training, and based on this, an algorithm and methodology for the use of essen-tial oils in the training of young short-distance runners were developed, tailored to their specific needs. Subsequent experimental validation confirmed the efficacy of the proposed approach.

Keywords: *young athletes, special performance, essential oils, relaxation, methods of using essential oils.*

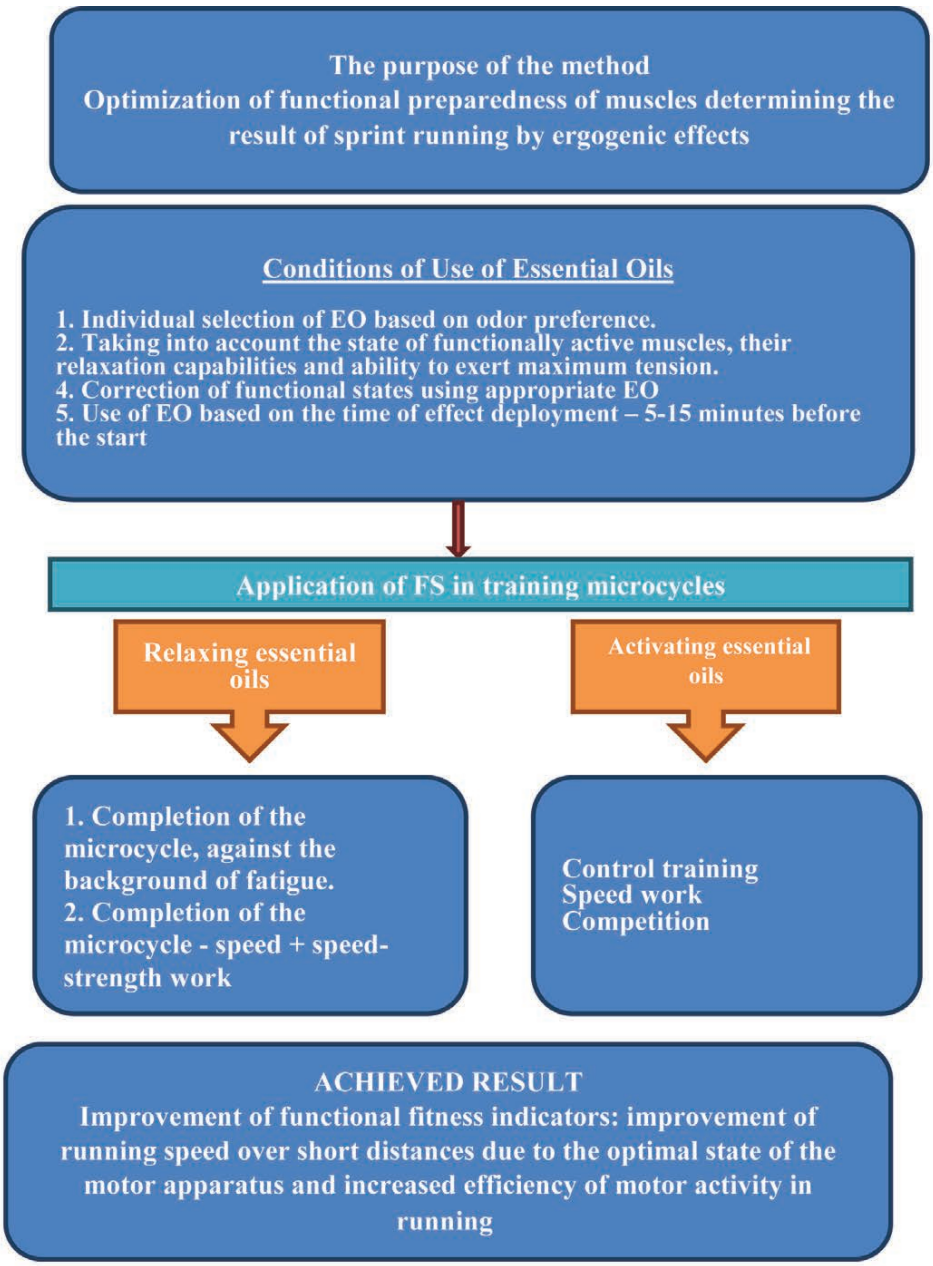
Introduction. Essential oils (EO) are currently used quite widely to influence the functional state (FS) of humans [1, 2, 7]. The possibilities of using EO in sports are being studied [3, 6]. Data have been obtained on a decrease in fatigue after physical exercise in animals that inhaled the smell of EO [8]. Of particular interest for sports practice is information on the positive effect of EO on the coordination of movements [4]. However, the methodological and technological features of using EO in sports training have not been sufficiently developed, especially for young athletes.

Objective of the study was to based on the evaluation of the impact of essential oils on the physical condition and athletic abilities of athletes, we aim to create a framework for incorporating essential oils into the training regimen of young sprinters.

Methods and structure of the study. The study involved young athletes involved in short-distance running. Two groups were formed: the main group, OG (n=9 young men) and the comparison group, CG (n=10), aged 15-16 years. The state of functionally active muscles was assessed according to myotonometry data (in conventional units of myotons, M), bicycle ergometric indicators of special performance. The running time over a distance of 100 m and the running step indicators for segments of 30-40 m and 80-90 m were determined (video filming, speed 30 frames/sec). The data were processed by the Dartfish computer program (Switzerland), running speed V, running step time T, support time to, flight time tп, step frequency (tempo) f and their length – l were calculated. Both groups of runners trained according to the same

type of plans. The OG participants inhaled relaxing or activating EO during training; the effects of EO with a subjectively preferred odor were studied. The level of intragroup differences was determined using the Wilcoxon test; the Mann-Whitney test was used to assess intergroup differences.

Results of the study and discussion. Before the training microcycle, no significant differences in muscle condition were found in the compared groups. By its completion, the relaxation capabilities of muscles implementing sports activities (running) somewhat worsened in the GS: elastic tone Et increased from 81,0±0,63 to 83,2±0,62 M, the «residual tone» indicator Rt (fatigue characteristic) increased from 0,5±0,22 to 1,9±0,23 M. As a result, the functional capabilities of muscles by the At value decreased from 18,0±1,07 to 15,2±0,92 M. All changes were statistically significant (Temp = 1, P < 0,01). During the same period, in the OG with regular use of EO, the deterioration of Et was less pronounced (growth from 80,56±0,56 to 81,89±0,51 M, Temp = 5,5, P < 0,01). The Ot indicator increased less than in the CG: from 0,44±0,18 to 0,89±0,35 M (Temp = 17, P > 0,05). At remained virtually unchanged (from 17,78±0,70 to 17,68±0,44, Temp = 14, P > 0,05). Thus, the functional capabilities of the muscles deteriorated significantly less in the OG compared to the CG. Control testing of young athletes from the OG who used EO showed an increase in



Scheme of the method of using essential oils in the training process

Features of using EO depending on the focus of the training process

Stage		Weeks	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Preparatory period		**Control**	**S**	A	**S**	A	**C**	A**S**
	GPS	1 week	SA	A	SA	A	AS	AS
		2 week	AS	AS	AS	AS	AS	AS
		3 week	SSW, A,C	SSW	SSW, A,S	SSW **REO)**	SSW, A,S	SSW
		4 week	SR, SSW	C, SSW	SR, SSW	C, SSW **(REO)**	SR, SSW	S, SSW
		Control	A, SSW	SSW	C (PEO)	SSW **(REO)**	C (PEO)	SSW,S
	SPS	1 week	SA	A	CA	A	AS	AS
		2 week	AS	AS	AS	AS	AS	AS
		3 week	SSW, A,S	SSW	SSW, A,S	SSW	SSW, A,S	SSW
		4 week	SR, SSW	S, SSW	SR, SSW	C, SSW	SR, SSW	S, SSW
		Control	A, SSW	SSW	C (PEO)	CKC **(REO)**	C (PEO)	SSW,S

*S – strength work, A – aerobic work, SSW – speed-strength work, SR – speed work, C – control training. PEO – preferred EO; **REO** – relaxing EO. GPS – general preparatory stage, SPS – special preparatory stage.*

special performance. The maximum time of performing bicycle ergometric loads of maximum power increased from 12,12±0,32 to 13,94±0,27 sec (Temp = 4,5, P < 0,01). The 100 m running time improved from 12,44±0,08 to 12,34±0,09 sec (Temp = 5,5, P < 0,01). In the GS, statistically significant changes in special performance were not noted. It can be assumed that changes during this period of the training process can be realized mainly due to an increase in the mobilization capabilities of young athletes.

The changes in running parameters were determined at different distance segments using EO. In the OG, during the initial testing, the running step characteristics at the 2nd segment of 80-90 m of the distance significantly worsened compared to the 1st segment of 30-40 m. At segment 2, the time of the support phase of the running step increased from 0.129±0.006 to 0.136±0.002 ms, unsupported from 0,126±0,009 to 0,131±0,003, the step frequency (in sec) decreased from 3,87±0,104 to 3,77±0,055 (P> 0,05). The result was a decrease in running speed from 7,89±0,075 (segment 1) to 7.61±0.085 (segment 2, P<0,05). Testing conducted under EO influence showed that in the second segment, compared to the first segment, the support time increased by 4,68%, and the step frequency decreased by 2,06%. These changes were less pronounced than in the initial testing. The step length in the second segment increased by 2,04%, and after exposure to EO – by 3,5%. The sum of such changes in running step indicators caused a smaller drop in speed after exposure to EO in the finishing segment, from 7,88±0,334 to 7,80±0,419 (by 1,01%, P<0,05), i.e. less than without the use of EO. The changes that occur when using EM reflect the growth of muscle relaxation abilities. This results in greater economy of movements, which is the main reason for maintaining running speed along with structural changes in the running step. Thus, the ergogenic potential of EO is demonstrated.

The conditions for using EO in the training process are revealed. First: when using a calming EO, the support and flight time increased, the frequency of steps decreased with an increase in their length. The effect of an activating EO caused minimal changes in the support time, frequency and length of the running step. Second, the preference for EO odors: better trained young men more often preferred calming EO (57%), and less trained ones – activating (58%). This is consistent with other studies that have shown the significance of EO odor preference [5].

The results of these and our previous studies became the basis for developing a methodology for using EO as ergogenic aids in the training process of young sprinters (see figure and table). The nature of the EO used was determined by the focus of the microcycles of the training process and the identified conditions of their use. *Scheme of the method of using essential oils in the training process*

Conclusions. The use of EO in the training process of young sprinters prevents undesirable deterioration of the functional capabilities of muscles that directly determine the result of running. Increased special performance is the result of the growth of the ability of young athletes to mobilize the existing potential of the body. The method of using EO in the training process of young sprinters is based on taking into account the relaxation capabilities of muscles, the degree of their fatigue, individual selection of EO (preference for

smell) and the use of essential oils depending on the focus of the training process.

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Elements of rhythm in apparatus movements: training gymnasts

UDC 796.412.2

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Abstract

Objective of the study was to based on the evaluation of the impact of electrical stimulation of the primary muscle groups and the kinematic characteristics of movements during the execution of technical maneuvers with an object to music with varying rhythmic patterns, we aim to determine the focus of subject training in rhythmic gymnastics.

Methods and structure of the study. To investigate the mechanics of motion in elite athletes (n=12), we employed the Qualisys optoelectronic system, which includes the Qualisys Track Manager (QTM) software.

Results and conclusions. The findings of the research allowed us to pinpoint the areas of focus for subject training in order to develop the rhythmic abilities of athletes at various stages of long-term training in rhythmic gymnastics. The focus of subject training for mastering the tempo-rhythmic structure of movements of an object, based on the identified factors that influence them, will be: enhancing coordination abilities, improving inter-muscular coordination, increasing the level of subject, musical, motor, and compositional preparedness of athletes, utilizing the subject as a means to create an image in the composition of gymnasts, and achieving high performance in competitive activities through proficiency in the majority of technical elements of the all-around.

Keywords: *artistic gymnastics, rhythm, tempo, motor expressiveness, biomechanical indicators, model characteristics.*

Introduction. Among all coordination abilities, rhythmic ability is one of the leading ones for achieving maximum sports results in rhythmic gymnastics, and different components of tempo-rhythmic characteristics of movement are significant for movements of both the body and the object [1, 5]. It is known that this type of coordination abilities is largely determined by the hereditary level of human inclinations, but if targeted development of rhythmic abilities is applied in the most favorable age periods, it is possible to achieve an increase [2]. However, there are few modern research works in this area, and the issue of the most appropriate ratio of means and methods for developing a sense of rhythm [3] in rhythmic gymnastics remains insufficiently studied.

Progressive development of rhythmic gymnastics poses more and more complex tasks for athletes to create not only technically virtuosic, but also emotional, bright, internally meaningful, musically convincing compositions with objects [4]. In accordance with the requirements of the European Gymnastics Standards and the rules for the sport of rhythmic gymnastics, when performing competition programs of various disciplines, judges evaluate program components according to a number of criteria, many of which are related to the manifestation of a sense of rhythm, namely: specific elements of the apparatus, coordinated with specific accents/phrases or dynamic changes in the music to create a visual impact, expression of the character and rhythm of the music.

Objective of the study was to based on the evaluation of the impact of electrical stimulation of the primary muscle groups and the kinematic characteristics of movements during the execution of technical maneuvers with an object to music with varying rhythmic patterns, we aim to determine the focus of subject training in rhythmic gymnastics.

Methods and structure of the study. To study the kinematics of movements of highly qualified female athletes (n=12), the Qualisys optical-electronic hardware-software complex with the Qualisys Track Manager (QTM) software was used. The electrical activity of muscles was recorded during video filming

of the combinations of work with an object to musical accompaniment with different rhythmic patterns in laboratory conditions and was recorded using surface (skin) electrodes (using a modern 16-channel electromyograph «MegaWin ME 6000» (Finland, 2008), and the obtained data were processed using a special computer program «MegaWin»). The accuracy of hitting the rhythm with the ball and hoop when performing technical work to different rhythmic patterns in different phases of movements was analyzed. Based on the data, features of the quality of the implementation of motor programs in each of the phases of movements were identified.

Results of the study and discussion. Technical actions with an object are caused by muscle tension of the musculoskeletal system, acting within a certain limited space and time. Any rhythmic error in working with an object will be a consequence of a poorly calculated relationship between the force of a given movement and the corresponding measure of time and space. It is necessary to know exactly what degree of force should be applied to a given proportion of time and space.

In this regard, a study was conducted aimed at determining the factors that determine the tempo-rhythmic characteristics of the movements of female athletes with an object. To solve this problem, the degree of influence of electrical activation of the main muscle groups, kinematic parameters of movements on the accuracy of reproduction of the rhythmic pattern when performing technical actions with an object to music was identified (Table 1).

It was determined that a greater number of factors determining the complexity of accurately hitting the rhythm with an object manifest themselves when performing a starting movement. Thus, when rolling the hoop across the hands, out of 75 factors studied, 26,83% determine the accuracy of rhythm reproduction in the starting action. This is primarily due to the physical properties of the object. When performing the hoop «spinner», it is also difficult to reproduce the rhythmic structure of its movement to get into the rhythm, since until the end of the rotational movement of the hoop in the vertical plane around the neck («spinner»), it is in an unsupported position. In this regard, getting into the rhythm in the final phase depends on the initial phase of performing the hoop «spinner», as indicated by 24,1% of the factors of the influence of electrical activation of the main muscle groups and kinematic parameters of movements on the accuracy of reproducing the rhythmic pattern when performing technical actions with an object to music (Table 2).

Another technical element of the object that is difficult to reproduce its tempo-rhythmic structure is the «eight» of the ball. The degree of influence of electrical activation of muscles and kinematic parameters of

Table 1. The degree of influence of electrical activation of the main muscle groups, kinematic parameters of movements on the accuracy of reproduction of the rhythmic pattern when performing technical actions with an object to music

Rhythmic groups	Rhythms	Tempo	Working with the subject	Degree of influence, %
Dicotyledonous size	Simple Rhythms, No. 6 «The Doll's Disease»	Slow	Small circle with hoop in front plane in front of hand	11,40
			Small circle with hoop in front plane behind hand	10,46
			Beginning of long roll of hoop over arms and chest	17,22
			Ending of long roll of hoop over arms and chest	21,27
			Throwing ball from behind back in horizontal plane with left hand of ball over arms and back	19,92
			Catching ball on right with right hand	15,86
			Beginning of long roll of ball over arms and chest	15,86
			Ending of long roll of ball over arms and chest	3,70
	Rhythmic group eighth-two sixteenths No. 17 «Neapolitan song»	Fast	1 phase of long roll of hoop on arms and back	26,70
			2 phase of long roll of hoop on arms and back	18,57
			Throw hoop in horizontal plane with elbow from left to right	18,57
			Catch hoop with left hand	32,08
			1 phase of roll of ball on arms and back	7,76
			Roll of ball on arms and back	21,03
			3 phase of roll of ball on arms and back	17,22
			Throw of ball from behind back	17,22

Table 2. The degree of influence of electrical activation of the main muscle groups, kinematic parameters of movements on the accuracy of reproduction of the rhythmic pattern when performing technical actions with an object to music

Rhythmic groups	Rhythms	Tempo	Working with the subject	Degree of influence, %
Tripartite size	Simple Rhythms №3 «Playing Horses»	Fast	Phase 1: rotate the hoop around the neck from right to left with a forward movement, arm bent	10,46
			Phase 3: rotate the hoop around your neck at your right shoulder, bend your right arm and take the hoop	23,97
			Passing the ball from the left hand to the right hand, wrapping it around the right hand	13,16
			Throwing a ball from the elbow joint	14,51
			Catching the ball with the left hand	7,76
	Dotted «German Song»	Moderate	Twist the ball inwards and downwards to the side with the right hand	26,68
			Twist the ball outward on the horizontal line to the side	33,43
			Twisting the ball on the body line (vertical) outward and upward	22,62

movements on the accuracy of reproducing the rhythmic pattern when performing technical actions with a ball to music is 33,73%.

Moreover, in all its phases and especially in the phase of twisting the ball on the horizontal line outward to the side. The accuracy of rhythm reproduction directly depends on the speed of movement of the shoulder anatomical point in the first phase of the «eight» of the ball – twisting the ball inward down to the side with the right hand (the correlation coefficient is 0,58). Thus, 26,98% of factors determine the accuracy of reproduction of the tempo-rhythmic structure of the ball in this phase. Accordingly, the rhythmic structure of this type of work with the object will be one of the most complex. And 32,38% will depend on the influence of electrical activation of the main muscle groups and kinematic parameters of movements on the accuracy of reproduction of the rhythmic pattern, especially when catching the object with the left hand.

The accuracy of reproduction of the rhythmic structure of the movements of the apparatus is also affected by the tempo to which the rhythmic pattern must be reproduced. It is always easier to reproduce movements of the apparatus at a fast tempo with a uniform rhythm. When performing work with the apparatus to slow music, the gymnast will most often either hurry or be late, or make incorrect accents; only a high level of technical mastery of the apparatus allows one to maintain a slow tempo and convey the changing rhythm of the musical piece with the apparatus.

Conclusions. The focus of the subject training for mastering the tempo-rhythmic structure of the subject's movements based on the identified factors that determine them will be: increasing the level of coordination abilities; improving intermuscular coordination; increasing the level of subject, musical-motor and compositional preparedness of female athletes; using the subject as a means of creating an image in the gymnasts' composition; achieving high efficiency of the gymnasts' competitive activity through free mastery of the absolute majority of technical elements of the all-around.

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Training of traffic police officers in the use of physical force in situations of operational service activities

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Abstract

Key words: *police officer, traffic police, State Traffic Safety Inspectorate of the Ministry of Internal Affairs of Russia, physical training, combat wrestling techniques.*

Introduction. Physical training of employees of internal affairs bodies is aimed at developing professionally significant physical qualities, developing combat fighting skills and the ability to use physical force in situations of operational and service activities. [1]. Currently, the current direction of physical training of the traffic police officers of the Ministry of Internal Affairs of Russia is training in the use of combat techniques in situations of operational and service activities.

Purpose of the research – identifying current methods of training traffic police officers in the situational use of physical force.

Research methodology and organization. The study was organized and conducted at the Tyumen Institute for Advanced Training of the Ministry of Internal Affairs employees in the period from 2019 to 2024. The following scientific methods were used in the study: analysis of the practice of using physical force by police officers, studies and scientific literature; modeling the educational process of advanced training; systematization of educational content.

Results and its discussion. As a result of the study, the training topic "Features of the use of physical force in typical situations of operational and service activities of employees of the State Traffic Safety Inspectorate of the Ministry of Internal Affairs of Russia" was developed and tested. [2]. This topic is structurally included in the thematic plan of the optional discipline "Current issues of the activities of the traffic police units of the Ministry of Internal Affairs of Russia" of the professional training program for persons for the position of "Police officer". Within the framework of this training topic, students are taught the techniques and tactics of using combat fighting techniques in situations of operational and official activities of traffic police officers of the State Traffic Safety Inspectorate of the Ministry of Internal Affairs of Russia. Current issues include situations where physical force is used to remove an offender from a vehicle; protection from blows with piercing and cutting objects in the confined space of a vehicle; protection from attacks on police officers when checking the vehicle owner's identity documents.

Conclusion. As a result of the study, the training topic "Features of the use of physical force and special means in typical situations of operational and official activities of employees of the State Traffic Safety Inspectorate of the Ministry of Internal Affairs of Russia" was developed and tested within the framework of the training of students in the professional training programs for persons in the position of "Policeman". As a result of the implementation of the training topic, the effectiveness of the use of physical force in the situations under consideration increased by 26%. The results of the study confirm the effectiveness of the developed training topic.

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Features of physical training of internal affairs officers for the prosecution and detention of criminals

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Abstract

Key words: *police officer, internal affairs agencies, physical training, pursuit, detention, combat fighting techniques.*

Introduction. Physical training of employees of internal affairs bodies is aimed at achieving a high level of development of professionally significant physical qualities of employees, mastery of combat fighting techniques [1]. In educational institutions of the Russian Ministry of Internal Affairs system, as part of the implementation of the main programs of professional training for individuals hired for the first time by the internal affairs bodies for the position of "Policeman", training sessions on physical training on the topic of "Combat training practice and tactics of using combat fighting techniques" are provided. In this regard, there was a need to find effective means and methods for training employees of internal affairs agencies to pursue and detain criminals [2].

Purpose of the research – identification of effective means and methods of physical training of employees of internal affairs agencies for the pursuit and detention of criminals.

Research methodology and organization. The study was organized at the Tyumen Institute for Advanced Training of the Ministry of Internal Affairs Employees in 2024. The following scientific methods were used in the course of the study: analysis of the practice of actions of employees of internal affairs bodies in situations of pursuit and detention of criminals; analysis of regulatory and legal documents governing the physical training of employees of internal affairs bodies, educational and methodological support for the physical training of employees of the Ministry of Internal Affairs of Russia; systematization of the means and methods used for the physical training of employees of internal affairs bodies.

Results and its discussion. As a result of the research, educational and methodological support was prepared for the educational topic “Educational and combat practice and tactics of using combat fighting techniques”. This training topic was integrated into the thematic plan of the main program of professional training for the professional preparation of persons for the position of "Police Officer". The staff examines in detail the techniques and tactics of pursuing and detaining a criminal, performing techniques, issues of interaction and mutual assistance of staff in defending against attacks and in detaining criminals. Algorithm for modeling training situational tasks for the use of combat fighting techniques according to the scheme: “search – pursuit – restriction of the assistant’s freedom of movement”.

Conclusion. The developed educational topic "Training and combat practice and tactics of using combat techniques" can be used in the educational process of physical training in educational institutions of the Russian Ministry of Internal Affairs system; Professional training centers of the Russian Ministry of Internal Affairs, as well as within the framework of professional service and physical training of the personnel of the Internal Affairs Bodies.

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Efficiency of training correction in canoeing based on post-exercise electrocardiogram changes

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Abstract

Objective of the study was to assess the diagnostic potential of post-training electrocardiogram alterations in the context of current training regimen optimization for elite kayakers and canoeists.

Methods and structure of the study. The electrocardiogram was taken from 28 male rowers aged 18 to 36 (3 Olympic champions, 7 international-level masters, 18 masters) and 18 female athletes aged 18 to 33 (2 Olympic champions, 4 international-level masters, 12 masters). The examination was conducted using the Valenta diagnostic system, with 12 standard leads, repeated at intervals of 3 to 12 days throughout the annual training cycle. A total of 1,360 measurements were taken. The following data were recorded: heart rate, the position of the heart's electrical axis AQRS, the duration of the P, T, and QRS complexes, the PQ, QT, and QT corrected (Bazett) intervals, and the ST segment.; The Macruz index, the height of the R and T waves, and the ratio of the R to T wave heights in the fifth and sixth thoracic leads, the waveform, and the T-wave amplitude in all leads, the position of the PQ and ST segments relative to the isoelectric line, and the shape of the ST segment ascent were examined.

Results and conclusions. It was discovered that the diagnostic value of an electrocardiogram diminishes significantly when it is taken only as part of a routine annual medical examination. To detect the slightest alterations that enable timely adjustment of training loads, it is essential to conduct at least one recording per week. Moreover, the new electrocardiogram must be meticulously compared with the previous one. It is also crucial to incorporate the ratio of K to N in the left chest leads and the measurement of the angle between the ascending and descending portions of the T-wave with its characteristic dome-like shape into the calculation of the recorded parameters.

One of the initial abnormalities in the electrocardiogram of athletes may be the alignment of the S-T segment and the ascending portion of the T wave, as well as an increase in the absolute QT interval due to the S-T segment with a relatively stable corrected QT.

Keywords: *highly skilled canoeists and kayakers, electrocardiogram, post-load changes, overexertion criteria, training process.*

Introduction. The current approaches to the selection of medical and biological markers of the need for short-term correction of the training process in certain situations are not always sufficiently substantiated. This is due to the lack of a number of examinations relevant for current monitoring and taking into account the different individual diagnostic significance of each of the recorded physiological and clinical laboratory parameters. The results of the research conducted by us over a period of six years (2028-2023) showed that in fact none of the physiological (heart rate, systolic and diastolic blood pressure, double product index, body components, integral indices of the functional state of the hardware and software complexes «Omega» and «Cardiovisor») and clinical and laboratory parameters (morphological, protein composition of the blood and a number of biochemical parameters – the content of urea, glucose, cortisol, total and free testosterone, iron, alanine aminotransferase, aspartate aminotransferase, total creatine phosphokinase), registered within the framework of systematic current medical and biological monitoring of highly qualified kayakers and canoeists, with the exception of stabilization in the negative zone of the criteria of psychoemotional status (sleep, mood, appetite), does not allow us to argue for coaches the need to regulate training loads [5, 6, 7, 8, 9, 10, 12]. Turning to the works of the founders of domestic sports medicine of the 70-90s of the last century, we considered it justified to return to the method of electrocardiography from the perspec-

tive of not chronic and urgent (as is customary), but its possible delayed post-load changes, which can be stopped by a short-term reduction in training loads.

Objective of the study was to assess the diagnostic potential of post-training electrocardiogram alterations in the context of current training regimen optimization for elite kayakers and canoeists.

As a specific task, the substantiation of the algorithm for analyzing the electrocardiogram in athletes when using it in the system of current medical and biological control of rowers on kayaks and canoes of high and higher qualification was chosen.

Methods and structure of the study. The electrocardiographic examination involved 28 male rowers aged 18 to 36 years (3 Honored Masters of Sports, 7 Masters of International Class, 18 Masters of Sports) and 18 female athletes aged 18 to 33 years (2 Honored Masters of Sports, 4 Masters of International Class, 12 Masters of Sports). The examination was conducted using the Valenta diagnostic system in 12 generally accepted leads, in the morning, immediately after sleep, in the supine position, on an empty stomach, repeatedly, with an interval of 3-12 days at all stages of the annual training cycle. The total number of measurements was 1360 (740 for males and 620 for female athletes). The following were recorded: heart rate (beats/min), position of the electrical axis of the heart AQRS (deg), duration of P waves (sec), T (sec), QRS complex (sec), PQ intervals (sec), PQ from the end of the P wave to the beginning of the Q wave (sec), QT (sec), corrected QT (Bazett) (sec), ST; the Macruse index – P/(PQ-P), amplitude of R and T waves in the fifth (V5) and sixth (V6) chest leads (mm), ratio of R and T wave amplitudes in V5 and V6, shape and amplitude of the T wave in all leads, position relative to the isoelectric line of the PQ and ST segments, shape of the ST segment elevation were also calculated and analyzed. As criteria for myocardial repolarization disorders in athletes, the indicators presented in the classification of the dystrophic variant of chronic overstrain of the cardiovascular system (according to A.G. Dembo, 1980 [2], according to L.A. Butchenko and V.L. Butchenko, 1984 [1]), in the works of S.A. Dushanin, V.V. Shigalevsky, 1988 [3] were analyzed.

Results of the study and discussion. According to the results of the conducted studies, the examined athletes can be divided into three subgroups – with a consistently normal electrocardiogram, with a consistently pathological electrocardiogram, consistent with chronic physical overstrain of the heart with periodic deterioration and improvement in terms of the terminal part of the ventricular complex, as well as with delayed post-load repolarization disorders, which, as a rule, normalize after a short-term regulation of loads.

Of the 28 rowers, 14 people (55,0%) consistently had a normal electrocardiogram, 6 (21,5%) consistently had a pathological one, and eight (21,5%) had periodic improvement or deterioration. Among women, out of 18 athletes, 10 people (55,5%) had a consistently normal electrocardiogram, three (16,7%) had a consistently pathological one, and five (27,8%) had a periodic improvement or deterioration. In the absence of a stable delayed negative reaction of the electrocardiogram in athletes to training loads of varying volume and intensity, it is reasonable to assume that electrocardiography can serve as one of the sufficiently reliable physiological examination methods in determining the degree of tolerance to physical activity, a high level of which is a necessary condition for improving athletic skills. At the same time, we have found that the most effective regulation of loads is against the background of the beginning of «leveling» of the S-T segment and the ascending knee of the T wave. According to L.A. Butchenko and V.L. Butchenko, [9], this corresponds to the 4th variant of the S-T segment. It is found in 1,4% of athletes, regardless of the type of sport. It is not found in healthy people who do not play sports. The frequency of this variant on the ECG is the same for athletes of both sexes. Its characteristic feature is the ascending direction of the S-T segment with a gradual transition to the T wave. Since there is no clear boundary between the segment and the wave, the width of the T wave increases. Such changes, according to our observations, can be recorded both in the chest and in the standard leads, they are characterized by high variability and can be corrected with a short-term decrease in loads.

In general, when examining a selected contingent of athletes, changes in the amplitude and shape of the T wave in standard leads II, III, AVF and chest leads V5, V6, as well as a domed T wave in leads V5-V6 were recorded as delayed post-load repolarization disorders according to electrocardiogram data. Changes in the amplitude and shape of the wave in standard leads II, III, AVF and chest leads V5, V6 required a longer regulation of loads, and the domed T wave in leads V5-V6, as a rule, remained stable, with the exception of a slight decrease in the amplitude of the domed T and an increase in the angle between the ascending and descending knees of the T wave.

Conclusions. It has been established that the informative value of the electrocardiogram in the system

of medical and biological monitoring of highly skilled canoeists and kayakers is sharply reduced with an insufficient number of its registrations. In order to detect the slightest changes in the ECG, allowing timely regulation of training loads for a short period of time (without practically disrupting the training process), it is necessary to record and analyze it at least once a week. It is very important to carefully compare the electrocardiogram with the previous one. In order to correctly detect the slightest changes in the amplitude of the T wave in the left chest leads, it is necessary to introduce the ratio of R to T into the calculation of the registered parameters, as well as the measurement of the angle between the ascending and descending knees of the T wave with its dome-shaped form. In general, according to the data obtained, it is electrocardiography, with strict observance of all the above conditions (including the time of registration, the position of the subject, the absence of food intake), that can serve as one of the informative methods of ongoing monitoring of a selected contingent of athletes and will allow simultaneously assessing the level of their tolerance to training loads. In highly qualified athletes with a consistently normal electrocardiogram, the criteria of the psychoemotional state are more diagnostically significant. Separately, it is necessary to dwell on the analysis and assessment of the QT interval in athletes, which is the subject of active discussions among specialists [4, 11]. According to the data we have obtained, one of the early violations of electrocardiograms in athletes can be an increase in the absolute QT interval due to the ST interval with a sufficiently high stability of the corrected QT interval. In our opinion, specialists dealing with this problem should return to the problem of ongoing changes in the QT interval in athletes against the background of high training loads once again.

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Age-related dynamics of sexual dimorphism in the structural components of physical performance in children aged 5-7 years

UDC 373.2

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Abstract

Objective of the study was to evaluation of the expression of sexual differentiation in the physical abilities of children aged 5 to 7.

Methods and structure of the study. Girls and boys aged from 5,5 to 6,0 years (n=28) and from 6,0 to 6,5 years (n= 28), respectively 6,5 to 7,0 years (n=20) and from 7,0 to 7,5 years (n=28), respectively, took part in the pedagogical experiment conducted on the basis of the Krasnodar Kindergarten No. 103 year (n=20). The following structural components of physical performance (PWC150) were subjected to statistical analysis: heart rate, body weight, body length, 10 squats in the first load, 20 squats in the second load and work power.

Results and conclusions. It was discovered that in the annual changes of PWC150 in older preschoolers, compared to their initial measurements, in most cases, there were significant variations in the sexual differences between boys and girls aged 5,5 to 7,5. In the remaining components of PWC150, the initial differences between boys and girls aged 5,5 to 7,5 ranged from 0,91% to 5,71%.

Therefore, the findings regarding the annual changes in the initial components of the physical performance of older preschoolers underscore the need for further investigation to determine the most effective approaches to physical education.

Keywords: *sexual dimorphism, preschool children aged 5-7 years, physical performance and its structural components.*

Introduction. Currently, in the scientific literature, there is a dual opinion among scientists on the issue of the manifestation of sexual dimorphism in various indicators of the physical condition of preschool and primary school children. Thus, E.M. Lapitskaya et al. did not find any differences in the physical and motor development of girls and boys aged 5-7 years, indicating that this is due to their different motor activity [4]. However, K.D. Chermit, K.Yu. Mamgetov, Yu.K. Chernyshenko, V.A. Balandin, V.E. Kuznetsova, N.I. Dvorkina, L.S. Dvorkin and others identified significant differences in the development of physical, mental qualities, and emotional personality traits of children at the stages of preschool ontogenesis [1, 2, 5, 6]. I.A. Krivolapchuk, M.B. Chernova and V.V. Myshyakov revealed that typological differences between children of this age depend, first of all, on the peculiarities of the functioning of bioenergetic mechanisms of energy supply of muscular activity, as well as on the adaptive features of the organism [3]. At the same time, the study of the issue of age dynamics of manifestation of sexual dimorphism in structural components of physical performance of children aged 5-7 years remains open.

Objective of the study was to evaluation of the expression of sexual differentiation in the physical abilities of children aged 5 to 7.

Methods and structure of the study. Girls and boys aged from 5,5 to 6,0 years (n=28) and from 6,0 to 6,5 years (n= 28), respectively 6,5 to 7,0 years (n=20) and from 7,0 to 7,5 years (n=28), respectively, took part in the pedagogical experiment conducted on the basis of the Krasnodar Kindergarten No. 103 year (n=20). The following structural components of physical performance (PWC150) were subjected to statistical analysis: heart rate, body weight, body length, 10 squats in the first load, 20 squats in the second load and work power.

Results of the study and discussion. Table 1 presents the statistical baseline indicators of the structural components of PWC150 in children aged 5,5 to 6,5 years.

Age from 5,5 to 6,5 years

Heart rate (f1). At the age of 5,5 to 6,0 years and

Table 1. Initial indicators of structural components of PWC150 in children aged 5,5 to 6,5 years

Components		Age of children in the first group (M± m)			
		5,5-6,0 years (by n=14)		6,0-6,5 years (by n= 14)	
		Girls	Boys	Girls	Boys
HR, bpm	f1	110,87±0,37	109,32±0,33*	109,73±0,35	108,57±0,31*
		p<0,01; Δ=1,42%		p<0,05;Δ=1,07%	
	f2	121,31±0,48	119,24±0,42*	120,58±0,53	118,06±0,47*
		p<0,01; Δ=1,74%		p<0,01; Δ=2,13%	
Body weight, kg	p	22,15±0,22*	21,19±0,18	22,56±0,21*	21, 87±0,25
		p<0,01; Δ=4,53%		p>0,05; Δ=3,16%	
Body length, m	BL	1,21±0,046*	1,20±0,043	1,22±0,061	1,22±0,066,
		p>0,05; Δ=0,83%		p>0,05; Δ=0,826%	
Squat, times	n1	10	10	10	10
	n2	20	20	20	20
Work power, kgm/min	N1	106,32±0,35*	101,71±0,32	108,29±0,38*	105,10±0,44
		p<0,001; Δ=4,53%		p<0,001; Δ=3,04%	
	N2	212,16±0,75*	203,42±0,68	216,58±0,65*	209,95±0,56
		p<0,001; Δ=4,29%		p<0,001; Δ=3,16%	
PWC_{150}, c.u.		590,38±6,25	630,76±7,31	587,26±18,35	706,61±23,,63*
		p<0,01; Δ=7,84%		p<0,01; Δ=20,03%	

Note: * the indicator of differences in favor of the specified gender, PWC_{150} – indicator of physical performance of children, N1 – power of the first load, N2 – power of the second load; f1 – pulse rate per minute after completion of the first load, f2 – pulse rate per minute after completion of the second load. The load power was calculated using the following formula: N=1,2×p×BL/3×n, where p is body weight in kg, BL in m, n is the number of squats, times.

from 6,0 to 6,5 years, reliable differences were found in favor of boys, respectively, at p < 0,01 by 1,42% in the first case and at p < 0,05 by 1,07%.

Heart rate (f2). After performing the second load, a reliable trend of differences is observed between girls and boys at the age of 5,5 to 6,0 years from 6,0 to 6,5 years, respectively, at p > 0,01 by 1,74% and p > 0,01 by 2,13% in favor of boys.

Body weight. At the age of 5,5 to 6,0 years, the differences between girls and boys in body weight were significant at p> 0,01 by 4,53% in favor of girls, respectively, at the age of 6,0 to 6,5 years, the differences between them in body weight were insignificant at p> 0,05 by 3,16%.

Body length (BL). At the age of 5,5 to 6,0 years, the differences between girls and boys in body length indicators were insignificant at p> 0,05 by 0,83%, respectively, at the age of 6,0 to 6,5 years, the differences between them were also insignificant at p> 0,05 by 0,826%.

Work power (N1). At the age of 5,5 to 6,0 years, the differences between girls and boys in N1 were significant at p<0,001 by 4,53% in favor of girls, respectively, the differences at the age of 6,0 to 6,5 years in N1 were significant at p>0,001 by 3,04% also in favor of girls.

Power of the work (N2). The differences between girls and boys at the age of 5,5 to 6,0 years in N2 were significant at p<0,001 by 4,29% in favor of girls, respectively, at the age of 6,0 to 6,5 years, the differences between them in N2 were significant at p>0,001 by 3,16% in favor of girls.

PWC_{150}. The differences between girls and boys aged 5,5 to 6,0 years in PWC150 were significant at p<0,01 by 7,84% in favor of boys, respectively, the differences between them at the age of 6,0 to 6,5 years were significant at p<0,01 by 20,03% in favor of boys.

Age from 6,5 to 7,5 years

Table 2 presents the statistical baseline indicators of the structural components of PWC150 for children aged 6.5 to 7.5 years.

HR (f1). The differences between girls and boys aged 6,5 to 6,0 years in f1 were significant at p<0,05 by 1,2% in favor of boys, respectively, at the age of 7,0 to 7,5 years, significant differences were found at p<0,05 by 0,91% also in favor of boys.

HR (f2). The differences between girls and boys during the first load were significant at p<0,01 by 1,55% in favor of boys; accordingly, after the second load, the differences were in favor of the latter (at p<0,01 by 1,58%).

Body weight. In girls aged 6,5 to 7,0 years, the differences between them in body weight indicators were significant at p<0,01 by 5,71% in favor of girls; accordingly, the differences between girls and boys aged 7,0 to 7,5 years in body weight were found to be insignificant (at p>0,05 by 1,26%).

Body length (BL). The differences between girls and boys in body length indicators were insignificant at p> 0,05 by 0,82% in favor of girls; accordingly, the differences between girls and boys aged 7,0 to 7,5 years in body length were insignificant at p> 0,05 or by 0,81%.

Work power (N1). The differences between girls and boys in N1 indicators were significant at p < 0,001 by 5,7% in favor of girls, accordingly, at the age of 7,0 to 7,5 years, the same significant differences were ob-

Table 1. Initial indicators of structural components of PWC150 in children aged 5,5 to 6,5 years

Components		Age of children in the second group (M±m)			
		6,5-7,0 years (by n= 10)		7,0-7,5 years (by n= 10)	
		Girls	Boys	Girls	Boys
HR, bpm	f1	108,53±0,35	107,24±0,31*	107,38±0,32*	106,41±0,29*
		p<0,05; Δ=1,2%		p<0,05; Δ=0,91%	
	f2	120,14±0,45,	118,31±0,39*	119,23±0,49	117,38±0,45*
		p<0,01; Δ=1,55%		p<0,05; Δ=1,58%	
Body weight, kg	p	23,69±0,23*	22,41±0,21	24,05±0,26*	23,75±0,28
		p<0,01; Δ=5,71%		p>0,05; Δ=1,26%	
Body length, m	BL	1,23±0,046*	1,22±0,044	1,24±0,068*	1,23±0,072
		p>0,05; Δ=0,82		p>0,05; Δ=0,81%	
Squat, times	n1	10	10	10	10
	n2	20	20	20	20
Work power, kgm/min	N1	116,55±0,46*	110,26±0,38	118,33±0,47*	114,39±0,41
		p<0,001; Δ=5,7%		p<0,001; Δ=3,44%	
	N2	233,11±0,81*	220,51±0,75	236,65±0,82*	228,78±8,79
		p<0,001; Δ=5,71%		p<0,001; Δ=3,44%	
PWC_{150} , c.u.			631,25±7,64*	614,49±7,73	680,29±15,25*
		p<0,01; Δ=5,29%		p<0,01; Δ=10,71%	

Note: the difference index in favor of the specified gender, PWC_{150} – the index of physical performance of children, N1 – the power of the first load, N2 – the power of the second load; f1 – the pulse rate per minute after the completion of the first load, f2 – the pulse rate per minute after the completion of the second load. The load power was calculated using the following formula: N=1,2×p×BL/3×n, where p is the body weight in kg, BL in m, n is the number of squats, times.

tained only at p < 0,001 by 3,44% in favor of the former.

Work power (N2). The differences between girls and boys in N2 indicators were significant at p<0,001 by 5,7% in favor of girls; Accordingly, the differences between girls and boys aged 7,0 to 7,5 years N2 were significant at p<0,001 by 3,44%, but already in favor of boys.

PWC_{150}. The differences between girls and boys in the PWC150 indicators were significant at p<0,01 by 5,29% in favor of boys; accordingly, in girls aged 7,0 to 7,5 years in PWC150, the differences between them were significant at p<0,01 by 10,71% in favor of boys.

Conclusions. It was established that in the annual dynamics of PWC150 in senior preschool children in relation to the initial indicators, in most cases reliable differences in sexual dimorphism were revealed between boys and girls in the age range from 5,5 to 7,5 years. In other structural components of PWC150, its initial indicators of relative differences between boys and girls aged 5,5 to 7,5 years were in the range from 0,91 to 5,71%.

Thus, the obtained results of the annual dynamics of the initial structural components of physical performance of senior preschool children prove the need for further research to substantiate the choice of the most effective means and methods of physical education.

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The prerequisites for hardware and software support in the digitalization of sports

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Abstract

Objective of the study was to substantiation of requirements for the development of sports APC in the context of phygitalization.

Results of the study and discussion. A retrospective examination of scholarly articles and empirical investigations in the realm of the development and implementation of sports APC. The examination of the four stages of the evolution of the sports agro-industrial complex in the context of digitalization has led us to identify the following prerequisites:

The APC must encompass at least one stage of sports training, providing all the necessary tools for coaches and athletes in competitive activities. It should not only evaluate individual parameters but also a system of measured parameters. The coach should be able to combine, create, and modify existing programs. The system should allow for the collection of both raw data and data that has been processed using artificial intelligence technologies, at a selected level of generalization, while maintaining the declared accuracy parameters. It should also enable seamless interaction with data, ensuring that no qualitative or quantitative losses occur during active sports activities. Additionally, it should be immune to theft or malicious use, thanks to the use of wireless and cloud technologies. Collaborate with a wide range of digital offerings and engage with the community.

Keywords: *phygitalization of sports, Games of the Future, phygital sports, eSports, digital sports, digitalization of sports, phygital center.*

Introduction. After the International Multisport Tournament «Games of the Future» the demand for the creation of phygital centers is growing both in our country and abroad. Modern sports science in the context of phygitalization of sports [4] cannot avoid turning to high-tech solutions that allow obtaining data, including large data, managing and analyzing them to obtain new knowledge in the field of theory and methodology of physical education and sports [1, 2]. At the present stage, wireless communication, cloud technologies for accumulating the required amount of information and artificial intelligence technologies (including machine and deep learning) for processing the received data are used to improve the use of the APC [6, 7, 8, 12, etc.].

Objective of the study was to substantiation of requirements for the development of sports APC in the context of phygitalization.

Results of the study and discussion. A retrospective analysis of the development and application of sports APCs allowed us to identify four historical and technical periods:

Stage 1. Sports APCs are used to conduct scientific research and are not widely implemented not only in competitions, but also in the process of sports training. Today, it is precisely such APCs that are most widely represented in higher education institutions engaged in the training of qualified personnel for the sports industry (see table).

Stage 2. Sports APCs are integrated into the training process - they collect both urgent information about the process parameters and accumulate significant amounts of data for their in-depth analysis in order to improve the planning of the training process [3, 13, etc.]. It should be noted that this period chronologically coincides with the emergence of digital

Examples of hardware and software systems (HSS) used in organizations for training personnel in the sports industry

Organization	Equipment
RUS «GTSOLIFK» Research Institute of Sports[1]	1. Hardware and software complex Qualisys 2. Polar Team System 3. Universal Activation Meter AC-9K 4. Hardware and software complex for analyzing technical actions of athletes 5. Hardware and software complex for high-speed shooting and analysis of impact movements 6. Hardware and software complex «Plantovisor» (Cindy Grazia 2007) 7. Complex of psychodiagnostic studies «Psychophysiologist» 8. Multifunctional computer complex «Neuro-MVP-8» 9. DartFish system 10. Stabilometric complex «Stabilan-01»
NSU named after P.F. Lesgaft[2]	1. Delsys wireless hardware and software biofeedback system 2. Valenta hardware and software system 3. Tanita DC-360 body composition analyzer 4. Polar 625 heart rate monitor 5. Electromyogram recorder 6. ST-150 stabilotrainer game controller 7. GREENFOOT musculoskeletal system diagnostics device 8. KM-AR-01 Diamond V cardiorespiratory system and tissue hydration monitoring system 9. SCATT-biathlon training system
VNIIFK (self-examination 2022)[3]	1. Telemetric electromyography device with a set for analyzing the biomechanics of movement 2. Diagnostic PAC «DiaSled» 3. Automated complex for functional diagnostics of the body's condition MESKRIN-VOP (general practitioner) 4. Equipment complex for video analysis of movements 5. Medical device ABC-012 «Medass» with software 6. Polar command pulse measurement system
SPbNIIFK[4]	1. Software for video analysis Dartfissh Pro Suite 8.0 2. Hardware and software complex «PAKPF-Mirage» 3. Device «Poly-Spectrum-8/E» 4. Device «Stabilan-01-2» 5. Polar Team2 6. Multifunctional computer complex for EEG and VR research «NeuronSpectrum-2» 7. Software and hardware complex module for training and reaction assessment SIGVET 8. Complex KM-AR-01-»Diamant» 9. Wireless automated system for testing athletes Fusion SmartSpeed Lite
SibSUFK[5]	1. Hardware and software complex «APKKPF» (BioMouse) 2. Hardware and software complex «Valeoscan» 3. Heart rate variability analysis program «PolySpectrum-Rhythm» with a set of equipment 4. Hardware and software complex «BOSLAB» with multichannel interfaces 5. Multifunctional computer complex for studying EEG and evoked potentials «Neuro Spectrum-3» 6. 2-channel multifunctional computer complex for studying EMG and SSEP «Neuro-EMG-Micro» 7. Stabilotrainer ST-150 8. Computer stabilizer analyzer with biological feedback «STABILAN -01» 9. Computer complex «PolySpectrum-S» 10. Hardware and software complex «Sports psychophysiologist»

[1]Russian University of Sport, Equipment Available at: https://gtsolifk.ru/nauka/nii_sporta_i_sportivnoy_meditsini/oborudovanie (access date: 20.03.2024).
[2]NSU named after P.F. Lesgaft, Material and technical support and equipment of the educational process Available at: http://lesgaft.spb.ru/sveden/objects (access date: 20.03.2024)
[3]Self-assessment report of the Federal Scientific Center of Physical Culture and Sport Available at: https://goo.su/EhujYk (access date: 20.10.2022)
[4]SPbNIIFK, Material and technical support and equipment of the educational process Available at: https:// https://www.spbniifk.ru/information/mto (access date: 09.07.2024).
[5]SibSUFK, Material and technical support and equipment of the educational process Available at: https://sibsport.ru/sveden/objects (date of access: 09.07.2024).

sports (including eSports), but has its own specifics in methodological terms - the need to use a complex technical device with modern software and hardware parts to prepare an athlete for participation in competitions, as well as the digitalization of the competitive activity itself, is recorded. However, IT companies create sports APCs without scientific justification.

Stage 3. Sports APCs began to cover not only training, but also competitive processes. Therefore, to study the problem of designing and using hardware and software support, the method of modeling business models was used, including the design of software and hardware and software products (Figure 1).

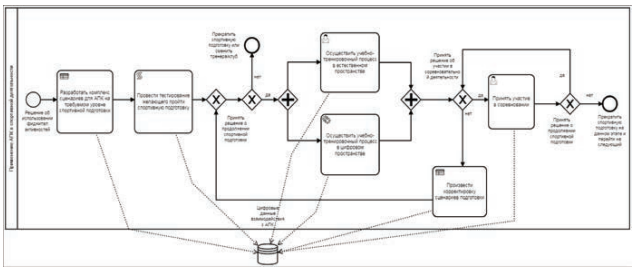

Figure 1. Modeling the use of sports APC in training and competitive activities using the BPMN methodology (the third stage of APC development)

As a result of modeling (service rating 8.2). We received a process with a high degree of automation, where the coach (head of sports training) has the ability to pedagogically influence the athlete and receives additional opportunities to organize the management of the sports training process based on data (Data Driven approach). For example, it was implemented by various authors in managing the activities of football players depending on the trajectories of their movement on the field [10, 11].

Stage 4. Sports APCs expand their functionality due to interactive interaction with the sports community (fans) [5, 14, etc.]. Research by European scientists has shown the need for mandatory consideration of this factor, which affects both the behavior of athletes and judges [9, 15, 16, etc.]. For example, Cisco has developed an APC to create a management system based on sports and fan activity data (Figure 2).

Conclusions. An analysis of four stages of development of sports ACS in the context of phygitalization allowed us to formulate the following requirements submitted for discussion:

1. Compliance – the ACS should fully cover at least one stage of sports training.

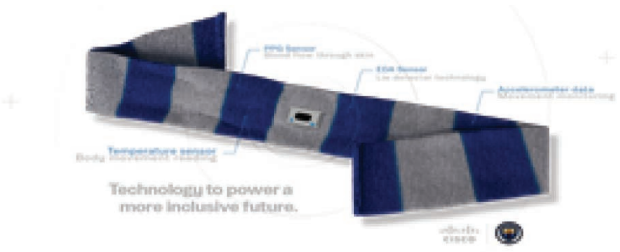

Figure 2. Cisco developed an automated control system to create a management system based on sports and fan activity data

2. Sufficiency – the ACS should contain all the tools necessary for a coach and an athlete in competitive activities.

3. Integrity – the ACS should evaluate not only individual parameters, but also a system of measured parameters.

4. Flexibility – the ACS should allow a coach to combine, create original methods and make changes to existing programs.

5. Informativeness – the ACS should allow receiving both "raw", unprocessed data and data that has already undergone intellectual processing (using artificial intelligence technologies) at the selected degree of generalization and maintain the declared accuracy parameters.

6. Reliability – the ACS should interact with data without the possibility of qualitative and quantitative losses (during active sports activities, using wireless and cloud technologies), theft or malicious use.

7. Openness – the APCS must be able to integrate with various digital services and products, as well as interact with the community.

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Motivation of athletes: individual and group running lessons

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Abstract

Objective of the study was to determine the reasons why people participate in sports, focusing on both group and individual training running sessions.

Methods and structure of the study. The research involved 93 amateur runners, ranging in age from 19 to 69. The participants were divided into two groups: those who studied in a group (42 individuals) and those who studied individually with a coach (51 individuals). All athletes underwent a survey using the methodology «Assessment of the Motives of an Amateur Athlete (Motivation Scale for Motor Activity, FASHION)» in adaptation by K.A. Bochaver, D.V. Bondarev, M.A. Papkov, and the author's questionnaire for analyzing biographical data of the subjects' motivational attitudes.

Results and conclusions. The reasons why amateur runners consistently engage in training have been explored, and the relationship between motivation and the type of training has been examined, particularly in the context of the growing popularity of marathon and race participation, particularly in St. Petersburg, where the number of athletes participating is increasing year after year.

It was discovered that there were differences in the scale of «Group affiliation» between athletes who trained individually and those who trained in a group. Additionally, there were variations in the factors that maintained motivation and the ultimate objectives of their training.

Despite the diverse and individual motivations for running, there are commonalities that unite runners into a community, regardless of their personal motivational priorities.

Keywords: *amateur sport, running, motivation.*

Introduction. In today's reality, when high-performance sports are under sanctions, attention to amateur sports and mass physical education is increasing. The study of motivation for running among its fans is becoming relevant for sports psychology [2, 4, 7-9]. According to the study on trends in the development of mass amateur sports and physical education, conducted by the Sociological Center of the CSP "Platform" in 2023 together with the Ministry of Sports of the Russian Federation, the involvement of the Russian population in sports and physical education is growing. The most popular types of activities are walking or running (practiced by 24% of those involved in sports), swimming (16%), fitness (14%), exercise therapy, health gymnastics (11%), weightlifting (11%), team games (13%) [1-3, 6, 11-12]. Group dynamics and support can stimulate a high level of motivation and self-confidence, as well as contribute to the setting and achievement of goals. Runners who train individually with a coach can rely on their own motivation, self-discipline, and internal factors to maintain their interest in running and make continued progress [5, 10, 13].

Objective of the study was to determine the reasons why people participate in sports, focusing on both group and individual training running sessions.

Methods and structure of the study. 93 amateur runners aged from 19 to 69 years took part in the scientific work. Most respondents were aged 30-39 years (46%), had completed higher education (76.8%) and were in a registered marriage (47%). All study participants mainly trained in St. Petersburg and the Leningrad Region. In the study, the athletes were divided into two groups: runners training in a group and runners training individually with a trainer. The group of runners who preferred group training consisted of 42 people, including 14 men and 28 women. The group of runners who preferred individual training consisted of 51 people, including 23 men and 28 women. All athletes completed a survey using the method «Assessment of the motives of an amateur athlete (Motivation Scale for Physical Activity, MODA)» adapted by K.A. Bochaver, D.V. Bondarev, M.A. Papkova and the author's questionnaire for the analysis of biographical data of motivational attitudes of the subjects.

Results of the study and discussion. The obtained results of diagnostics of motives for sports activities among amateur runners showed that the highest average values in both groups of respondents were found for the subscales «pleasure» and «physical condition», from which it can be concluded that the most pronounced motives for sports activities are enjoyment of physical activity and the desire to improve physical condition (Figure 1, 2). This emphasizes that emotional satisfaction and the desire to maintain or improve health and physical fitness play an important role in making a decision about regular physical exercise. The maximum value for all scales is 25 points, except for «Competition/ambition» - 24 and «Expectations of others» - 21 points. The minimum value is 5 points.

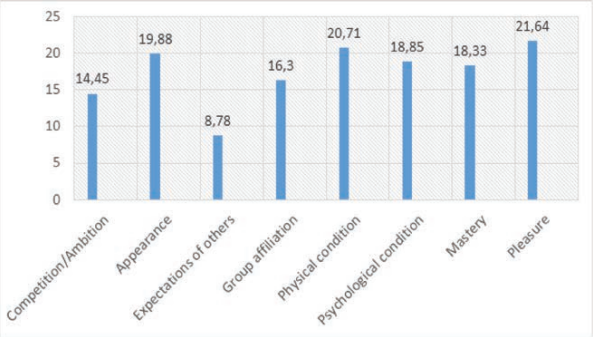

Figure 1. Expression of motives for running in athletes who prefer group training using the method «Assessment of motives of an amateur athlete»

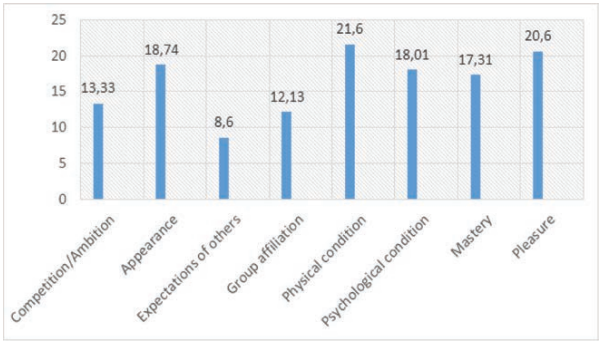

Figure 2. Expression of motives for running in athletes who prefer individual training using the method «Assessment of motives of an amateur athlete»

Small differences in the mean values for the subscales «mastery» and «competition/ambition», which are higher in group running, may indicate that training in a group contributes to the development of skills and improvement of running technique. The subscale «appearance» also shows higher mean values in group participants, which may be due to increased attention to one's own appearance in the context of social interaction. Participation in group activities often involves not only joint training, but also social activity, during which participants may strive to make a positive impression on others. When checking the reliability of differences in the expression of motives for running in the two groups, reliable results were obtained only for one scale – «Group affiliation» (I exercise to communicate with friends during training) (see table). Perhaps, participants in group training feel more motivated due to social support and competition with other participants.

Comparison of mean values of motives for regular physical activity using Student's t-test

Scale	Average value		The meaning of the Student's t-test	p
	Group	Individual		
Group affiliation	16,30952	12,13725	4,490970	0,000021*

Comparison of motives did not reveal statistically significant differences in the expression of other motives for doing sports. This may indicate that the main reasons that motivate people to run are universal and do not depend on the preference for training alone or in a group. This may include the desire to maintain health, the desire to improve physical fitness, the search for relaxation and stress resistance, as

well as the desire to be part of a community of like-minded people. Thus, regardless of the training format, the main motives remain similar and are aimed at achieving personal goals in running and general well-being. Runners demonstrate differences depending on the chosen training format. During group training, runners experience anxiety before the start, and during individual training, excitement and optimism are manifested, based on faith in themselves and their own abilities. Internal factors of runners' motivation include individual characteristics, needs, values, and beliefs. They determine a person's preferences, interests, and goals, which may differ from group norms and values. Individuals often strive for self-realization, independence, and personal satisfaction, which leads to the formation of internal motives. External factors – social norms, expectations, support from loved ones and the coach play a big role in motivating group running. Group norms and values determine the behavior of group members in compliance with group norms and mutual respect.

Conclusions. The results of the study indicate that the motivation for running in amateurs is multifaceted and individualized, but at the same time has common features that allow runners to be united into a single community, regardless of their personal motivational emphases. This emphasizes the importance of taking into account individual characteristics when developing training programs and motivational strategies in amateur running.

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Faculty of physical culture of zabsu: development of sports in the trans-baikal territory

UDC 796.01

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Abstract

The article celebrates the 65th anniversary of the Faculty of Physical Culture and Sports at Zabaikalsky State University (ZabSU), which has a rich history deeply intertwined with the advancement of physical culture and sports in the Trans-Baikal region.

Objective of the study was to examine the significance of the Faculty of Physical Culture and Sports at ZabSU as a driving force in the advancement of sports culture in the Trans-Baikal region through a historical lens.

Methods and structure of the study. In the course of our research, we have compiled a comprehensive collection of all-Union and national legal documents related to physical culture and sports, as well as reporting materials from the archives of the Trans-Baikal Territory State Archive. These documents provide a detailed account of the activities of the Faculty of Physical Culture and Sports at the Trans-Baikal State University. We have then analyzed and compared the information extracted from these documents.

Results and conclusions. Throughout the history of the faculty, it has been a hub for the training of essential professionals, including physical education teachers, coaches, sports event organizers, and, of course, individuals who contribute to the success of sports. Furthermore, the article highlights that the Faculty of Physical Culture and Sports at ZabSU has consistently been a driving force behind the organization of sports events at the city, regional, national, and international levels, some of which have become established traditions. The article also emphasizes the importance of this department within the university in the context of evolving regulations that reflect the advancement of physical culture and sports in our country. The authors conclude that the Faculty of Physical Culture and Sports at the university continues to serve as a leading training ground for the field of physical culture and sports in the Trans-Baikal region and beyond.

Keywords: *Faculty of Physical Education and Sports, Transbaikal State University, physical education, sports, Transbaikalia.*

Introduction. Over the past ten years, considerable attention has been paid to the development of physical culture and sports in Russia. Russian President V.V. Putin, speaking at a meeting with members of the government in May 2024, emphasized the need to create conditions for as many people in the country as possible to engage in physical culture and sports for free, calling this task «absolute».[1] Earlier, the President of the Russian Federation gave a positive assessment to the proposal of Deputy Prime Minister D. Chernyshenko to form a separate comprehensive state program on sports with the aim of involving 70% of the country's citizens in systematic sports by 2030, that is, «to make sports a norm of life for 93 million people». In this regard, the «Strategy for the Development of Physical Culture and Sports in the Russian Federation for the Period up to 2030» was approved by the order of the Government of the Russian Federation of November 24, 2020.[2] In accordance with the tasks set by the President of Russia, 2021-2025 in the Zabaikalsky Krai were declared the «Five Years of Sports» [4]. The regional ministry has prepared a comprehensive plan, outlined large-scale tasks and planned a large number of sports events. The main sports center and the main pedagogical, methodological foundation for fulfilling the tasks of developing physical education and sports

[1] Putin: Sports activities should be "as free as possible" for citizens [electronic resource]. Available at: https://rg.ru/2024/06/04/putin-zaniatiia-sportom-dolzhny-byt-maksimalno-besplatnymi-dlia-grazhdan.html?ysclid=m1273tjb6o52046602 (date of access: 25.08.2024).

[2] Strategy for the Development of Physical Culture and Sports in the Russian Federation until 2030. Approved by Order of the Government of the Russian Federation of November 24, 2020 No. 3081-r [electronic resource]. Available at: http://static.government.ru/media/files/Rr4JTrKDQ5nANTR1Oj29BM7zJBHXM05d.pdf (date of access: 25.08.2024).

in Zabaikalsky Krai is Zabaikalsky State Pedagogical Institute (formerly ChSPI). It was systematic physical education classes at the university, the formation in the late 1950s – early 1960s of the Department of Theory and Methodology of Physical Education, Gymnastics and Sports Games under the leadership of Yu.P. Sviridov, and then an independent faculty of physical education of ChSPI, the training of physical education teachers that became the starting point for fulfilling the main goal of society in those years - the education of a harmoniously developed personality. In addition, the relevance is determined by the anniversary date – the 65th anniversary of one of the most prominent faculties of the Transbaikal State University – the "sports department", which has become the driver of the development of sports and recreational work in the region since its creation. The issues of the development of physical culture and sports in Transbaikalia and the activities of the Physical Culture and Sports Department of Zabaikalsky State University have repeatedly been reflected in the pages of scientific, popular science literature, as well as in the media at the regional and all-Russian levels1 [1-3].

Objective of the study was to examine the significance of the Faculty of Physical Culture and Sports at ZabSU as a driving force in the advancement of sports culture in the Trans-Baikal region through a historical lens.

Methods and structure of the study. In the course of the scientific work, a set of all-Union and Russian regulatory documents in the field of physical culture and sports and reporting materials from the funds of the State Archive of the Trans-Baikal Territory, which reflect the activities of the Faculty of Physical Culture and Sports of the Trans-Baikal State University, was summarized; an analysis and correlation of information extracted from the above documents was carried out.

Results of the study and discussion. An important milestone in the development of physical culture and sports in the USSR was 1959. In accordance with the Resolution of the Central Committee of the CPSU, the Council of Ministers of the USSR No. 56 of January 9, 1959 «On the management of physical culture and sports in the country», the management of the physical culture movement was reorganized2. This year also became a landmark one for Transbaikalia: the Chita Pedagogical Institute opened a faculty of physical education, which operated for the first three years as a department of the natural history and geography faculty. This coincidence was not accidental. The above-mentioned document emphasized the need to pay close attention to the quality of work of specialized departments in organizing mass health work among students, as well as to improving the athletic skills of students in universities and colleges of the country. The implementation of all this work in the late 1950s – early 1960s was undertaken by a generation of teachers who came from the front – participants in the Great Patriotic War, headed by the rector of the institute, Hero of the Soviet Union I.V. Korolkov. Among them, one can note Transbaikal athletes and sports enthusiasts: A.M. Grabar (organizer and first dean of the faculty), teachers and specialists in physical education – N.V. Mishukov, P.I. Isaev, O.A. Feoktistova, G.N. Shikhanov, A.A. Bakhtina, heads of departments – V.I. Ivanov, S.A. Sedov, L.S. Koltakov, coaches and inspirers of victories – B.L. Liga, M.V. Goncharov, V.V. Matyushin, R.A. Koryukhin, N.I. Tamarovsky. Resolution of the Council of Ministers of the USSR No. 671 of August 11, 1966 «Issues of Development of Physical Culture and Sports» quite clearly defined the need to strengthen the material and technical base in the field of physical culture and sports, including setting the task of building sports facilities at university and interuniversity levels.3 The enthusiasm and dedication of the teachers and students of ChGPI led to the fact that already in 1966 a faculty building with the necessary infrastructure (gyms, swimming pool, etc.) was put into operation,4 and in the early 1970s, a gymnastics hall and the Arakhley sports and health camp. The dedicated work of teachers and coaches in the 1960s and 1970s, based on the created material base, immediately brought high results. This is evidenced by the standards of masters of sports of the USSR achieved by students of the «sports department» (V. Bukatic, G. Byankin, V. Zverev, V. Kuznetsov, Yu. Golubev, etc.). Graduates of the department - the first champions and prize winners of all-Russian and all-Union competitions not only brought glory to Transbaikal sports. They influenced the sharp increase in interest in physical education in the region as a whole.

[1] Small Encyclopedia of Transbaikalia: Chita Region: Physical Culture and Sports. R.F. Geniatulin [ed.]. Novosibirsk: Nauka publ., 2006. 284 p.

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[3] Resolution of the Council of Ministers of the USSR of 11.08.1966 N 671 "Issues of development of physical culture and sports" [electronic resource]. Available at: https://e-ecolog.ru/docs/5GkvhXbQGh3sFioBjADG1?ysclid=m1dkeqktfi705221229 (date of access: 25.08.2024)

[4] SATT (State Archives of the Transbaikal Territory). F. R-177. Op. 2. D. 60.

A feature of the development of Transbaikal sports in the 1970s and 1980s is the active scientific work of the teaching staff of the pedagogical and medical institutes of Chita. The scientific laboratories of Professor V.V. Alfonsov, scientific and pedagogical schools of V.I. Kuznetsov, V.N. Prokofieva and V.Ya. Kiseleva, which have gained wide popularity far beyond our region, still attract students and schoolchildren to scientific research. The results of scientific research were actively used in the practical work of athletes and coaches, which led to an increase in the performance of Chita teams in team sports (football club «Lokomotiv», volleyball team «Zabaikalka», etc.). During the existence of the Faculty of Physical Education and Sports of ZabSU, many of its graduates have forever inscribed their names in the history of Russian and world sports.

Resolution of the Central Committee of the CPSU, the Council of Ministers of the USSR No. 890 of September 11, 1981 «On the further rise of the mass character of physical education and sports»1 again set the corresponding tasks for the Faculty of Physical Education of the Chita Pedagogical Institute. Archival documents of this time repeatedly contain references to the said document and testify to the active participation of teachers and students of the faculty in the preparation of a number of mass sports and health events of various levels: the All-Union Physical Culture and Sports Complex GTO, the May Day relay race, the Spartakiad of Chita universities, winter all-around, ski relay race for the prize of the newspaper «Komsomolets Zabaikalya», etc.[2] Большая часть этих мероприятий продолжает существовать и сегодня.

The availability of a modern sports base, high-quality, highly qualified teaching staff, and guaranteed employment make the Faculty of Physical Education and Sports of ZabSU one of the most sought-after at the moment. The faculty is ready to solve complex but achievable tasks set before such higher educational institutions. During a meeting of the President of the Russian Federation with members of the government, the Minister of Sports M. Degtyarev reported that today 56% of citizens in Russia regularly engage in physical activity and sports. According to him, at the moment there are more than 752000 working citizens in the country who have GTO badges.[3] And in the speech of the governor A.M. Osipova, head of the Transbaikal Territory, announced another figure in the summer of 2024: 50% of Transbaikal residents regularly engage in sports.[4] Thus, the faculty has something to strive for, especially since the rate of development of sports in the region is quite high.

Conclusions. Physical culture is undoubtedly one of the most significant components of the harmonious development of the individual, that is, the primary task that has faced society and the domestic education system for decades. Much attention was paid to its development, attracting interest in sports, especially among young people, at all stages of the existence of Transbaikalia. However, it is worth recognizing that systematic mass work to attract Transbaikal youth to the sports movement began with the appearance of the Faculty of Physical Education at the Chita State Pedagogical Institute in 1959. The development of mass physical culture in the region, the growth of interest in sports inevitably led to high-quality training of Transbaikal athletes, a constant increase in demands on sports results. A new scientific approach to the preparation of athletes, conducting physical education lessons, training, relaxation sharply increased the results of Transbaikal athletes. All this, both several decades ago and now, is closely connected with the development of the Faculty of Physical Education and Sports of ChGPI-ZabSU, which, in our opinion, is the driver of the development of physical education and sports in Transbaikalia.

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[2] SATT. F. R-177. Op. 2. D. 677. SATT. F. R-177. Op. 2. D. 1022.

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[4] About 50% of the population in Transbaikalia is involved in sports [electronic resource]. Available at: https://zabrab75.ru/news/sport/poryadka-50-nas-eleniya-zanimaetsya-sportom-v-zabajkale/?ysclid=m1dt6trmo6253406796 (date of access: 25.08.2024)

Professional training of students majoring in physical education: the role of the state exam

UDC 378.146

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Abstract

Objective of the study was to evaluate the preparedness of students in the field of physical education for their future careers, we will conduct a comprehensive assessment during the state examination.

Methods and structure of the study. The research work was carried out with the participation of 2024 bachelor's degree graduates of the Transbaikal State University in the field of «Pedagogical Education» in the amount of 43 full-time and part-time students. Using the mechanism of independent assessment of qualifications at open meetings of state examination commissions, the indicators of the theoretical and methodological, project-technological, practical and activity components of readiness for professional activity of graduates were studied.

Results and conclusions. The process of developing a teacher's professional preparedness for teaching involves a series of stages, spanning a considerable timeframe. These stages include pre-professional training, obtaining specialized pedagogical education through secondary vocational and higher education institutions, and engaging in actual teaching, during which teachers are required to enhance their skills.

Based on the established methodology for assessing the outcomes of the state examination, the level of preparedness of physical education graduates for professional work is determined. The examination reveals the indicators of theoretical and methodological, design and technological, and practical and activity-based preparedness of physical education graduates. Additionally, differences in the structure of readiness for professional work between full-time and part-time students were identified.

The interdependence between the theoretical and methodological, design and technological, practical and activity, and initial physical fitness indicators (as measured by the entrance tests in physical education) has been identified, and the extent to which these indicators affect the preparedness of physical education graduates for their professional careers has been assessed.

Keywords: *state examination, professional readiness, components of professional readiness.*

Introduction. The professional readiness of a teacher as a complex of individual psychological characteristics, properties and qualities of a person, necessary for successful mastery of pedagogical activity, is formed over a long period of time: the prerequisites for professional success are laid long before receiving professional education, are actively formed in the process of training in the specialty and continue to be improved in the course of direct pedagogical work.

A number of researchers [2, 4, 10] believe that the level of training of future teachers and their further professional success depend on the effectiveness of selection at the stage of entrance examinations. Some works are devoted to the formation of components of professional readiness of future physical education teachers and coaches during their studies at a university [1, 8]. The issues of assessing and improving the professional competence of sports teachers in the process of additional education were studied by L.M. Pevitsina [6], S.I. Mikhailyuk et al. [5]. Scientists and practitioners [3, 7, 9] are deeply interested in the procedure and technologies for assessing the professional readiness of students majoring in pedagogical fields during the final state certification at universities, including through the use of demonstration exam tools. At the same time, no unified approaches to assessing the quality of professional training of future teachers have been developed. Experts call the development and justification of reliable criteria for assessing the professional readiness of graduates during the

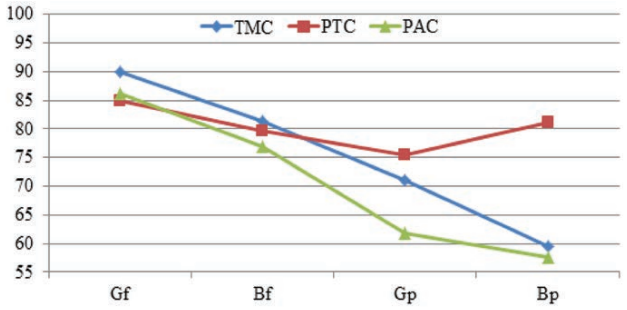
state exam one of the urgent tasks of the system for training physical education personnel.

Objective of the study was to evaluate the preparedness of students in the field of physical education for their future careers, we will conduct a comprehensive assessment during the state examination.

Methods and structure of the study. The main methods of theoretical research were analysis, generalization and systematization of data from scientific and methodological literature. Empirical data were obtained using expert assessment during the state exam, descriptive statistics, and calculation of the Bravais-Pearson correlation coefficient.

The study was organized and conducted with the participation of 43 graduates of the 2024 bachelor's degree program of the Transbaikal State University in the field of «Pedagogical Education», including 23 full-time students (12 girls (Gf) and 11 boys (Bf), average age – 23 years) and 20 part-time students (9 girls (Gp), 11 boys (Bp), average age – 31 years). The state examination (SE) was conducted using the mechanism of independent assessment of qualifications at open meetings of state examination commissions represented by the scientific and pedagogical staff of the university and persons invited from third-party organizations (employers), consisted of three interrelated parts, allowing to assess the theoretical and methodological (TMC), project-technological (PTC), practical-activity components (PAC) of readiness for professional activity of graduates1.

Results of the study and discussion. The analysis of the results of the state examination showed a fairly high level of readiness for professional activity (RPA) of full-time students who demonstrated professional and pedagogical skills at the benchmark (from 85 to 100 points, «excellent») and standard (from 70 to 84 points, «good») levels. A high level of RPA was demonstrated by 75% of girls and 45,5% of boys, about 9% of graduates demonstrated the threshold level of readiness. The results of the state examination of correspondence graduates were on average at the threshold level (from 55 to 69 points, «satisfactory»). About 45% of correspondence graduates showed a standard level of RPA, no benchmark professional and pedagogical skills were noted. A comparative analysis of the assessed components of the extended day program of graduates majoring in physical education during the state examination allowed us to establish that in the structure of the extended day program of full-time students, the leading place is occupied by the TMC, in second place for girls – PDC (86,23%), and for boys – PTC (79,7%) components. The third place is occupied by PTC (85%) for girls, and by PAC (77,03%) for boys. The leading place in the structure of the extended day program of part-time students is occupied by PTC. Boys demonstrate higher scores for this component both in % of the maximum possible value and in comparison with girls. The second place is given to the TMC. The practical and activity component occupies the third place (see the figure).



Indicators of readiness for professional activity of graduates of 2024, percentage of the maximum possible

Analyzing the results of the correlation between the indicators of theoretical and methodological (TMC), project-technological (PTC), practical-activity (PAC) readiness for professional activity, we established a strong and average statistical relationship (see table).

In the group of full-time students, a strong and average positive correlation was found between the three main components of the RPA, which confirms the fact of the influence of the studied indicators on the level of graduates' readiness for professional activity and indicates the presence of an integrated system for the formation of professional readiness in the course of students' mastering the main educational program in the chosen training profile.

In the group of correspondence students, an average positive correlation was established between the TMC and the PAC for girls; TMC and PTC, TMC and PAC, PTC and PAC for boys. Apparently, the practical component of training, including the skills of developing pedagogical systems and the skills of demonstrating motor training and developmental effects, is of primary importance for correspondence students, and the TMC plays a supporting role in relation to PAC and the PTC.

Analysis of the results of identifying the relationship between the initial indicators of physical fitness (PF) of students obtained during the entrance examinations and the formed components of the RPA indicated the

[1] State Certification Program. Available at: https://zabgu.ru/ftp/B/44.03.05/44.03.05.16/6_GIA/2.Program%20GIA%20(FGOS%20VO%203++).pdf

The relationship between the indicators of readiness for professional activity of graduates of 2024 (p<0,05)

Components of readiness	Gender	Full-time education				Part-time education			
		TMC	PTC	PAC	PF	TMC	PTC	PAC	PF
TMC	G	1	0,70	0,76		1		0,67	
	B	1	0,65	0,65		1	0,63	0,60	
PTC	G		1	0,70			1		
	B		1	0,65			1	0,73	
PAC	G			1				1	
	B			1				1	
PF	G				1			0,74	1
	B				1	0,66		0,70	1

presence of a strong and average correlation with PAC for correspondence students, as well as with the TMC for male correspondence students (see table). In the group of full-time students, this correlation was weakly expressed. The initial level of physical fitness, after all, is an important component of the extended day program in the field of physical culture and sports, acting as a factor in the successful mastering of the main educational program in the conditions of minimizing contact work in the process of correspondence education. It is physical fitness, along with project-technological skills, that serves as the basis for a more successful and high-quality demonstration of professional and pedagogical skills in correspondence students.

Conclusions. Thus, when developing readiness for professional activity in full-time physical education students, it is necessary to rely on their success and motivation to master theoretical and methodological knowledge, pay more attention to developing project-technological skills in girls, and gain experience in demonstrating professional and pedagogical skills in boys. In the course of developing readiness for professional activity in correspondence students, it is necessary to strengthen the theoretical and methodological component of training in conjunction with the project-technological component, and, relying on the formed basis of «skills-knowledge», build up the practical and demonstration component, revising the content of practical and methodological disciplines and industrial practice programs.

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Sport as a factor in the mental well-being of students with disabilities

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Abstract

Objective of the study was to identification of the peculiarities of mental states of students with disabilities involved in sports.

Methods and structure of the study. The empirical approach to research was through experimentation. The data analysis was conducted using the IBM SPSS Statistics 27 statistical software and the Excel program. The study included students with disabilities who participated in sports and their peers, students from the 1st to 4th years of the Russian State University of Social Technologies.

Results and conclusions. The disparities in the psychological states of students with disabilities who participate in sports and their peers were identified. Athletes are characterized by a predominance of positive emotions, which are closely linked to the manifestation of their volitional qualities and the ability to focus their attention. Student-athletes, on the other hand, experience negative emotional experiences during periods of inactivity, impulsive actions, and feelings of insecurity. These negative mental states are less likely to occur when mental processes are activated, physiological reactions change, or behavior is modified. The relationship between the mental states and personal characteristics of athletes with disabilities has been empirically demonstrated. The correlations that have been identified reveal the following patterns: as sensitivity to external stimuli and awareness of perception increases, so does the desire for independence; positive emotions enhance a sense of individuality; and as self-confidence grows, so does life satisfaction.; The experience of optimism enhances responsiveness and empathy. The feeling of joy is closely linked to perseverance and enthusiasm. As the number of actions increases, empathy, life satisfaction, and receptivity grow, while the desire to make a good impression diminishes.

Keywords: *students with disabilities, athletes, mental states, positive experiences, self-control.*

Introduction. One of the most important aspects of the life of persons with disabilities is their mental state, which can significantly affect the ability to socially adapt and interact with the outside world. In this context, it is necessary to determine the characteristics of mental states in students with disabilities involved and not involved in sports activities. The theoretical basis for the study was the provisions on the nature of the occurrence [1, 2], changes [3] of mental states and their regulation [4, 5]. In connection with the need to develop technologies for the adaptation of persons with disabilities, special attention is required to issues about the specifics of the mental states of athletes with disabilities [6]. Currently, research is being conducted in the field of emotional regulation of disabled athletes [7], assessment and correction of functional states [8], social and psychological support of athletes with disabilities [9].

Analysis of mental states shows that they are complex, multidimensional phenomena that include emotional, cognitive, behavioral and physiological components [10]. Mental states of individuals with various nosologies, such as musculoskeletal disorders, sensory deficiencies, etc., have a number of specific features. Thus, they are characterized by increased anxiety, depressive experiences, a feeling of helplessness, social isolation, and other negative mental states. Therefore, it is important to consider sports as an activity that allows compensating for physical deficiencies by changing the mental states of the individual.

Objective of the study was to identification of the peculiarities of mental states of students with disabilities involved in sports.

Methods and structure of the study. The empirical method of the study was testing using the “Relief

of the Mental State" technique (A.O. Prokhorov); the California Psychological Inventory CPI as adapted by N.V. Tarabrina, N.A. Grafinina. Data was calculated using the IBM SPSS Statistics 27 statistical package and Excel. Statistical methods: Mann-Whitney U-test, Spearman correlation coefficient. The Russian State University of Social Technologies served as the basis for the empirical study. The study involved 60 people with disabilities aged 17-21, 30 of whom were students involved in sports (Group 1), 30 students not involved in sports (Group 2).

Results of the study and discussion. By analyzing empirical data, it was found that the physiological response scale scores differed in both groups of individuals, with the exception of the temperature score (Table 1). This means that students who do not play sports are more prone to muscle tension and stiffness.

The analysis of self-examination of students who do not play sports showed that low levels of physical activity and apathy predominate among this group. In addition to the problems mentioned above, students often experience discomfort associated with unpleasant sensations in the heart, oral mucosa, breathing and digestion.

According to the Behavior scale, there are significant differences in all indicators (Table 2), which means that athletes are more active, consistent, confident and open than their peers who do not play sports. Students in Group 2 most often show signs of passivity, insecurity and isolation. These signs indicate their insufficient development in the area of volitional self-control, independence and purposefulness. They often experience a feeling of fear, especially when making a decision, have a tendency to isolation and secrecy in communication, and experience negative experiences about the lack of communicative competence. Respondents in this group experience an increased degree of drowsiness and lethargy, which may be associated with immersion in their own experiences.

They also tend to experience emotional heaviness and tension, which affects their overall mental state. Athletes are less likely to develop negative mental states compared to their peers. Differences were found in all indicators of the experience scale in the two groups of students. Respondents of Group 2 were more likely to experience intense negative emotions, such as sadness, sorrow, tension, emotional heaviness and stiffness. A complex of negative emotions can provoke changes in the personality structure, which is manifested in the form of character accentuations, phobias, personal anxiety and low self-esteem. Correlations were found between the indicators of the mental processes scale and the personal characteristics of students involved in sports. With the ease of emergence of images and clarity of ideas, athletes show increased activity, assertiveness and enthusiasm ($r = 0,466$, $p \leq 0,01$). The emergence of a feeling of joy is associated with the awareness of one's uniqueness ($r=-0,599$, $p\leq0,01$). Increased self-confidence gives athletes a feeling of comfort and satisfaction with themselves and their lives ($r=0,640$, $p\leq0,01$). Correlation analysis showed the presence of close connections between states associated with physiological processes: the feeling of increased cardiac activity directly correlates with a sense of respon-

Table 1. Results of the study of mental states on the scale of physiological reactions of students with disabilities involved in sports and their peers

Physiological response scale indices	$\bar{X}$		$U_{emp.}$	Level of significance
	Group 1	Group 2		
Temperature	6,7	6,5	420	0,644
Muscle tone	7,7	6,5	307	0,031
Movement coordination	7,6	5,8	137	0,000
Motor activity	7,7	5,8	142	0,000
Cardiovascular system	7,3	6	303	0,028
Respiratory system	7,7	6	234	0,001
Sweating	7,9	6,5	273	0,007
Gastrointestinal tract	7,7	5,9	244	0,002
Oral mucosa	7,1	6,2	312	0,030
Skin	7,1	5,7	224	0,000

Note: $\bar{X}$ *– mean value (points); Uemp. – Mann–Whitney criterion.*

Table 2. Results of the study of mental states on the scale "Behavior" of students with disabilities involved in sports and their peers

Behavior scale indicators	$\bar{X}$		$U_{emp.}$	Level of significance
	Group 1	Group 2		
Activity	8,8	5	121	0,000
Sequence	8,4	6,1	221	0,001
Measuredness	8,1	4,6	124	0,000
Thoughtfulness	8,2	5,3	167	0,000
Controllability	8,6	5,5	152	0,000
Adequacy	8,8	5,3	175,5	0,000
Tension	5,8	6,4	411	0,559
Stability	8,9	5,8	121	0,000
Confidence	8,9	4,7	126	0,000
Openness	8	5,3	199,5	0,000

Note: $\bar{X}$ *– mean value (points); Uemp. – Mann–Whitney criterion.*

sibility (r=0,511, p≤0,01) and tolerance (r=0,594, p≤0,01); a decrease in efficiency and performance is accompanied by an increase in the depth and frequency of breathing (r= -0,502, p≤0,01). The state of optimism is closely associated with the ability to understand the feelings and attitudes of other people (r=0,473, p≤0,01). Positive experiences increase the desire for competition (r=0,667, p≤0,01), self-acceptance and self-confidence (r=0,693, p≤0,01), sensitivity and attunement to other people (r=0,510, p≤0,01). Consistency in behavior in athletes with disabilities contributes to the development of empathy, the ability to understand and empathize with the feelings of others (r=0,491, p≤0,01), and gives a sense of their uniqueness (r=0,607, p≤0,01).

Conclusions. Significant differences in mental states were revealed in students with disabilities involved in sports and their peers who do not play sports. The revealed correlations between the intensity of mental states and personal characteristics of athletes with disabilities indicate the following patterns.

In the sphere of mental processes: with increased sensitivity to external stimuli and awareness of perception, the desire for independence and susceptibility also increases; with the ease of emergence of images, energy and enthusiasm increase; positive emotions of joy reduce the feeling of one's ordinariness; with increased self-confidence, satisfaction with oneself and one's life increases; increased attention is associated with an increased desire for change.

In the sphere of physiological reactions: increased cardiac activity is associated with increased responsibility and increased diligence; rapid breathing accompanies manifestations of self-sufficiency and independence; increased sweating is closely associated with the manifestation of empathy and intellectual activity; a feeling of slight hunger intensifies with an increase in empathy and responsiveness to others; In the sphere of experiences: the experience of optimism increases responsiveness and empathy; the feeling of cheerfulness is closely connected with persistence and enthusiasm, the positive direction of experiences increases rivalry, competition and self-acceptance. In the sphere of behavior: with an increase in the consistency of actions, empathy and life satisfaction increase; the thoughtfulness of one's actions increases understanding of others, an increase in tension reduces the manifestation of empathy and assertiveness, increases the feeling of mediocrity, dependence and sensitivity to the opinions of others.

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Social inclusion of athletes with disabilities in regional national teams

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Abstract

Objective of the study was to pinpoint the elements that contribute to the inclusion of athletes with disabilities in regional national teams.

Methods and structure of the study. To gather empirical information, a survey was created for athletes with disabilities (n=36) who are enrolled in the National Research University of the Russian Federation, the «Republican Center for Sports Training of National Teams of the Russian Federation». This center is responsible for developing and supporting sports training in 13 disciplines.

Results and conclusions. By comparing their condition before and after participating in sports, participants note not only an improvement in their well-being and vitality, but also an expansion of their social circle and other activities. In the world of sports, the rules, criteria, and standards are clearly defined, providing a legitimate opportunity for recognition, social status, and more. It is evident that regular training of athletes with disabilities at the Sports Training Center for national teams contributes to their integration not only into the sports arena, where they can become renowned and respected sports masters, winners, or medalists in sports competitions of various levels. The recognition of athletes with disabilities underscores the fact that engaging in sports has given them a sense of belonging to a larger sports community.

Keywords: *communication, inclusion/exclusion, self-esteem, social functional systems, differentiation, sports competitions.*

Introduction. We adhere to the sociological concept of N. Luhmann of systemic differentiation of modern society, which is based not on action, but on communication. According to N. Luhmann, when explaining an action, one has to «limit oneself» to stating the intention, to think out the «implied meaning» of the action, motives, etc. [7, p.18-19]. Of course, the psychological approach allows us to consider motives [6]. N. Luhmann writes: «The transition to functional differentiation uses the intra-social relevance of the inclusion/exclusion distinction together with the developed differences in the spheres of non-sedentary life... As with any form of differentiation, the regulation of inclusion is transferred to private systems» [7, p.39; 8, p.222]. Thus, society makes inclusion dependent on highly differentiated chances for communication; today, specific individuals must participate in all functional systems, depending on which communication codes they are able to adapt to. At the same time, N. Luhmann suggested that the problem of exclusion «cannot be organized using any single functional system, for example, only education» [7, p. 47]. Today, researchers analyze the activities of many functional systems for the integration of people with disabilities [1, pp. 77-86]. Modern society is freeing itself from perceiving the other side of the form – exclusion – as a phenomenon of social structure. If earlier they talked about the marginalization of the problem of exclusion, today the problems of exclusion are acquiring a quantitatively different importance, as N. Luhmann believes. This brings, according to N. Luhmann, dramatic changes to the self-understanding of individuals. If earlier the social position of an individual was concretized due to belonging to a class, place of birth, etc., now «existence itself is based on visibility» [7, p. 41]. Moreover, there are social standards, a hierarchy of values, etc. [12]. Therefore, as N. Luhmann believes, «identity» and «self-realization» become a problem, and «social identity» may differ from bodily-psychic existence, the individual must discover whether his own projections are recognized by others. And just for athletes there is a formal indicator – his achievements in competitions of various levels.

Objective of the study was to pinpoint the elements that contribute to the inclusion of athletes with disabilities in regional national teams.

Methods and structure of the study. If we talk about the exclusion of people with disabilities, then according to the concept of N. Luhmann, the actual exclusion from any functional system, for example, unemployment, lack of cash income, insufficient medical care, etc., limits what is achievable in other systems, which can subsequently lead to their isolation. [7, p.44-45]. Then they must make every effort to connect to various communications, for example, to find a job [11, p.61-62]. The State Budgetary Institution of the Republic of Sakha (Yakutia) «Republican Center for Sports Training of National Teams of the Republic of Sakha (Yakutia)» is engaged in the development and support of 13 sports. The center is attended by people with hearing disabilities (56%) and athletes with musculoskeletal disorders (44%). Paralympic and Deaflympic sports, as well as sports for people with intellectual disabilities, are cultivated here: athletics, football, sitting volleyball, goalball, table tennis, freestyle wrestling, judo, swimming, powerlifting, shooting and archery [10].

In 2021-2023, the State Budgetary Institution of the Republic of Sakha (Yakutia) «RCSPSK Sakha (Yakutia)» sent athletes with disabilities to republican, Russian and international competitions. The data in Table 1 shows that the number of athletes with disabilities decreased by 3 people. As part of the study, a survey was conducted among athletes with disabilities from January to May 2024 to collect empirical data. The sample (n=36) included 22 men (61%) and 14 women (39%). The distribution of respondents by age and gender is shown in figure 1.

Results of the study and discussion. Below are the results of the survey on a five-point scale of self-assessment of respondents before and after coming

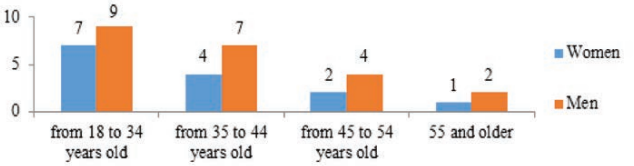

Figure 1. Distribution of respondents by age and gender, people

to sports (see figure 2, 3). From the data in figure 2, it follows that respondents equally rated both the increase in self-confidence and the readiness to make decisions independently.

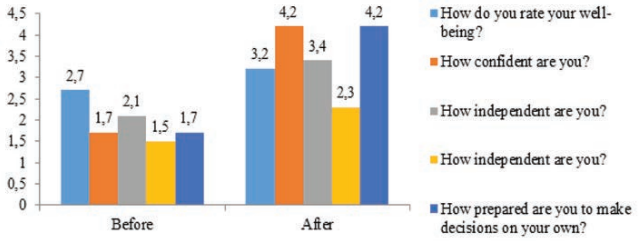

Figure 2. Self-assessment of personal emotional and psychological components, average score

According to respondents, their ability to regulate their behavior increased by 2,5 times after systematic exercise (figure 3), i.e., their regulatory personal qualities [3, pp. 33-35].

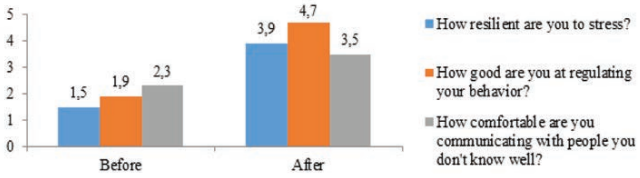

Figure 3. Self-assessment of stress resistance when interacting with others, average score

The next self-assessment indicator showed that interest in other types of activity increased 3,4 times. This means that it can be assumed that the surveyed ath-

Table 1. Dynamics of the number of competition participants among athletes with disabilities in the period 2021-2023

Indicator	Values by year, people		Changes 2023 to 2021		
	2021 г.	2022 г.	2023 г.	Abs. meas. (+/-)	Rate of increase, %
Freestyle wrestling (surdo)	21	16	17	-4	-19,0
Powerlifting (poda)	9	9	-	-9	-100,0
Judo (surdo)	2	2	2	0	0,0
Sitting volleyball	1	1	1	0	0,0
Powerlifting (poda)	-	10	10	10	=
Swimming (poda)	1	1	1	0	0,0
Archery (poda)	5	8	5	0	0,0
Shooting (surdo)	9	-	10	1	11,1
Track and field (poda)	1	-	-	-1	-100,0
Total	49	47	46	-3	-6,1

letes with disabilities have expanded their circle of communication, established some connections, etc. [9].

Thus, from the self-assessment data on a five-point scale of the surveyed athletes with disabilities, it is clear that playing sports helped to strengthen self-confidence and make decisions independently (4,2 points), regulate their behavior (4,7 points), expand contacts, which helps to increase activity in other areas (4,8 points), i.e. sports help them increase their resilience [2, p. 40].

Answering the next question, the majority of respondents chose the option «social integration through sports formed a more positive attitude towards themselves and society as a whole» (76%), – received support from coaches and teammates (59%). Also, the majority of respondents noted that they «consider themselves full members of the sports team (68%) and after regular sports activities they «experience difficulties in being included in the team» 2,7 times less than before. When asked what else could be done for the most complete social integration, every fourth respondent answered: «creation of programs for including athletes with disabilities in training groups with healthy athletes»; «organization of meetings and events aimed at developing tolerance and mutual understanding among all participants of the sports community» (22%); «development of sports infrastructure for athletes with disabilities» (19%); «accessibility of sports facilities for people with disabilities» and «development and implementation of specialized programs and training adapted to the individual characteristics of athletes with disabilities» (14% each) [4, 5]; «specialized trainings and seminars for coaches and other specialists working with athletes with disabilities» (6%), which is what researchers are working on today.

Conclusions. Of course, regular training of athletes with disabilities at the Center for Sports Training of National Teams contributes to their integration into the sports sphere, where they can become recognizable and recognized masters of sports, winners or prize winners of sports competitions of various levels. In addition, according to the recognition of athletes with disabilities, it is clear that playing sports has given them a sense of being part of a large sports community.

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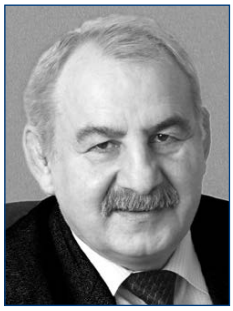
Assessment of locomotion: binary interaction of features in children aged 5-6 years

UDC 796.011



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Abstract

Objective of the study was to study of catching a falling object provides a framework for evaluating the quality of children's natural locomotion at the age of 5-6 years, with the binary interaction of symmetry-dissymmetry and symmetry-asymmetry serving as criteria for assessment.

Methods and structure of the study. To assess the quality of motor skills, researchers have employed objective techniques that involve analyzing video footage and measuring the bioelectric activity of muscles through the recording and analysis of surface electromyography.

Results and conclusions. It was discovered that at the age of five, a program is created that enables the execution of movements at a convenient speed. At the age of six, the program is modified to alter the speed and tempo of movement, with the aim of increasing it.

The concept of symmetry is a complex interplay of symmetry and asymmetry. Dissymmetry is the initial phase of reducing symmetry, which can manifest as the loss of a component or minor deviations from the ideal state.

Dissymmetry is a form of contradictory or partially disrupted symmetry, which can be seen as a form of unstable symmetry that retains the stability inherent in symmetry while also allowing for variation.

Keywords: *symmetry-asymmetry, symmetry-dissymmetry, binary interaction, signs of symmetry-asymmetry, stability and variability, assessment of motor action, motor skill, children aged 5-6 years.*

Introduction. The concepts of «asymmetry» and «dissymmetry» denote a violation of symmetry at different levels, and their opposition, which is part of the binary system, is symmetry. Deviation of indicators in any direction violates symmetry, as a result of which the phenomenon of dissymmetry can be taken as a type of asymmetry. At the same time, the nature of the permissible variations in the change of the two principles of the binary system of symmetry-asymmetry – right and left – are themselves symmetrical. At the same time, the fact that the degree of deviation from symmetry of various indicators can vary within significant limits supports the idea of using the term «dissymmetry», which contains the potential need to determine the magnitude and direction of deviation of a feature from a symmetrical state. Symmetry and asymmetry are interacting factors that follow from the definition of symmetry. Dissymmetry is the initial stage of a decrease in the level of symmetry, expressed either in the loss of some element, or in minor deviations of the indicator (indicators) from symmetry. Thus, dissymmetry is a certain contradictory symmetry or partially upset symmetry, which can be assessed as unstable symmetry, providing the stability function inherent in symmetry, and simultaneously allowing for the manifestation of variability.

The mechanisms of interaction of «symmetry-dissymmetry» and «symmetry-asymmetry» in a complex living system, which includes humans, follow from the natural interaction of symmetry - the manifestation of stability and dissymmetry or asymmetry – as a reflection of variability, which corresponds to the philosophi-

cal law of the unity and struggle of opposites. The stability of the system or its symmetrical state does not allow it to be enriched functionally. The emergence of new, more advanced forms of organization or unique events can only occur in an unstable system, and this circumstance reduces the process of adaptation or development to a compromise between diversity and redundancy.

It was assumed that the study of the binary interaction of the features of symmetry-dissymmetry and symmetry-asymmetry will lead to the possibility of assessing the quality of mastering motor skills. It was decided to test this assumption by assessing the development of motor skills in performing natural locomotion in children aged 5-6 years.

Objective of the study was to study of catching a falling object provides a framework for evaluating the quality of children's natural locomotion at the age of 5-6 years, with the binary interaction of symmetry-dissymmetry and symmetry-asymmetry serving as criteria for assessment.

Methods and structure of the study. The study was conducted at the Health Center of the Research Institute of Complex Problems of the Adyghe State University and in the preschool educational institution No. 6 in Maikop in groups of children aged 5-6 years. The survey involved 60 practically healthy children of the same age and approximately the same constitution. Children of this age studied in a preparatory group according to the traditional education system.

The study was conducted in accordance with the consent of the parents of preschoolers. Catching a falling ball was used as a test task. Registration of the spatio-temporal characteristics of this motor action was carried out using a three-dimensional video analysis system of movements (Biosoft Video).

The basis for the study is the study of the stereotypical nature of limb movements during the locomotor act. Under normal conditions, stereotypicality can be an indicator of the stability of the action program or the formation of the action algorithm.

Results of the study and discussion. The quality of catching a falling object was assessed by determining the maximum acceleration and velocity of the elbow and shoulder joints; establishing the speed and acceleration of the hand by studying the locomotion parameters (phase duration, amplitude of movements in the joints, etc.). The indicators of the time of execution of the movement when catching a flying object at the age of five remain unchanged in all three series. Considering the same picture in the pre-movement phase, it can be assumed that already at the age of five, the time picture of the performance of a motor action in familiar conditions has already been formed. This position is confirmed by the stability of the speed of movement of the hand (between the indicators of the series $p>0,05$). However, a stable reproduction of the time of implementation of the movement and the speed of movement of the hand is formed with unstable components due to internal mutual compensations. Thus, the angular velocity in the shoulder joint in the third series (day 3) and the angular acceleration in the shoulder joint in the second series (day 2) reliably ($p < 0.05$) differs from the previous result. This circumstance allows us to state that in this age group the temporal pattern of movement has already been formed, and the spatial program of movement is in a state of uncertain execution and search. In addition, the children of this group have a stable idea of habituality and temporal comfort in the execution of this motor action.

Despite the reliable decrease in the time costs for the implementation of the movement in the second series of attempts relative to the first and the preservation of this advantage subsequently, reliable changes in any temporal-spatial parameter are not observed in six-year-old children ($p>0,05$). Probably, this phenomenon is determined by tendential aggregate changes in the parameters.

The fact that an increase in the speed of habitual movement does not lead to significant changes in the implementation of the temporal-spatial characteristics of movements allows us to state that in this age group the temporal-spatial pattern of movement has already been formed, that is, both the temporal, spatial and dynamic programs of movement have been formed. In this case, there should be differences between the features characterizing the activity program in five-year-olds and six-year-olds.Let us check this assumption.

Let us compare the parameters of movement obtained in the first and last series of testing, due to the fact that these data reflect the final result of the reorganization of the movement program with the awareness and understanding of the essence of the motor task. In the first series, there are no differences between the indicators of different age groups characterizing the time of movement, angular velocity in the shoulder and elbow joints, as well as in the features of the speed and acceleration of the hand, that is, the

preservation of the signs of symmetry is ensured. However, here a change is detected in the action program, which is characterized by an age-related decrease in angular acceleration in the shoulder joint with an increase in angular acceleration in the elbow joint. In other words, the signs of symmetry are unstable, there is a decrease in the role of the link in the execution of the movement, which has a large mass and requires greater efforts to accelerate, while the role of the link that is easier to control and less massive increases, mutual compensation of the components of the motor support is observed to maintain and stabilize the signs of symmetry during the period of manifestation of dissymmetry. That is, at the age of six, there is a search for internal reserves that allow optimizing movements, and, consequently, a change in the program occurs, which is reflected in the nature of the binary interaction of the features of symmetry-dissymmetry.

It can be assumed that at the age of five, a program of action is created that allows the implementation of movements at a comfortable pace. At the age of six, coordination changes are made to the existing program in order to change the speed of a comfortable pace of movement towards its increase, as well as to stabilize the temporal-spatial characteristics and ensure symmetry in the implementation of a motor action.

These tendential phenomena are more clearly manifested in the final series of tests. After a certain amount of purposeful execution of the movement, six-year-old children spend significantly less time on performing the movement, they have higher results in angular acceleration and angular velocity of the elbow joint with an equal angular velocity of the shoulder joints and a lower value of angular acceleration of the shoulder joint. With an unchanged value of acceleration developed by the hand, six-year-old children achieve significant differences in the speed of the hand. That is, changes in the movement control program that occur at the age of six allow us to talk about economization and a higher quality of movement control itself, as well as about the stabilization of the time-spatial characteristics of movement corresponding to the patterns of manifestation of symmetry signs. Thus, it was revealed that at the age of five, an action program is created that allows for the implementation of movements at a comfortable pace. At the age of six, coordination changes are made to the existing program in order to change the speed of a comfortable pace of movement towards its increase.

Conclusions. Symmetry and asymmetry are interacting factors that follow from the definition of symmetry. Dissymmetry is the initial stage of a decrease in the level of symmetry, expressed either in the loss of some element or in minor deviations of the indicator (indicators) from symmetry. Dissymmetry is some contradictory symmetry or partially upset symmetry, which can be assessed as an unstable symmetry that provides the stability function inherent in symmetry and simultaneously allows for the manifestation of variability.

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Enhancing the effectiveness of strength training methods in the context of physical education for high school students

UDC 373.1

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Abstract

Objective of the study was to theoretical, methodological, and experimental validation of the approach to enhancing the strength capabilities of high school students through the application of fitness technologies.

Methods and structure of the study. Twenty-two young men from the eleventh grade of Secondary School No. 26 in Chita, Transbaikal Territory, participated in a pedagogical experiment. The experiment, which consisted of three stages – ascertaining, forming, and control – was conducted from September 2023 to May 2024. During this time, medical and biological research was conducted, control tests were administered, and experimental methods were implemented. The boys in the control group (KG) and the experimental group (EG) engaged in the experiment for nine months, which were divided into three-week periods (mesocycles). Each mesocycle consisted of three weekly sessions (microcycles), each lasting 60 minutes outside of school hours. On average, 12 practical sessions were conducted in each mesocycle, resulting in a total of approximately 108 sessions. The sessions followed a structured format, with a warm-up (functional and joint warm-up), pre-stretch (dynamic stretching exercises) lasting 10 minutes, a cardio-power section (aerobic exercises for 25 minutes and strength training for 15 minutes), and a cool-down (static stretching exercises) lasting 10 minutes.

Results and conclusions. The unique aspect of the experimental approach was the alteration of the content of the main lesson section by adjusting the level of physical exertion, employing the circuit method, alternating between aerobic and anaerobic activities, incorporating dynamic and static strength exercises, and integrating various types of strength training technologies with a gymnastic focus. The findings of the educational experiment confirmed the efficacy of the implemented approach. Based on the experimental outcomes, conclusions were drawn regarding the successful implementation of the method.

Keywords: *strength, schoolchildren, high school students, improvement, physical exercises, training, abilities, anaerobic.*

Introduction. Recently, there has been a tendency towards a decrease in the general level of health and physical fitness of schoolchildren in Russia [1; 2]. The increasing intensity of the educational process in educational institutions leads to the fact that high school students are forced to spend more and more time at the computer, which contributes to a significant decrease in physical activity [3]. These factors negatively affect physical fitness, the level of strength abilities and have an unfavorable effect on the interest in physical education among the younger generation [4].

As noted by A.A. Gusev, A.A. Zhuravlev, N.I. Zayarnov, A.D. Tuboltseva, E.A. Smirnova, strength training is the main component in the physical education program for senior school boys, ensuring the harmony of motor activity.

A number of authors I.V. Chernov, R.V. Revunov notes that traditional approaches to organizing strength-oriented classes currently do not have the proper impact on the strength training of schoolchildren, their desire for systematic physical exercise, self-improvement, and increased muscle strength, and do not take into account in sufficient volume the health and training significance of strength training [5]. Therefore, the situation that has developed in modern educational institutions requires new, non-standard approaches and technologies to solving the problem of developing strength abilities in the learning process, which must correspond to individual characteristics and contribute to the most ef-

fective implementation of the interests of high school students [4, 5].

Objective of the study was to theoretical, methodological, and experimental validation of the approach to enhancing the strength capabilities of high school students through the application of fitness technologies.

Methods and structure of the study. The pedagogical experiment was conducted at Secondary School No. 26 in Chita, Transbaikal Territory, Russian Federation, from February 2023 to July 2024 in three stages. The pedagogical experiment involved 22 11th-grade boys who were divided into two groups: control (CG) and experimental (EG), each consisting of 11 people.

At the beginning and at the end of the pedagogical experiment, medical and biological studies and control tests were conducted in the control (CG) and experimental (EG) groups. All studies were conducted in the afternoon. The results of each study were recorded in consolidated electronic protocols. Medical and biological studies made it possible to identify the body types of high school students according to the theory of M.V. Chernorutsky. Control tests were carried out to study the level of dynamic and static strength abilities. The young men of the control (CG) and experimental (EG) groups were engaged in training for nine months (mesocycles), three times a week (microcycles), for 60 minutes after school hours. In one mesocycle, on average, 12 practical classes were held, with a total of about 108 classes.

A distinctive feature of the experimental methodology was the modification of the content of the main part of the lesson by changing the intensity of physical activity; using the circuit method; alternating aerobic and anaerobic work; using dynamic and static strength exercises; including various strength types of gymnastic fitness technologies. The duration of the power part (Power) remained unchanged throughout the pedagogical experiment. During the first mesocycle (September), the young men of the control (CG) and experimental (EG) groups had the same content of practical classes and a moderate-intensity load at a heart rate of 120-130 beats per minute. The strength exercises were performed using the repeated efforts method in an aerobic mode for all muscle groups (shoulder girdle, upper limbs, trunk, buttocks, lower limbs). The complex included strength dynamic exercises with the weight of one's own body to develop strength abilities. Starting from the second mesocycle (October), the subjects of the control and experimental groups were divided into several subgroups taking into account their body types.

In the control group, the repeated efforts method was used with the frontal method of organizing the participants. The complex included strength dynamic exercises with their own weight for all muscle groups (shoulder girdle, upper limbs, trunk, buttocks, lower limbs). Young men with a normosthenic body type performed exercises taking into account the principle of achieving an individual maximum in a combination of aerobic and anaerobic modes at a heart rate of 150-160 beats per minute. Young men with a hypersthenic body type performed exercises up to the maximum number of times in aerobic mode at a heart rate of 130-140 beats per minute. Young men with an asthenic body type performed exercises until fatigue at a heart rate of 150-160 beats per minute. In subsequent mesocycles, the combinations and types of strength dynamic exercises in the complex changed.

In the experimental group, in October and November, a circular method was used, which is an organizational and methodological form of performing physical exercises. In training sessions, the following were used: Body Sculpt direction (strength exercises for all muscle groups based on the use of special equipment: fitball, medicine ball). In total, two sets of strength exercises of a dynamic and static nature were developed in combination with aerobic

Results of strength abilities indicators of senior schoolchildren of the control and experimental groups during the control experiment

Control exercises (units of measurement)	CG (n=11)	EG (n=11)	Reliability	
	X±m m	X±m m	t	p
Bending and unbending arms in a prone position (number of times)	26,20±0,16	32,50±0,10	t=3,41	p<0,01
Flexion and extension of the trunk from a supine position for 1 min (number of times)	42,17±0,18	52,10±0,24	t=3,24	p<0,01
Long jump from a place with a push from two legs (cm)	205,04±5,61	225,00±7,00	t=4,12	p<0,01
Hanging Legs at 90° (sec)	11,05±0,04	13,50±0,03	t=3,61	p<0,01
Hanging on bent arms on the horizontal bar (sec)	30,27±0,20	35,00±0,21	t=4,27	p<0,01

and anaerobic muscle work modes. One set was used in October, the other set - in November. The sets of strength exercises were aimed at developing strength abilities, dynamic and static strength endurance. In December, January and February, several strength types of fitness technologies were introduced: Body Pump, ABS, ABL, Upper Body. At each lesson, regional and global exercises were used depending on the volume of active muscle mass. The Body Pump direction was used as a global effect at a heart rate of 150-160 beats / min, for regional effects, the following directions were used - ABS, ABL, Upper Body at a heart rate of 130-140 beats / min. In March, April and May, the Hot Iron direction was used as a global impact with a heart rate of 160-170 bpm, while the regional impact was achieved with ABS, ABL, and Upper Body with a heart rate of 130-140 bpm. Strength exercise complexes were performed taking into account the increase in the intensity of physical activity.

Body Pump and Hot Iron classes were conducted using the frontal method simultaneously with subgroups of young men of all body types in the same intensity mode. The selection of ABS, ABL, and Upper Body exercises and their dosage were carried out taking into account body types and were performed using the repeated method. Young men with normosthenic and asthenic body types performed the exercises taking into account the principle of achieving an individual maximum. Young men with a hypersthenic body type performed the exercises up to the maximum number of times. In addition, the following sequence was observed in one weekly microcycle: during the first lesson, a set of exercises was performed to develop strength abilities themselves; during the second lesson, a set of exercises was performed to develop dynamic strength endurance; During the third session, a set of exercises was performed to develop static strength endurance.

Results of the study and discussion. At the ascertaining stage of the pedagogical experiment, the use of M.V. Chernorutsky's methodology made it possible to identify body types in young men in the control and experimental groups. In the control group, 1 (9%) student was identified with an asthenic body type, while in the experimental group there were 2 (18%) students; with a normosthenic type, 4 (36%) students were found in the control group, while in the experimental group there were 4 (36%) students; with a hypersthenic type, 6 (55%) students were found in the control group, while in the experimental group there were 5 (46%) students. At the beginning of the study, no reliability was found in the control and experimental groups of high school students (for the 5% significance level). At the ascertaining stage of the pedagogical experiment, the strength abilities of schoolchildren in the control and experimental groups corresponded to a low level compared to the normative ones. Analysis of the strength abilities results during the control stage will reveal statistically significant differences in all the studied indicators in the experimental group of young men (see the table).

The analysis of the strength training indicators of the young men obtained at the end of the experiment when compared with the normative ones revealed an average level and demonstrates higher growth rates in the experimental group compared with the control group.

Conclusions. The results of the pedagogical experiment demonstrated the effectiveness of the applied methodology and indicate positive dynamics of the experimental group's indicators. Thus, the growth rate in arm flexion and extension in a prone position was: in the experimental group – 15%; in the control group – 1,40%; the growth rate of torso flexion and extension from a supine position in 1 minute was: in the experimental group – 17%; in the control group – 3%; the growth rate in long jump from a place with a push with two legs was: in the experimental group – 14%; in the control group – 0,98%; the growth rate when holding the legs at an angle of 90˚ while hanging on a horizontal bar was: in the experimental group – 20%; in the control group – 1,27%; The growth rates in hanging with bent arms on a horizontal bar were: in the experimental group – 18%; in the control group – 1,33%.

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Practice-oriented training for students in the fitness industry

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Abstract

Objective of the study was to validate the model of practice-oriented training for students in the context of group fitness instructor training courses, and to empirically demonstrate its efficacy in the field of pedagogy.

Methods and structure of the study. To accomplish the objective, we employed the following techniques: a review of scholarly and methodological publications, software, simulation, surveys, ranking, and expert evaluation. The pedagogical investigation was conducted at the Institute of Physical Culture and Sports (IPC&S) of the Herzen State Pedagogical University. It involved 485 students in their fourth year of undergraduate and graduate studies, as well as participants in advanced training courses in fitness.

Results and conclusions. The article outlines the rationale for the implementation of practice-oriented training for students enrolled in instructor training programs for group fitness classes in higher education institutions. This approach is crucial for developing the theoretical, methodological, and practical skills of undergraduate and graduate students, as well as for conducting fitness classes in a student fitness club as part of extracurricular activities, with the support of student self-governance.

Based on the feedback from students, the objectives and goals of the training programs were established, the most popular fitness programs were identified, and their content was adjusted. The hierarchy of factors that determine the necessity for developing practice-oriented training for students in instructor training programs for group fitness classes was determined.

Fitness programs were developed and approved for students to choose from. The fourth-year students and postgraduate students were educated through the advanced training course «Instructor of group fitness programs» (72 hours).

Keywords: *training courses, model, fitness programs, students, efficiency.*

Introduction. The Strategy for the Development of Physical Culture and Sports in the Russian Federation until 2030 sets a target for increasing the number of children and youth systematically involved in physical culture and sports to 90% by 2030, which predetermines the growth of the personnel in the field of physical culture and sports. Thus, the number of full-time employees should reach 649 thousand. In this regard, the need for professionally competent specialists who are proficient in innovative technologies, competitive, ready for continuous self-education, creativity, striving to improve their qualifications in various areas of professional activity, is becoming especially urgent.

This creates a challenge for the higher education system, the answer to which can be the development of variable models of professional training and retraining of specialists in physical culture, sports and fitness. In accordance with this, it is necessary to expand the range of additional education programs and advanced training courses.

Objective of the study was to validate the model of practice-oriented training for students in the context of group fitness instructor training courses, and to empirically demonstrate its efficacy in the field of pedagogy.

Methods and structure of the study. To accomplish the objective, we employed the following techniques: a review of scholarly and methodological publications, software, simulation, surveys, ranking, and expert evaluation. The pedagogical investigation was conducted at the Institute of Physical Culture and Sports (IPC&S) of the Herzen State Pedagogical Uni-

versity. It involved 485 students in their fourth year of undergraduate and graduate studies, as well as participants in advanced training courses in fitness.

Results of the study and discussion. Research conducted in recent years by domestic scientists in the field of training fitness specialists shows that a huge number of students and university graduates are entering the fitness industry. This is due to the prestige of the fitness instructor profession and its demand. However, as experts note, the level of training of graduates is not high enough; it should be more modern and closer to practice [1, 2, 4]. In this regard, new academic disciplines and entire modules on fitness have appeared in the training of students. New areas of training in the master's degree program have been opened at the Institute of Physical Culture and Sport: "Fitness Management in Physical Education", "Fitness Technologies in Physical Culture", and advanced training courses in children's fitness have been held for many years. In 2024, a student fitness club was created, operating on a self-government basis, which not only gives students the opportunity to engage in fitness, but also provides them with conditions for undergoing pedagogical practice, as well as, within the framework of various fitness club events (participation in seminars, master classes, professional skills competitions), the opportunity to improve their methodological level and gain pedagogical experience [3]. However, for the effective work of students of the Institute of Physical Culture and Sport in the fitness club, expanding the list of fitness services and attracting students from other faculties of the university to classes, additional in-depth knowledge is required, which they can acquire in courses, as part of additional education. Thus, at the institute, students receive more theoretical knowledge on fitness (especially for graduate students), but practical classes are not enough, which they noted in the questionnaire responses. The analysis of the conducted questionnaire of students of the Institute of Physical Culture and Sport indicates the relevance and demand for training courses for instructors of group fitness programs and the development of a practice-oriented training model (Table 1)

In accordance with new socio-cultural demands and current trends in the fitness industry, a survey was conducted among students of the Institute of Physical Culture and Sport on the demand for various fitness programs. Students were offered a list of 12 fitness programs recommended by teachers, from which they could choose only five to study and put them in order of priority. The students put the program «Group Fitness Program Instructor» in first place. The program (72 hours) was developed and approved, 28 students were trained in it over three months (Table 2).

In the survey, in which students and course participants took part, questions were asked that determined the purpose of their coming to the courses, the features of the program content, the forms of training and the terms. Their answers were compared with the answers of students who were trained in different years. As a result of the survey, it was determined that, during the considered time period, goal setting has undergone significant changes. Thus, if at the beginning of the longitudinal study (for 2021), the priority for both categories of respondents was to study the new program, then by 2024 significant changes had occurred and the goal of obtaining a document on completion of PC courses came to the leading position. This fact can be determined by the certification system of teaching staff, which provides for mandatory advanced training with a certain frequency and the provision of an appropriate supporting document. However, for students, this

Table 1. Factors determining the feasibility of developing a model of practice-oriented training for students in training courses for group fitness program instructors (n=345)

Ranking place	Factors	Rank indicator (%)
1	Insufficient level of methodological training and practical experience to carry out professional activities in the field of fitness	26,3
2	Gain practical experience in conducting fitness classes and employment opportunities	23,7
3	Obtaining a state-issued document on completion of courses (discounts on fees, different training periods)	15,7
4	Self-realization in the activities of a student fitness club (points for admission to a master's program)	12,1
5	Gaining additional fitness knowledge (to be competitive)	11,3
6	Highly specialized training in a selected area of group fitness programs (various forms of training)	10,9

Table 2. Selection of fitness programs for training students in 2024-2025

Place	Fitness programs
1	«Group Fitness Program Instructor» - an educational program for conducting modern classes in classical, dance, step and fitball aerobics
2	«Fitness correction» is a health program for individual lessons in video format for the prevention of various disorders of posture, vision, cardiovascular system and breathing, etc. (ages vary)
3	«Fitness technologies in physical education lessons of various focus and in the school day of a schoolchild» (or preschooler)
4	«Musical and dance therapy using fitballs» is a health program for women aimed at relieving stress, increasing efficiency and correcting professional burnout
5	«Modeling non-standard activities for conducting a modern physical education lesson at school» (or conducting classes with students)

<table>
<tr><th colspan="4">CONCEPTUAL COMPONENT</th></tr>
<tr><td colspan="4">Objective

Formation of professional knowledge, skills, abilities of students studying to be instructors of group fitness programs and acquisition of teaching experience</td></tr>
<tr><td colspan="4">Tasks:</td></tr>
<tr><td colspan="2">Improving the level of professional, pedagogical and general cultural competencies of students in the field of fitness, allowing them to work effectively according to the studied program of course training</td><td colspan="2">Activating the creative potential of students and equipping them with original authorial technologies, methods and forms of conducting fitness classes</td></tr>
<tr><td colspan="4">Principles: methodical, health training and fitness</td></tr>
<tr><td colspan="4">Conceptual provisions:

demand, innovation, mobility, creativity, reflexivity, technological capability, predictability, effectiveness</td></tr>
<tr><th colspan="4">ORGANIZATIONAL AND MANAGEMENT COMPONENT</th></tr>
<tr><td>Optional format: in-person, remote, mixed</td><td>Course: short-term (40 hours), advanced training (72 hours), professional retraining (510 hours)</td><td colspan="2">State-issued document:

certificate, certificate, diploma of retraining</td></tr>
<tr><th colspan="4">CONTENT COMPONENT – training program</th></tr>
<tr><td>«Software and methodological support»</td><td>«Theoretical training»</td><td>«Methodological and practical training»</td><td>«Distance learning»</td></tr>
<tr><td>Teaching aids, textbooks, audio and video materials</td><td>Lectures, control testing</td><td>Practical teaching material, creative tasks</td><td>Independent work (homework)</td></tr>
<tr><th colspan="4">Блок «Дополнительный»</th></tr>
<tr><td>Seminars, Master Classes,

Competition «Best Instructor»</td><td>Mandatory teaching practice and conducting classes in a student fitness club</td><td colspan="2">Scientific work (scientific article)</td></tr>
<tr><th colspan="4">RESULT COMPONENT</th></tr>
<tr><td colspan="4">Mastering the program material, acquiring theoretical knowledge, methodological skills and practical experience in a specific fitness program</td></tr>
</table>

Figure 1. Model of practice-oriented training of students in fitness instructor training courses

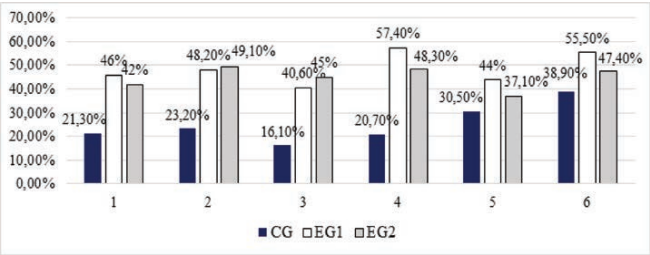
goal is defined as secondary, and "acquiring practical experience and methodological training" comes to the fore. Apparently, this is due to the opportunity to work in the fitness club of the Institute of Physical Culture and Sport, which is desirable and prestigious for many students. Of particular importance here is the formation of their professional image among student youth from different faculties of the university involved in fitness, which motivates them to gain additional knowledge that will help conduct classes at a higher level.

As a result of the survey data, it was revealed that the courses should be shorter, lectures should be given in a minimal volume, since theoretical material can be given for independent study in a distance format or as part of searching for material on given topics on the Internet, while much attention should be paid to methodological and practical training.

Based on many years of experience in conducting advanced training courses, student surveys and conducted research [3, 4], a model of practice-oriented training of students in training courses for group program instructors was developed (Fig. 1).

To test the effectiveness of the model, a pedagogical experiment was conducted over the course of three months; all participants underwent training in advanced training programs (72 hours), in which three groups of 4th-year and master's students of the Institute of Physical Culture and Sport (14 people in each) participated.

Experimental group No. 1 (E-1) consisted of students who had completed training in the "Group Program Instructor" program, developed on the basis of the presented model, students in experimental group No. 2 (E-2) had completed training in other institutions, and the control group consisted of students who conducted classes in a student fitness club without training in courses. Before and after training, students took tests and conducted control classes, which were assessed by experts - teachers. The results of average increases in theoretical knowledge indicators are presented in figure 2.



1 – Basic concepts, principles and objectives of health training and fitness;

2 – content of fitness programs for different contingents of trainees;

3 – types of health training planning;

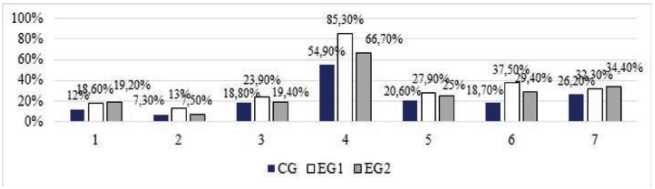
4 – features of psychophysical development of different contingents of trainees;

5 – types of pedagogical control over the functional and physical condition of trainees;

6 – means and methods of correcting the condition of trainees taking into account their individual characteristics.

Figure 2. Increase in average knowledge assessment indicators, based on the results of testing students (in %)

Conducting practical classes in one of the fitness areas was carried out at the student's choice. During the class, he must demonstrate professional skills that were assessed by experts out of 10 points before and after training. The increase in the results of professional skills indicators is presented (in %) in figure 3.



1- Correct demonstration of exercises;

2- coordination of movements with music;

3- implementation of methodological prompts and counting;

4- competent selection of exercises and their compilation into complexes;

5- correction of errors;

6- implementation of an individual approach to students;

7- implementation of pedagogical control over students.

Figure 3. Increase in average indicators of expert assessment of professional skills of students (%)

Comparing the three groups, it should be noted that in all indicators of theoretical knowledge and professional skills, students of the E-1 group are ahead of the E-2 and K-groups, which indicates the effectiveness of the developed model and the pedagogical practice additionally included in the training program. It can also be noted that specialized, more in-depth training is necessary for students, since the K-group showed a lower percentage of growth in all indicators, compared to the experimental groups (E-1 and E-2).

Conclusions. In conclusion, it should be noted that today there is a need to develop new models of teaching students that integrate distance and tradi-

tional technologies, mastering new platforms and various information products in training, which will allow moving to a new level of training in advanced training courses and professional training in fitness that meets the requirements of modern society.

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Students' involvement in physical activity: socio-psychological aspect

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Abstract

Objective of the study was to justification of the relevance of the concept of «resource of engagement» in the context of students' physical activity and the comprehensive feature of «resource of engagement in physical activity».

Methods and structure of the study. The research sample included 651 full-time students participating in university sports teams, with 353 from Amur State University, 145 from Kurgan State University, and 153 from M.E. Evseviev Mordovian State Pedagogical University. The sample consisted of 36,9% males and 63,1% females. The study was conducted in the spring of 2024. To analyze the interrelationships between the individual components of the «engagement resource», factor analysis was employed. The method of factor allocation was the method of the main components, and the rotation method was varimax with Kaiser normalization.

Results and conclusions. The article explores the concept of physical activity and its significance in human life. It highlights the significance of studying the participation of young students in physical activities. The article takes a multidisciplinary approach to examining various aspects of engagement. It is noted that the concept of «participation in physical activity» is still evolving. The article argues that the psychological aspect of this concept can be understood through the lens of the «resource of participation in physical activity». The article empirically identifies the psychological dimensions of this resource, which shape the unique characteristics and circumstances of its implementation.

Keywords: *physical activity; involvement; involvement structure; resource of involvement in physical activity; psychological dimensions of the resource of involvement; student youth.*

Introduction. Involvement of student youth in various types of physical activity at the university is one of the current areas of modern research.

Indicators of involvement of student youth in regular physical exercise are a subject of social and economic significance, are controlled at the state level and indicate the level of quality of life of the population. The studies note the priority focus on ensuring the growth of these indicators, since, despite the measures taken by the state, the involvement of the population in sports in the Russian Federation is not yet as high as in some countries.

Psychological, sociological, pedagogical interpretations of the involvement of student youth in various types of activity consider it from the position of integration into an activity or an organization, increasing the efficiency of activity, supra-situational (excessive) activity, efforts that a person makes to achieve a result, etc. In a state of involvement, a person more productively realizes personal potential (which is characterized by a high «degree of physical, mental and emotional activity»), strives to realize personally significant goals, «consciously handles environmental stimuli» and actively interacts with the environment, which is important when performing goal-oriented motor activity.

Since we have previously provided a detailed analysis of approaches to understanding the phenomenon of involvement as such, we will focus on those aspects of it that are most informative in the context of involvement in physical activity. In our opinion, these should include data on the structure of involvement and the

factors influencing it. Its final structure included three components: instrumental, cognitive and semantic [2, 3].

The proposed five-factor model, which includes objective and subjective components of involvement [1], is also productive for analyzing involvement in physical activity. In this vein, the objective component of student youth involvement in physical activity can be represented by the behavioral component, that is, motor activity itself. Subjective – consists of cognitive, emotional, motivational and value components.

Objective of the study was to justification of the relevance of the concept of «resource of engagement» in the context of students' physical activity and the comprehensive feature of «resource of engagement in physical activity».

Methods and structure of the study. To diagnose the "resource of involvement in physical activity", a set of methods was used, including two blocks: 1) to assess the instrumental component: «Style of self-regulation of behavior»; «Tomsk rigidity questionnaire»; «Level of subjective control»; «Psychological readiness for innovative activity»; «Motivation for success and fear of failure»; «New questionnaire of tolerance to uncertainty»; 2) to assess the semantic component: «Methodology for diagnosing personal

Psychological dimensions of the «resource of involvement in physical activity» of university students

Name of the factor	Factor fullness	Factor weight, in %
Factor 1. Disorganization of activities	Value-semantic time disorganizers (0,813) Organizational time disorganizers (0,812) Motivational time disorganizers (0,835) Emotional apathy (0,778) Emotional tension (0,704) Experience in activity «Emptiness» (0,473) Achievement motivation (-0,560) Planning (-0,469) Modeling (-0,388) Programming (-0,368) Results evaluation (-0,424)	13,13
Factor 2. Readiness for change	Initiative (0,589) Preference for activities requiring innovation (0,612) Readiness for change (0,684) Actual rigidity (-0,671) Sensitive rigidity (-0,608) Attitude rigidity (-0,536) Socio-psychological attitude «Freedom» (0,428) Flexibility (0,662)	9,36
Factor 3. Acceptance of responsibility	Internality in the area of achievements (0,754) Internality in the area of failures (0,753) Internality in the area of family relations (0,626) Internality in the area of industrial relations (0,683) Internality in the area of interpersonal relations (0,534) Internality in relation to health and illness (0,416)	8,56
Factor 4. Readiness for uncertainty	Tolerance of Uncertainty (0,661) Intolerance of Uncertainty (0,816) Interpersonal Intolerance of Uncertainty (0,821)	6,71
Factor 5. Focus on a specific result	Socio-psychological attitude «Result» (0,492) Socio-psychological attitude «Egoism» (0,720) Socio-psychological attitude «Power» (0,574) Socio-psychological attitude «Money» (0,613) Independence (0,338)	5,85
Factor 6. Orientation towards the educational and training process	Experience in the activity «Pleasure» (0,498) Experience in the activity «Meaning» (0,528) Experience in the activity «Effort» (0,369) Socio-psychological attitude «Process» (0,353) Socio-psychological attitude «Altruism» (0,562) Socio-psychological attitude «Work» (0,597)	5,48

time disorganizers»; «Diagnostics of experiences in professional activity»; «Methodology for diagnosing socio-psychological attitudes of the individual in the motivational-need sphere».

The sample of the study consisted of 651 full-time students involved in sports sections of universities, of which 353 were students of Amur State University, 145 of Kurgan State University, 153 of Mordovian State Pedagogical University named after M.E. Evsevieva. The sample included 36,9% of boys and 63,1% of girls. The study was conducted in the spring of 2024. Factor analysis was used to determine the combinations of individual components of the «engagement resource» (the method of factor extraction is the principal component method; the rotation method is varimax with Kaiser normalization).

Results of the study and discussion. As a result of statistical processing of the data obtained using the above methods (without taking into account the general indicators) using the «rock scree» method, six factors were identified that explain 49.1% of the total variance of the characteristics (see table).

We consider the specified factors as psychological dimensions of the «involvement resource», reflecting which of its components and in what combinations are predominantly used by a person in the process of implementing an activity. Accordingly, unlike the components of the «involvement resource», they are more situational.

Conclusions. The conducted theoretical analysis of the literature and empirical research allow us to make a number of conclusions and generalizations. The concept of «involvement in physical activity» is currently in the process of formation and, in fact, goes the same way (from sociological understanding to psychological) as «student involvement», «involvement in the organization» and others. In its understanding, as well as involvement in general, there is terminological and methodological diversity.

The introduction of the concept of «resource of involvement in physical activity» allows us to consider this phenomenon more deeply and comprehensively. Involvement in physical activity in this case is understood as a person's state, formed in the space of interaction of a person as an open biopsychosocial system and the environment in which physical activity is realized. The psychological dimensions of the «resource of involvement in physical activity» identified as a result of the empirical study reflect various options for interaction between representatives of student youth and the environment in which their physical activity is realized, including the inability to independently organize activities (instrumental and value-semantic disorganization), readiness to act in situations of novelty and uncertainty, to take responsibility, focus on results and individualistic values, as well as the process orientation of physical activity.

As areas for further research on student involvement in physical activity, we can highlight: clarification of the specific content of the components of the «resource of involvement in physical activity» depending on its organizational form (physical education classes, amateur sports, professional sports); identification of the specifics of the psychological dimensions of the resource of involvement in athletes depending on the type of sport, skill level, etc.

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Physical education: taking into account the psycho-emotional state of students

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Abstract

Objective of the study was to justification for the application of techniques and strategies for managing students' emotional well-being in the context of physical education instruction.

Methods and structure of the study. A teaching experiment was carried out with a group of second-year male students (n=40) from the Mining Faculty of the Trans-Baikal State University. To enhance the physical fitness of students, a model for the modular planning of physical education classes was created, incorporating techniques and methods for regulating the emotional state.

Results and conclusions. The simulation of the educational process through the implementation of specific exercises designed to enhance and cultivate psychophysical attributes and the body's inherent adaptive capacities has proven to be a successful strategy for optimizing the physical education experience. This approach has also had a positive impact on the students' psychological well-being. The study's findings indicate a positive trend in the students' psychological state, cognitive abilities, and psychomotor skills.

Keywords: *physical education, students, psycho-emotional state.*

Introduction. Emotional stress during university studies causes a decrease in the adaptation processes in the body, has a negative impact on the physical and mental health of students. At the same time, as experts note, university graduates must have a high level of health and physical performance in order to carry out professional activities. In this regard, ensuring a balance of mental and physical performance is one of the main areas of organizing physical education at a university [1, 2, 4]. Experts have proven that psychoemotional qualities form the basis of students' mental performance. At the same time, the process of physical education causes tension in the psychoemotional sphere of students, therefore, according to experts, the traditional organization of physical education in universities does not rely on the psychophysiological capabilities of students. The adequacy of physical activity to the psychophysiological state of students is one of the factors in preserving the health of students. In this regard, when planning physical education and sports classes, the peculiarities of the psychophysiological state of students should be taken into account [3, 5, 6].

Objective of the study was to justification for the application of techniques and strategies for managing students' emotional well-being in the context of physical education instruction.

Methods and structure of the study. The pedagogical experiment was conducted with the participation of second-year male students (n=40) of the Mining Faculty of the Transbaikal State University. In order to optimize the physical education of students, a model of modular planning of physical education classes was developed using the means and methods of regulating the psycho-emotional state (Table 1).

Psychological and pedagogical support is one of the components of comprehensive control of physical education of students. Psychological and pedagogical testing was conducted in order to study the psychoemotional state, mental properties and psychomotor qualities of the students' personality. The following were used for the study: a) «Lemur-Tessier-Fillion Psy-

chological Stress Scale PSM-25» – an integral indicator of mental tension; b) «Spielberger-Khanin Test» – a person's emotional reaction to a stressful situation, a mental property of personality anxiety; c) «Munsterberg Test» – selectivity of attention, concentration; d) «Ability to psychophysiological self-regulation» – emotion management and the ability to control nervous and muscle tone.

Results of the study and discussion. The use of special exercises during the academic year aimed at increasing and developing the reserve adaptive capabilities of the students' body in regulating neuro-emotional stress had a positive effect on the dynamics of changes in the psycho-emotional state, mental properties and psychomotor qualities of the subjects' personality (Table 2).

The assessment of the stress level using the Lemur-Tessier-Fillion Psychological Stress Scale PSM-25 adapted by N.E. Vodopyanova at the beginning of the study revealed a low stress level, by the end of the study this indicator increased to the average level, the increase in indicators was 14,85%. If at the beginning of the study the result obtained indicates the state of psychological adaptation of the students' body to workloads, then at the end of the study the integral indicator of mental stress associated with the upcoming session indicates the need to use various means and methods in the educational process to reduce the neuropsychic stress of students. The dynamics of a person's emotional reaction to a stressful situation, the mental property of an anxious personality were studied based on the Spielberger-Khanin Test. According to the results of the study of situational anxiety in the subjects, it was revealed that by the end of the study there was a decrease in the number of students with a high level of situational anxiety from 17,39% to 12,25%. The positive dynamics was 41,96%. At the same time, by the end of the study, the number of students who endure the educational process in a normal psycho-emotional state increased from 52,61% to 64,18%. The positive dynamics amounted to 18,03%.

At the end of the study, the number of students with an inactive psycho-emotional state and a low level of motivation decreased from 30% to 23,57%. The positive dynamics amounted to 27,28%.

According to the results of the study of personal anxiety at the end of the school year, the indicators were distributed as follows: high anxiety level - decrease to 31,7% of subjects; average anxiety level – increase to 36,8% of subjects; low anxiety level – decrease to 31,5% of subjects. The obtained results indicate the need to use special tools and techniques in the process of motor activity during classes aimed at reducing psycho-emotional stress, which causes emotional arousal and adverse changes in the body of students.

The study of the dynamics of changes in the level of selectivity and concentration of attention in subjects was carried out using the «Munsterberg Test». When completing the test at the beginning of the study, students found 19,32±2,41 words in the test material, which indicates a below-average level of selectivity and concentration of attention among the subjects. Positive dynamics in this test is observed among the

Table 1. Modeling the educational process with a focus on optimizing physical education of students, taking into account their psycho-emotional state

The goal is to regulate the psycho-emotional state of students during physical education classes	
Modules	**Means and methods of regulation of psycho-emotional state**
Module 1 – focused on developing general endurance – optimizing the functional capabilities of the cardiovascular and respiratory systems	- sets of exercises aimed at developing the ability to voluntary muscle relaxation (for the muscles of the arms, legs and torso) (at the end of the main part of the lesson); - a set of breathing exercises according to the K.P. Buteyko method (the final part of the lesson)
Module 2 – focused on developing strength endurance and the vestibular apparatus – optimizing the functional capabilities of the neuromuscular apparatus	- variation of physical load when performing a set of Crossfit exercises (the main part of the lesson); - relaxation training method - focused on self-control of tension and relaxation of various muscle groups (the final part of the lesson)
Module 3 – focused on developing strength abilities – optimizing the functional capabilities of the neuromuscular system	- exercises for stretching and holding stretched muscles (stretching) (the main part of the lesson); - the method of autogenic training - focused on self-regulation of breathing when performing muscle tension (the final part of the lesson)
Module 4 – focused on developing speed-strength and coordination abilities – optimizing the functional capabilities of the neuromuscular system	- strict dosing of physical activity and rest intervals; - relaxation training method - exercises to relieve local muscle tension (the main part of the lesson); - psychophysical training method - the use of complex coordination exercises aimed at reducing neuro-emotional tension (the final part of the lesson)

Table 2. Dynamics of the psycho-emotional state of students during the formative pedagogical experiment

Control exercises (tests)		Baseline indicators (n=40)	Initial level	Final indicators (n=40)	Final level
Lemur-Tessier-Fillion Psychological Stress Scale PSM-25 (scores)		86	Low	101	Medium
Spielberger-Hanin test (scores)	Situational anxiety	51,4 38,9 27,4	High Medium Low	48,6 33, 29,5	High Medium Low
	Personal anxiety	49,6 39,4 32,7	High Medium Low	46,3 35,7M30,6	High Medium Low
Control exercises (tests)		Baseline indicators (n=40)	Final indicators (n=40)	Reliability of differences (p<0,05)	
Munsterberg test (number of words)		19,32±1,06	23,05±0,73	t=2,89 p<0,05	
Ability to psycho-physiological self-regulation	Resting heart rate (bpm)	71,25±1,55	64,29±1,24	t=3,52 p<0,05	
	Heart rate after the test (bpm)	70,9±1,51	63,23±1,35	t=3,78 p<0,05	
	Respiratory rate at rest (times/min)	19,68±0,77	17,31±0,56	t=2,49 p<0,05	
	RR after test (times/min)	18,25±0,59	16,04±0,37	t=2,10 p<0,05	

subjects by the end of the study. Statistical processing of the data revealed reliable differences (p<0,05), the average level of selectivity and concentration of attention, the increase in indicators was 19,31%. The study of the dynamics of the formation of skills to manage emotions and control nervous and muscle tone was conducted using the test «Ability to psychophysiological self-regulation». At the end of the study, positive dynamics is observed both in heart rate (HR increase: at rest – 10,83%; after the test – 12,13%) and in respiratory rate (RR increase: at rest – 13,69%; after the test – 13,78%). The positive dynamics of changes in heart rate and respiratory rate indicate students' positive mastery of psychophysiological self-regulation.

***C*onclusions.** Regulation of the psycho-emotional state of students based on the use of special exercises aimed at increasing and developing the body's reserve adaptive capabilities allowed optimizing the process of physical education of students. The results of the study can be useful in developing a job description for mining industry specialists when compiling characteristics of psychophysical qualities, as well as in organizing professional and applied physical training at the university.

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Formation of leadership among curators of sports groups

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Abstract

Objective of the study was to pinpoint the characteristics that contribute to the development of leadership abilities in the leader of a student group in the sports department.

Methods and structure of the study. The research project involved students from various years and academic disciplines. Sociometric techniques were employed to assess the values and position of a leader within a group. To identify the characteristics of leadership, criteria for its development were established, with specific indicators of readiness for leadership.

Results and conclusions. It is clear that in order to become a leader, the mentor of the sports department's student group must cultivate certain traits, such as a strong motivational framework that includes goal-setting, a set of values, and the distinctiveness of our work. In the hierarchy of leadership attributes, the primary factor is the ambition to excel in academic and professional pursuits.

Keywords: *leader, leadership, curator, student group, sports department.*

Introduction. Interaction in a student group during the formation of the educational team, adaptation of students to new requirements of the educational process is an important aspect of educational activities. In this regard, an important role is given to the curator of the student group, who could have leadership qualities. However, the solution to this problem is determined by the peculiarities of training at the sports department. It is known that many students of this department are actively involved in sports activities, the nature of which is reflected in their personal qualities, attitude to society and studies. Most student athletes themselves are carriers of leadership qualities and strive to achieve high results in both sports and educational activities.

Objective of the study was to pinpoint the characteristics that contribute to the development of leadership abilities in the leader of a student group in the sports department.

Methods and structure of the study. According to scientists, a leader must have such personal characteristics as enthusiasm, the ability to dominate, self-confidence, and intelligence. Along with them, such qualities as balance, prudence, maturity, strength of the "I", receptivity, intuition, empathy, rich imagination, the ability to avoid excessive thinking, the desire to help people, and tolerance for uncertainty are also distinguished.

Since 1972, leadership has been included in the international list of types of giftedness and has come to be regarded as an individual talent. In our country, this phenomenon has until recently been primarily ideological in nature. Leadership giftedness is manifested in the fact that if a young person has this feature, then, most often, he has the ability to organize the process of interpersonal interaction in a purposeful, effective way and causing a sense of understanding of what is happening in all participants in the communication. The following features are characteristic of leadership as a type of giftedness:

- the dominant role of internal motivation, in particular, in which the motivation for success prevails;

• the creative activity under study, expressed in posing and solving problems;

• the ability to achieve original solutions, forecasting and anticipating;

• the ability to create ideal standards that provide high aesthetic, moral, intellectual assessments.

The study involved student groups of different years and specialties of study. Sociometric methods for studying the values and status of the leader in the group were used as diagnostic tools. To determine the indicators of readiness for leadership, criteria for the formation of this phenomenon were developed.

Research results and conclusions. Based on the questionnaire of respondents, it was revealed that senior students of the sports faculty prioritize such a quality of a leader as «being responsible for oneself and others» (Figure 1). According to them, in modern society there is an order for a leader of the new generation, who should have traditional views on humanistic values, and at the same time be able to realize his managerial abilities aimed at revealing the potential of those young people who surround him, have the ability to adapt to changes and make the necessary decisions.

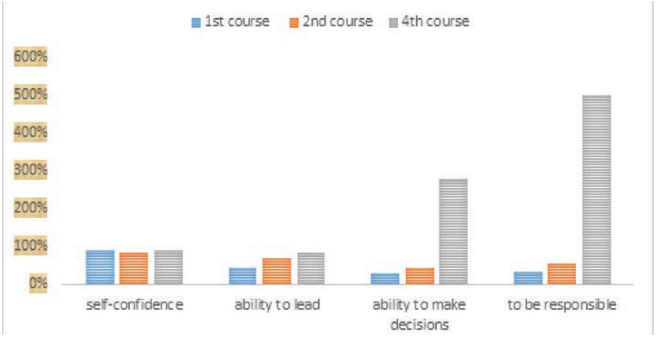

Figure 1. Qualities required for a leader

In our understanding, the characteristics inherent in a leader are reflected in the sociocentric approach, where the desire for a leading role dominates not so much for one's own benefit, but in the interests of the team or society as a whole.

A sociometric study using the author's methods allowed us to identify students' opinions on whether the group's curator is a leader or not? Is he perceived as an appointed leader? In addition, the role of a leader with a business, emotional status, or a complex integration of these statuses, which the curator claims, was determined (Figure 2).

Criteria indicators of readiness for leadership

Components of readiness	Criteria indicators
Motivational readiness	1. Conscious acceptance of the values of future professional activity. 2. Life attitudes: intentions and inclinations related to the chosen professional activity. 3. Predominance of motives that ensure the effectiveness of the performance of future professional activity.
Theoretical and practical readiness	1. Availability of professional knowledge reflecting the specifics of the work. 2. Developed professional thinking, social intelligence, manifested in theoretical and practical activities. 3. The degree of formation of cognitive, constructive and organizational skills for the upcoming activity
Communicative readiness	1. Ability to create "two-way communication channels". 2. Ability to choose the optimal communication style in different situations, master the means of verbal and non-verbal communication.
Creative readiness	1. Recognition of the importance of an active position, manifested in independence, psychological and creative activity in mastering knowledge and skills. 2. The presence of developed creative abilities and experience in applying them in practice 3. The ability to take a research position in relation to one's practical activity and to oneself as its subject.

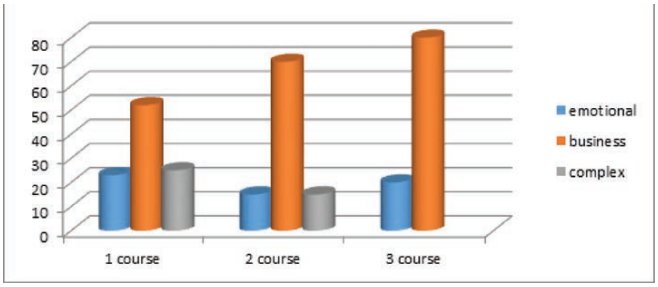

Figure 2. Definition of the status role of the curator as a leader

The specificity of the future professional activity of students of the sports faculty is manifested in the fact that they constantly reflect on previously learned activity patterns, value standards, conceptual patterns of behavior associated with sports. Overcoming the initial difficulties of adaptation is achieved through the use of various innovative approaches in training at the sports faculty, as well as support of the student group by the curator, which over time turns into constant support. At the initial stage, in the first two years, the role of the curator is especially important, so his task is not to control and solve complex problems for students, but to become a link between students and the educational environment of the educational organization as a whole, to promote the development of personal qualities of the student in the context of the «significant other» and to maintain conditions for self-development.

Conclusions. The study identified leadership characteristics of student group curators of the sports faculty, including achievements, attitude to society, participation in public life, ability to show initiative, interest in scientific, sports and cultural spheres, responsible behavior in a team, respectful attitude to equipment, focus on achieving goals, belonging to one's team, integrity in observing ethical standards, willingness to support classmates, everyday discipline, steadfastness of convictions, criticality towards others and self-discipline, reliability in competitive conditions, neatness in appearance, desire to lead, desire for sports achievements. It was established that in order to achieve the status of a leader, a student group curator of the sports faculty must develop such qualities as: a stable motivational structure consisting of goal-setting, a value system and uniqueness of thought activity. In the hierarchy of leadership characteristics, the dominant role is played by the desire to achieve high results in educational and professional activities.

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Education through sport: prevention of social passivity of children and youth

UDC 371

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Abstract

Objective of the study was to ascertain the perspectives of leaders in organizations, instructors in physical education and sports (PE and sports), regarding the potential of this field in shaping the character and fostering the social engagement of children and young people.

Methods and structure of the study. The research approach involved examining the outcomes of surveys conducted among administrators and instructors in the field of physical education and sports. The survey encompassed various aspects, including evaluating the potential of physical education and sports in shaping the development of children and young people, as well as assessing the preparedness of physical education and sports instructors to tackle educational challenges. The study involved 81 principals of educational institutions in the field of physical education and sports, as well as 91 physical education and sports instructors.

Results and conclusions. The findings indicated that both the leaders in the field of physical education and sports and educators in general recognize the significance of harnessing the potential of this field to educate children and young people, fostering their pro-social engagement. However, they may not always be able to clearly articulate effective solutions to this issue.

Keywords: *education of children and youth, physical education and sports, prosocial activity, children and youth movements.*

Introduction. In modern education, the problem of educating the younger generation on the basis of traditional Russian spiritual and moral values, including through physical education and sports (PES), has become relevant. The results of sociological studies have shown a contradiction between the lack of interest of high school students in the topic of «sports and a healthy lifestyle» (3% according to VTsIOM) and the significance of the phenomenon of «Russian sport» for them as a reason for pride – 4th place in the list of «reasons for pride» for schoolchildren (after the history of Russia, the natural resources of the country and its culture), the resolution of which will contribute to the education of prosocial activity as a personally and socially significant activity of children and youth. Scientists note that social education of children and youth is a process of specially organized inclusion of schoolchildren in various social connections and situations that allow them to accumulate experience of social interaction in society [5]. It should be noted that it is important to actualize spiritual and moral values in the education of children and youth, in the design of local and municipal ecosystems of education for the development of their prosocial activity [3], in sports-oriented education as «activity-based socialization of the child, where conditions are created for the development of his harmonious social activity» [1, p. 48]. An important function in the field of education is performed today by children's and youth movements, for example, the public-state movement of children and youth (PSCY) «Movement of the First». The theoretical basis for this study was made up of: the provisions

of the theory of social education by A.V. Mudrik [5]; ideas of the axiological approach [4] and the concept of sportization of physical education by L.I. Lubysheva [1].

Objective of the study was to ascertain the perspectives of leaders in organizations, instructors in physical education and sports (PE and sports), regarding the potential of this field in shaping the character and fostering the social engagement of children and young people.

Methods and structure of the study. The study involved 172 people – heads of educational organizations – 81 respondents, teachers, instructors and coaches leading physical education and sports classes – 91 respondents. The survey examined aspects of assessing the potential of physical education and sports in educating children and youth, as well as the professional readiness of physical education and sports teachers in solving educational problems.

Results of the study and discussion. The directors were asked to choose 5 most significant, in their opinion, criteria for assessing the activities of schools and, as we can see from the answers received, the criterion of education of spiritual and moral values in children and youth was noted as the most significant, having gained 17,6% of the votes (66 directors out of 81). In second place is participation in Olympiads of various levels within the country (15,5%), in third place is the prevention and warning of juvenile and adolescent crime (13,4%), which is directly related to the educational activities of teachers, including physical education teachers. Such criteria as the results of the State Final Attestation (7,8%), the use of city resources (2,7%), the organization of the activities of preschool departments (2,1%), did not receive multiple votes, despite the fact that they are significant in the compilation of official school ratings, which indicates that the heads of educational organizations understand the priority of educational activities.

The question of the forms and methods of integrating Russian traditional spiritual and moral values into physical education and sport programs turned out to be ambiguous and difficult for respondents - only 38 directors out of 81 (about 47%) were able to offer specific solutions. The answers of the remaining 53% of respondents were formal in nature, some respondents refrained from commenting, that is, most managers, when building educational activities in educational organizations, do not see the potential of physical education and sport and, accordingly, do not use it. Based on the answers to the open question to directors to suggest areas and topics for advanced training courses for teachers in order to improve the process of educating children and youth, we note that about 50% of respondents were unable to offer ideas other than increasing the general level of motivation and studying teaching methods, of which 24% found it difficult to answer. The remaining 50% of directors gave fairly detailed answers, noting the barriers to the educational process in the field of physical education and sport: outdated and irrelevant methods and technology for teaching physical education and sport; lack of extracurricular activities with a prosocial focus of education; misunderstanding of the role and influence of the physical education and sports teacher in the process of education and the importance of the value foundations of the educational process.

In the responses of physical education and sports teachers to the question about the values that can be transmitted through their subject – the first 6 leading positions were occupied by the following values: health (11,7%), service to the Fatherland (8,2%), honor and dignity (8,1%), friendship and unity of the peoples of Russia (7,3%), historical memory and continuity of generations (7,2%).

Based on the results of the teachers' responses to the proposal to identify the problems in solving the problems of educating children and youth in the field of physical education and sports, we received the following data - 34% of respondents believe that there are no problems and all educational tasks are solved through physical education and sports. The remaining 66% of respondents were divided into 2 groups: 40% believe that the reasons for the problems associated with the failure to fulfill educational tasks in the field of physical education and sports are associated exclusively with external factors (parents, society, friends, the state, the Internet, etc.), and physical education and sports teachers have nothing to do with this and work with an already formed personality, and only 26% of teachers see the reason for the current situation as their own unpreparedness for the educational process through physical education and sports, unrealized practices and opportunities.

When comparing the responses of the groups of directors and teachers in determining the priority of pedagogical tasks of teachers and coaches, we see that only 20% of the directors' choices and 23% of the teachers' choices indicate tasks aimed at fostering patriotism, morality and pro-social activity of children

and youth. And 53% of the directors note the importance of developing physical education, strengthening physical and mental health, considering physical education and sports exclusively a tool for maintaining the current and potential physical capabilities of the body. This suggests that in a number of pedagogical tasks for physical education and sports teachers, it is necessary to actualize the tasks of educating schoolchildren, their pro-social activity, without reducing them only to the indicators of passing standards and participating in competitions.

The respondents' answers to questions about the activity of state policy in the framework of educating children and youth through physical education and sports programs are indicative. In the category of directors-respondents, only 13 respondents (16%) did not indicate the specific activity of their school students in any physical education and sports organization, or noted their complete absence. 84% of representatives of educational institutions listed public and state movements their students are members of, with the exception of standard sections and Spartakiads – Children's and Youth Sports Schools, the GTO festival, the Russian Youth Youth Youth Movement (Youth Army, Cossack Squad), a school sports club, the RFU project «Football at School», a search movement, projects of the Ministry of Education («Orlyata Russian», the «Be Healthy!» campaign), the Republican project «Healthy Generation – Strong Region», a school tourist club, the Football Union project «Football at School», «Presidential Competitions», after-school activities «Outdoor Games». Sections and clubs are an even more common type of sports activity, which can be found almost everywhere.

Conclusions. The analysis of the results of the survey of directors and teachers allowed not only to determine their opinion on the educational potential of physical education and sports in the development of prosocial activity of children and youth, but also identified «growth points» for the integration of spiritual and moral values into the system of physical education education, and also identified the need to improve the level of professional competencies of physical education and sports teachers in the field of education.

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Individual factors that influence the development of spiritual and moral principles in young athletes of military age

UDC 37.015.3

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Abstract

Objective of the study was to pinpoint the individual factors that contribute to the development of spiritual and moral principles in young men of military age who participate in sports.

Methods and structure of the research. The empirical study was carried out in four regions of the Russian Federation: Arkhangelsk, Kaliningrad, Murmansk and Leningrad regions. The total number of respondents – 1050 respondents – boys in the age range from 16 to 20 years (conscription age). The diagnostics were carried out using the following methods: «Spiritual personality»; «Diagnostics of moral education»; study of the axiological orientation of the individual; study of moral identity.

Research results and conclusions. The findings of the study allowed for the identification of individual factors that contribute to the development of spiritual and moral values among young athletes. The study assessed the level of spiritual values, moral upbringing, and axiological orientation (humanistic and pragmatic) of young men of military age, both those who participate in sports and those who do not. The findings are valuable as they can help to enhance the educational and developmental potential of sports activities, which can effectively contribute to the formation of spiritual and moral values among young people in the educational process of secondary and higher educational institutions.

Keywords: *young athletes of draft age, spiritual and moral values, personal predictors, axiological orientation, moral education, moral identity.*

Introduction. Physical culture of an individual is considered today as a complex system, including the formation of value attitudes, behavioral and motivational components, as well as the motor needs and abilities of an individual, which determine the effectiveness of not only its social adaptation, but also the development of morality [1, p. 12]. At the same time, from the point of view of V.V. Ignatova, the formation of spiritual and moral values should be one of the priority areas of moral development of an individual [2, p. 19]. All this confirms the need for a deep and balanced approach to identifying personal predictors of the formation of spiritual and moral values of young people of draft age involved in sports, in the context of confronting external threats.

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Table 1. Distribution into groups

Group number	Name/characteristic	Number of respondents	Percentage of the entire sample
1	No sport	261	24,9
2	Combat and strength	273	26,0
3	Individual and cyclic	266	25,3
4	Game (all types)	250	23,8

Table 2. Results of calculations of the Kruskal-Wallace H-criterion for spiritual and moral values (4 groups)

Comparison line – scales of the «Spiritual personality» method	Kruskal-Wallace H-test	Ст. св.	Asymp. meaning
Moral Wisdom	118,128	2	0,000**
Self-Control	254,352	2	0,000**
Reliability and Responsibility	327,158	2	0,000**
Spirituality of Relationships	245,495	2	0,000**
Truthfulness and Contentment	245,411	2	0,000**

Note: *p<0,05; **p<0,01.

and empirical (survey, testing). To achieve the set objectives, the following diagnostic tools were used: the «Spiritual Personality» questionnaire (Husain, Anas, in adaptation by G.V. Ozhiganova; the technique of axiological orientation of personality (A.V. Kaptsov); the moral identity questionnaire (J. Black and W. Reynolds, in adaptation by O.A. Sychev, I.N. Protasova), the method of «Diagnostics of moral education» (A.I. Shemshurina).

Results of the study and discussion. The sample of respondents consisted of 1050 young men of draft age. The representation of sports in their lives is 75,1%, Table 1 shows the distribution of young men into groups by sports activities.

To calculate the significance of differences in the selected groups according to the studied indicators of spiritual and moral values and personal characteristics, the Kruskal-Wallace H-test was used. We chose this method of mathematical statistics because it allows us to compare the significance of differences in three or more samples, and is also non-parametric (the distribution of the obtained data differs from normal) [3]. The results obtained for assessing the differences in spiritual and moral values are considered in Table 2.

Analyzing table 2, we note that the studied groups of young men with different representation of sports activities have significantly different indicators for each component of the spiritual and moral characteristics (p<0,01). For a visual comparison, we present the average indicators of each scale of the «Spiritual Personality» methodology in figure 1.

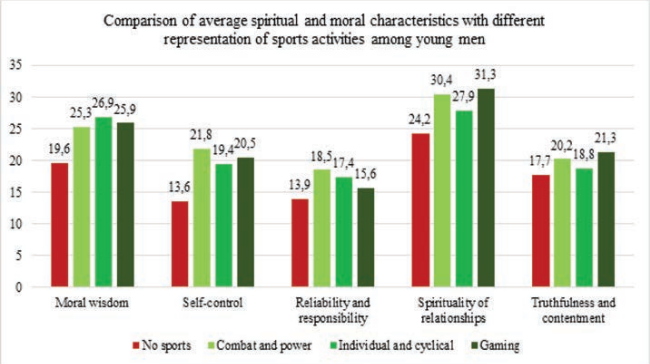

Figure 1. Comparison of average spiritual and moral characteristics by groups

Analyzing figure 1, we note that according to the average indicators:

– moral wisdom, self-control, reliability and responsibility are most pronounced among respondents from the «Martial and strength arts» group;

– «spirituality of relationships», «truthfulness and satisfaction» are more developed among respondents from the «game sports» group;

– in general, among the three groups of young men who play sports, there is an average level (upper limit) of development according to the scales «moral wisdom», «self-control», «reliability and responsibility», «truthfulness and satisfaction», as well as an average level according to the scale «spirituality of relationships»;

– among respondents who do not play sports, there is a low level of development (upper limit) of each studied characteristic of spiritual morality.

The obtained results for assessing the differences in personal characteristics are considered in table 3.

Table 3. Results of calculations of the Kruskal-Wallis H-criterion for personal characteristics (4 groups)

Name of method	Line of comparison - methods for personal characteristics	Kruskal-Wallace H-tests	Ст. св.	Asymp. meaning
Methodology of axiological orientation of personality	Humanistic orientation	9,066	2	0,185
	Pragmatic orientation	10,963	2	0,154
Moral Identity Questionnaire	Moral Self	85,528	2	**0,000****
	Moral integrity	101,059	2	**0,000****
Diagnostics of moral education	Moral education	118,232	2	**0,000****

Note: *p<0,05; **p<0,01.

Analyzing table 3, we note that the studied groups of young men with different representation of sports activities have significantly different indicators for moral identity and moral education (p<0,01). Among the axiological orientation of the personality, no significant differences are observed for either the humanistic or pragmatic orientation. For a visual comparison, we present the average indicators of humanistic orientation in figure 2.

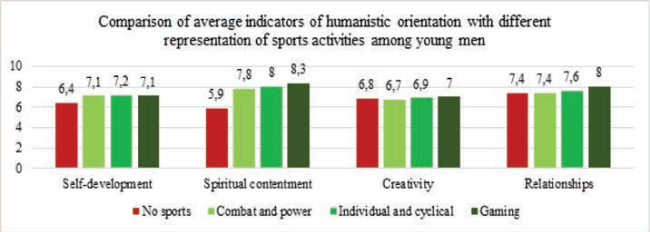

Figure 2. Comparison of average indicators of humanistic orientation by groups

Analyzing figure 2, we note that in terms of average indicators of humanistic orientation, we see a noticeable difference only in the formation of spiritual and moral satisfaction, which is lower among respondents who do not engage in sports. However, statistically, no significant differences were found for the entire indicator of the humanistic orientation of the individual. For a visual comparison, we present the average indicators of pragmatic orientation in figure 3.

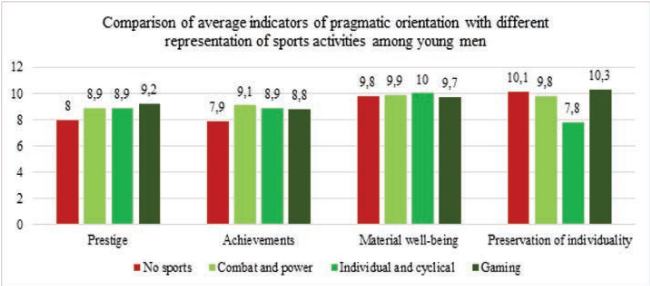

Figure 3. Comparison of average indicators of pragmatic orientation by groups

Analyzing figure 3, we note that in terms of average indicators we see a noticeable difference only in the development of «preservation of individuality», which is lower among respondents involved in individual and cyclic sports. The orientation towards achievements is also lower among respondents who do not engage in sports. However, statistically, no significant differences were found for the entire indicator of the pragmatic orientation of the individual. For a visual comparison, we present the average indicators of moral identity in figure 4.

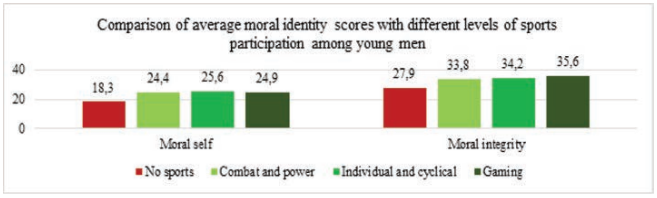

Figure 4. Comparison of average moral identity scores across groups

Analyzing figure 4, we note that, based on average indicators, we see a noticeable difference in the development of moral identity among young men of draft age who do not play sports (lower than among respondents who play any kind of sports). For a visual comparison, we present the average indicators of moral education in figure 5.

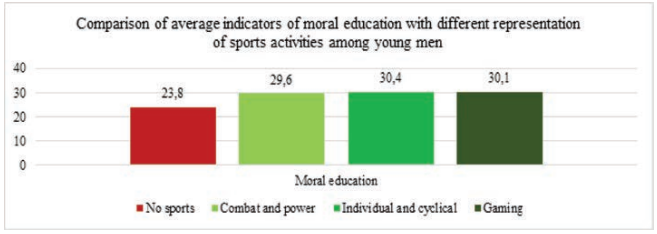

Figure 5. Comparison of average indicators of moral education by groups

Analyzing figure 5, we note that, based on average indicators, we see a noticeable difference in the development of moral education among students who do not play sports (the lower limit of the average level).

Conclusions. The results of the study are in demand due to the possibility of actualizing the educational and developmental potential of sports activities, which allows for the effective formation of spiritual and moral values of young people in the educational process of secondary and higher educational institutions.

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Concretization of the direction of formation of artistry among female rhythmic gymnasts based on taking into account factors of success in creating a motor image to music

UDC 796.412.2

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Abstract
The article is devoted to specifying the factors of success in creating a motor image to music, as well as developing approaches to the formation of artistry of athletes in rhythmic gymnastics at the stage of initial training, based on the trends in the development of rhythmic gymnastics and the psychophysiological characteristics of athletes.

Keywords: *gymnasts' artistry, expressiveness of movements, perception of music, direction of developing artistry.*

Introduction. The content of competitive compositions in rhythmic gymnastics undergoes changes in different periods of its development. Depending on the requirements of the competition rules, the compositions became more dance-like or, conversely, more technical. At the current stage of development of rhythmic gymnastics, achieving a full disclosure of the artistic image is becoming an increasingly difficult task, since the competition rules reward combinations of technically complex elements, while the combination of body difficulty and waves, as an element of motor expressiveness, is not rewarded with additional points [1].

Methods and structure of the study. To achieve the goal and objectives, the following sets of scientific methods and research technologies were used: analysis of specialized literature and program documents; pedagogical observations of the training process (n=90) and competitive activity (n=60) in rhythmic gymnastics; electroencephalography; vibraimage technologies; hardware and software complex «Sigvet-command»; pedagogical experiment; methods of mathematical statistics. The methods made it possible to determine the factors that determine the manifestation of gymnasts' artistry, the focus and content of the methodology for developing artistry based on the factors of success in creating a motor image to music.

Results of the study and discussion. Having conducted a comparative analysis of competitive compositions (n=60) of different time periods of rhythmic gymnastics development (from 2004 to 2024), the percentage ratio of time spent by athletes on performing technical elements and expressive elements was revealed. The advantage of the 2004 compositions was established: they are harmonious in their content, which meets the laws of composition. The compositions are diverse in their content and use of expressive means. The requirements for artistry in the compositions of the 2000s were assessed as a separate aspect of skill and included high requirements for musical accompaniment, harmony in the composition, facial expression and holistic body movements. In subsequent years, the requirements for artistry changed, and more attention was paid to the originality in the use of technical elements, skill in using the object. Significant changes in the competition rules occurred in 2022, combined elements began to appear more and more often in competitive compositions, combining 2 or more technical elements in one, the time for their implementation is significantly reduced, now the performance of preparatory, service elements does not take up much time from the composition, but at the same time the amount of «object difficulty» has also

increased significantly. Having analyzed the compositions of 2022 and 2024, it was found that the number of technical elements in the competitive composition is continuously increasing, and the expressive elements are only components of service or technical elements. And, despite the fact that the demonstration of artistry is ensured by a variety of musical accompaniment (the use of various arrangements, music with words, etc.), the main trend is the monotony of rhythms and tempo, melodic patterns that determine the choice of expressive elements.

In the course of the survey of highly qualified female athletes (CMS, MS and MSIC; n=50), it was found that the majority of them choose rhythm (32%) and tempo (34%) as a guideline in creating an expressive composition, as they are easier to perceive musical characteristics. The next most popular guideline was the lyrics. Less significant for the athletes were musical dynamics and melodic pattern. The explanation for this lies in the complexity of perceiving these musical characteristics and their detailing in movements, which requires a developed musical ear and a large arsenal of means of motor expression.

The majority of respondents (90%) indicate the need to show empathy with musical images and the presence of emotions when listening to music (48%). The next most important are the emerging motor associations that characterize the formation of the «body language» capable of conveying a musical idea. This is a logical image that allows the gymnast to consciously and purposefully use the means of motor expression. Considering that the training process is designed and new competition compositions are created under the guidance of coaches, it was important to compare their opinion with the opinion of the students. Respondents clearly believe that the level of musicality development in gymnasts directly affects the artistry of the performance of a competition composition. At the same time, most respondents believe that musicality is most effectively developed between the ages of four and 10 (67%). However, coaches (n=50) spend no more than 15 minutes on developing musicality during training, and the means of its development include listening to music, exercises with a change in rhythm and tempo, and to a lesser extent, musical games and motor improvisation to music. At the same time, based on the survey data, exercises to develop the ability to express certain emotions to music were used by less than 7% of respondents.

In order to specify approaches to the formation of artistry in rhythmic gymnasts, pedagogical observations of the training process at the initial training stage (n=90) and an analysis of short-term planning documents were conducted.

It was found that in the projects and directly during the implementation of classes there is no specification of tasks aimed at developing musicality, expressiveness and artistry. The means used to form the artistic component of skill were games and improvisation exercises. An analysis of the percentage of exercises of various orientations showed the predominance of exercises for the development of physical qualities (43,5%) and the formation of motor skills (46,0%). At the same time, only 10,5% of the total lesson time was devoted to exercises for the development of the artistic component of performing skills.

In determining the focus of further research, it was taken into account that the creation of a motor image to music, the understanding of music by an athlete is associated with the level of general culture and a number of psychophysiological features of perception. Based on this, the influence of music on the psychophysiological state of gymnasts when performing movements, on the coordination of movements with music, the level of motor expressiveness and the success of creating a motor image as a whole was studied. For this purpose, the vibraimage technology (VibraImage) was used, which allows recording micromovements and microvibrations of an athlete and, thus, is a universal detector of emotions, when identifying any emotional and psychophysiological states [2].

A comparative analysis of the indicators of the psychophysiological state of subgroups of gymnasts with different levels of performance skill made it possible to identify the following general trends: at rest, gymnasts with a high level of skill have lower indicators than gymnasts with an average level of skill; relative to rest, significant changes in the indicators of gymnasts with a high level of skill occur only after performing a series of dance steps to cheerful music, with a simple rhythmic structure; the indicators of gymnasts with an average level of skill undergo changes every time they listen to music and after performing a series of dance steps. The obtained results showed that when listening to music, as well as when performing a series of dance steps, athletes with a lower level of performance skills need to make more efforts to demonstrate artistry to music.

Based on the analysis of electroencephalography when listening to music of various emotional nature, it was found that the main reason for low motor expressiveness is the lack of understanding in gymnasts of the direction in creating a motor image, which is due to the accuracy of perception of the idea of the musical accompaniment.

In the process of specifying the factors of success in creating a motor image to music, a correlation analysis was carried out between the indicators of the

Table 1 – The relationship between the effectiveness of coordination of movements with music and psycho-physiological indicators of female athletes (n=12, r)

emotional focus of musical fragments					
fun		love		protest	
high level of preparedness of gymnasts					
S	B	C	B	X	B
-0,7	-0,7	0,6	0,5	-0,6	0,8
average level of preparedness of gymnasts					
protest					
C		B		S	
-0,8		-0,8		-0,7	
Legend: S – "self-regulation"; B – "balance"; C – "charismatic"					

psychophysiological state and the quality of the implementation of the artistic component of performance skills. It was found that gymnasts with a high level of training already at rest without listening to music have a strong feedback relationship between the number of deductions for aesthetic errors with such indicators as «balance» (r = - 0,6; - 0,89) and «self-regulation» (r = - 0,49, -0,94).

The analysis of the indicators of listening to the first musical fragment revealed a strong connection between «self-regulation» and the quality of the artistic component of performance skills (r = -0,94). At the same time, after performing a series of dance steps to music, the relationship in the indicators of «balance» increases (r = -0,89) and decreases in the indicator of «self-regulation» (r = -0,71). It follows that when performing a competitive composition to cheerful music, it is necessary to have sufficient «self-regulation» skills. Having a high level of charisma is necessary for performing a competitive composition to lyrical, sad and tragic music. When performing a competitive composition to rock music, one should have sufficient indicators in «self-regulation», «charismatics» and «balance».

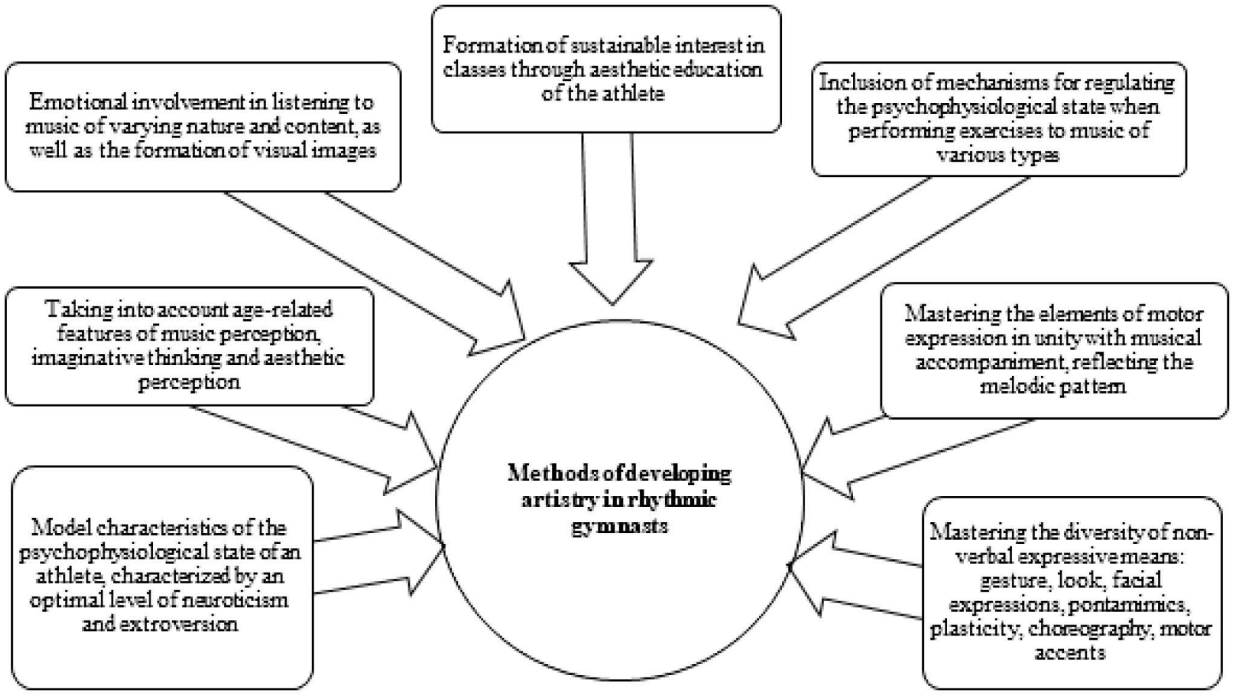
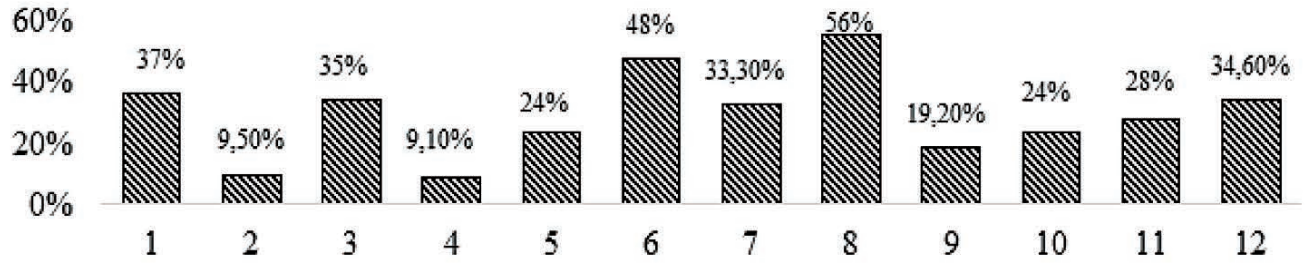


Figure 1 – Factors of success in creating a motor image to music



Note: 1 – gymnastic posture; 2 – turnout of the legs; 3 – foot lifts; 4 – body balance in technical elements; 5 – technical elements correspond to model characteristics; 6 – ease and plasticity of movements; 7 – smoothness of transitions and fusion of movements; 8 – integrity of the composition, without loss of subject; 9 – correspondence of movements to the rhythm of the music; 10 – correspondence of the dance track to the musical genre; 11 – reflection of the character of the music by movements; 12 – emotional expressiveness.

Figure 2 – Increases in the quality of the implementation of the artistic component of performance skills in competitive compositions of gymnasts at the end of the pedagogical experiment (%)

An assumption was made about the influence of such psychophysiological characteristics as: «charisma», «balance» and «self-regulation» on the ability to effectively reproduce musical rhythm and tempo using the hardware and software complex «Sigvet-command» (Table 1).

The obtained data confirmed the assumption made. The results of the conducted studies [3] made it possible to determine the direction of the process of forming the artistic component of the performing skills of female athletes in rhythmic gymnastics, taking into account the factors of success in creating a motor image to music (Figure 2). When developing the content of training, general pedagogical principles were taken into account, as well as the principles of sports training: awareness and activity, clarity, strength and progression, unity of all aspects of training [4]. Of great importance was taking into account the age-related psychophysiological characteristics of female athletes when mastering various musical characteristics (tempo, rhythmic structure, etc.), understanding the «character of music», involvement in the creation of visual artistic images and associations to music. The presence of figurative representations, in turn, formed an idea of movement, which is in a strong relationship with the success of creating a motor image to music.

The regulation of the design process was determined by the traditional structure and stages of training in motor actions. Each of the stages solved its own goals and objectives, but they were all united by the general focus of training on creating a competitive rhythmic gymnastics composition that reflects the main idea of a musical piece. The first stage of forming the artistic component of performing skills implied the creation of an idea of the main idea of musical accompaniment, the basics of musical literacy and was aimed at forming visual and logical images in athletes. Mastering the mechanisms of psychophysiological regulation of the state by young gymnasts while listening to music with bright emotional coloring included the formation of self-regulation skills in combination with the improvement of facial expressions as an indicator of the manifestation of charisma. The second stage solved the problems of forming the athletes' knowledge about the means of motor expressiveness and their relationship with music, the skills and abilities of motor expressiveness (learning hand accents, hand movements, points with legs, body and arm waves, etc.), the skills of their coordination with the nature of the musical accompaniment and reflecting the idea of the music.

The third stage was aimed at constructing a competitive composition taking into account the previously studied means of motor expressiveness, mastering it, improving and detailing the elements of the athletes' artistry in accordance with the nature of the musical accompaniment.

Specifying the content of the process of forming artistry in gymnasts at the initial stage of training, goals, objectives were formulated, means, methods and methodological techniques were determined, which included listening to music with comments from a coach who forms an idea of music, musical games, exercises to coordinate movements with music, facial expressiveness.

Experimental testing of the designed methodology made it possible to reveal the high efficiency of the impact on each of the designated criteria determining the artistry of gymnasts (Figure 2).

Thus, the increase in «charisma» due to the diversity of facial expressions and motor expressiveness ensured a decrease in the amount of visible efforts, the achievement of ease and plasticity of movements when performing competitive compositions. Improvement of the «self-regulation» mechanisms, allowing switching and concentrating on the technique of elements performed to music, became the reason for significant increases in the criterion of «no loss of object» and, as a result, an increase in the integrity of movements that emphasize the character of the music. Improvement of gymnastic posture became the basis for creating a more precise motor image to music and ensured high-quality performance of elements of motor expressiveness.

Conclusions. Thus, in the process of sports training of young gymnasts, a methodology aimed at developing artistry and ensuring an increase in the effectiveness of competitive activity in rhythmic gymnastics was successfully tested. It has been proven that the artistry of gymnasts depends on objective factors of expressiveness, which determine the direction of the applied means and methods of training. The formation of emotional experience of empathy with a musical plot in young gymnasts, as well as an arsenal of means of motor and facial expressiveness, contributed to the manifestation of artistry in creating a motor image. The focus of the designed methodology on understanding and mastering the mechanisms of creating an artistic motor image by athletes contributed to the high-quality implementation of the principle of consciousness and activity in training sessions, ensuring their harmonious physical and spiritual development [5].

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