



T & PPC

Theory & Practice of Physical Culture

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**Athletic
training**

**Sport
psychology**

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physical education**

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Competence-based learning in the development of sociological knowledge in the field of physical culture and sports

The level of sociological knowledge of a future specialist about a person and society determines his professional ability to solve complex social problems.

At the stage of professional training, a student of a sports university needs not only to master the ways, methods and forms of training, as well as other features of professional activity, but also to acquire skills and abilities to understand life situations and social relations, on the basis of which large and small groups are created in daily and work activities. Sociological knowledge helps to navigate complex social institutions that ensure the vital activity of society, as well as to get an idea of people's sporting interests, their motivations and value orientations in the field of physical activity, without which it is difficult to understand and explain their behavior.

If sociology helps to know and evaluate the world from the perspective of social science and obtain objective information, then the competence approach allows you to implement the principle of harmonization of professional training and personal development of a future sports teacher.

The competence approach assumes that in the learning process, the future specialist should not be aimed at increasing the amount of knowledge in various subject areas, but could independently make decisions in difficult and non-standard situations.

The use of the competence-based model of professional skills training implies fundamental changes in the organization of educational activities, in the choice of criteria for evaluating educational results compared with the traditional approach based on the concept of obtaining knowledge, skills and abilities. In the process of mastering competencies, the emphasis in training is on the formation of students' skills to independently determine their professional goals, actions and responsibility for decision-making. Along with this, an important aspect of competence-based learning is the focus on the development of the student's personality, which contributes to the formation of motivation for self-education, adaptation to changes in public life.

The competence model in education is based on the methodology of the activity approach, in which the learning process is based on the active cognitive activity of the student. The key point here is to move away from informational reproductive knowledge to knowledge of action. The knowledge acquired in this case is characterized not so much by the number of known facts as by the ability to apply them in the professional field, in related fields, and sometimes in situations in which the connection between the problem and the subject knowledge is clearly not traced. Therefore, the modern educational process should consist not only in transferring to students subject knowledge that has a long-term prospect of their use, but in demonstrating the application of this knowledge to solve urgent professional and quasi-professional problems, as well as creating conditions for their independent solution in the learning process.

The main means of forming the competencies of a future specialist is a competence-oriented task, which can be defined as a didactic unit modeling a professional task, the fulfillment of which requires the student to synthesize knowledge, skills, and manifestations of personal qualities.

The performance of a competence-oriented task ensures high efficiency in the organization of independent educational, cognitive, research, and project work of a student, which models the professional activity of a future specialist in the field of physical culture and sports.

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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Accounting the individual-typological profile in the competitive activity of hockey players of various game roles

UDC 796.966



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Abstract

Objective of the study was to determination of the level of significant individual-typological components of the playing role of hockey athletes aged 14 years, influencing the effectiveness of competitive activity.

Methods and structure of the study. An experimental study was conducted to assess the individual typological characteristics of 14-year-old athletes of various playing roles that are significant in hockey. The composition of the methods is determined by the specifics of sports activity and was aimed at diagnosing parameters that are significant for hockey athletes: the level of self-esteem, situational and personal anxiety, reaction speed and processing of visual information, mental stability and personality orientation, degree of endurance of the nervous system, accuracy and concentration, type temperamental characteristics.

The study population consisted of young men born in 2010 who play hockey - members of the U-14 Ural Federal District national team, winners of the 2023 Federal District National Team Championship (n=25 people).

Results and conclusions. Based on the identified level of selected indicators, individual typological profiles were compiled, presented in the form of psychograms.

Keywords: *hockey, playing role, individual personal characteristics, individual typological profile.*

Introduction. Modern hockey places high demands on the physical, technical and tactical preparedness of an athlete. A large volume of complex-intensive work associated with the need to quickly engage and make decisions in game situations dictates special requirements for the individual characteristics of hockey athletes, which can significantly influence the performance of activities and allow the formation of an individual style that determines the choice of playing role. Taking into account significant individual typological characteristics is especially important in connection with the implementation of gaming activities, since not only technical and physical preparedness helps to become one of the best in the chosen sport, but also a predisposition to the type of gaming activity being implemented.

Authors V.I. Voronova, N.L. Vysochina, A.P. Mikhnov draw attention to the fact that the most significant factors influencing the choice of playing role include: playing style of activity (playing predisposition) and the level of development of the motor qualities of athletes [1, 2]. According to other authors, the basic components are the level of professional, special physical preparedness [3]. The logical choice of these factors is obvious, but does not address the issue of taking into account individual typological aspects when choosing a game role, which are presented in scientific research only fragmentarily. The above confirms the conclusion that scientific works devoted to this issue are focused, for the most part, on the study of the technical and tactical component of activity.

It should be taken into account that the choice of playing role depends not only on the functions performed, but also on the presence of appropriate personal characteristics of the athlete [3]. The effectiveness of a hockey player also depends on the mobility of nervous processes associated with the type of nervous system, intellectual and temperamental characteristics, visual perception, stability, distribution and concentration of attention, speed of information processing and level of endurance.

In this regard, the problem of determining the significant individual typological qualities of hockey players that correlate with the specifics of the playing role is becoming increasingly relevant, since taking into account mental resources is a vector for increasing sports achievements and determines the relevance of this study.

Objective of the study was to determination of the level of significant individual-typological compo-

nents of the playing role of hockey athletes aged 14 years, influencing the effectiveness of competitive activity.

Methods and structure of the study. The study population consisted of young men born in 2010 who play hockey - members of the U-14 Ural Federal District national team, winners of the 2023 Federal District National Team Championship (n=25 people). The composition of the methods is determined by the specifics of sports activity and included constant indicators that can serve as informative indicators of an athletes propensity to perform certain game tasks:

1. The study of the level of self-esteem of character traits was carried out using the «Determination of Self-Esteem» method by Dembo-Rubinstein. 2. To study the individual psychological tendency to increase the level of anxiety, the M. Luscher color test technique was used. 3. To determine the speed of the visual-motor reaction and concentration of attention, the

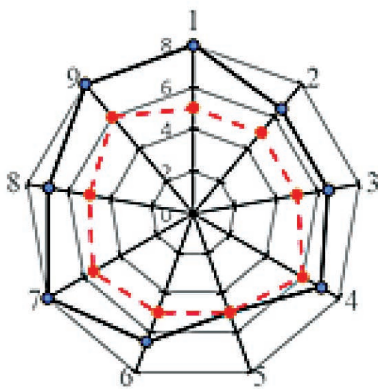


Figure 1. Psychogram of an athlete-hockey player in the forward position

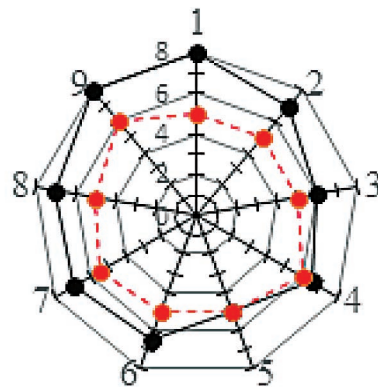


Figure 2. Psychogram of an athlete-hockey player in the position of center forward

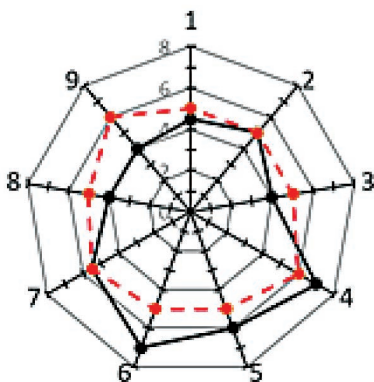


Figure 3. Psychogram of an athlete-hockey player in the position of defender

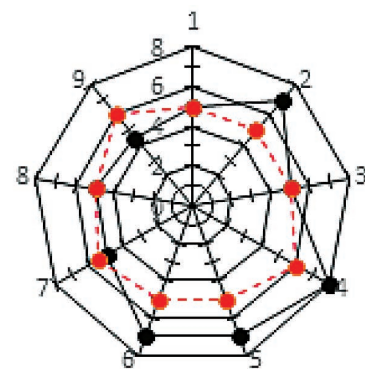


Figure 4. Psychogram of an athlete-hockey player in the goalkeeper position

Note: 1 – level of self-esteem; 2 – situational anxiety; 3 – personal anxiety; 4 – reaction speed; 5 – accuracy and concentration; 6 – speed of information processing; 7 – endurance of the nervous system; 8 – level of neuroticism; 9 – extraversion\ introversion.



«Simple visual-motor reaction (SVMR)» technique was used. 4. To identify the speed of information processing and the dynamics of the formation of the speed of decision-making, taking into account the mobility of the processes of the nervous system – «Reaction of choice». 5. Express method «Tapping test» by E. P. Ilyin - for the purpose of assessing the overall performance and endurance of the nervous system. 6. In order to determine the types of temperamental characteristics and the manifestation of the level of emotional stability/instability in various gaming situations - G. Eysenck's EPI personality questionnaire (option A).

To ensure uniformity in the presentation of results, all indicators were converted into conventional units in accordance with the developed scale. The identified level of individual typological characteristics made it possible to compile psychograms (profiles) of hockey players of various playing roles. To compare the results, a conditional model was created, without taking into account the role, reflecting the generalized level of the teams results.

Results of the study and discussion. The obtained test results, reflecting individual characteristics, are presented in Figure 1-4 in the form of psychograms in relation to the game role.

Shown in Figure 1, the data indicate that the leading indicators in the structure of readiness of athletes in the winger position are the level of self-esteem. At the same time, indicators of concentration are at a lower level than those of defenders and goalkeepers. The most significant factors of the central attacker (Figure 2) include: personal and situational anxiety, the predominance of extraversion over introversion. The findings also indicate a lower level of focus than that of defensive and goalkeeper players. At the same time, they are distinguished by a high level of self-esteem and developed leadership qualities. An explanation for this may be that hockey players who play on the attack line quite often have to take on a leadership role in the team. It should also be noted that athletes in the role of attackers are characterized by choleric-sanguine temperamental characteristics with a predominant level of extraversion.

Many researchers in the field of sports argue that the individual typological characteristics of defensive players are inferior in many respects. Thus, in accordance with the results obtained, the level of self-esteem among players of this role is much lower compared to the indicators of attackers. At the same time, defensive players are characterized by a higher level of stability and concentration, and speed of information processing.

Among the most significant individual indicators of goalkeepers, it is important to note the developed level of concentration. It should also be noted that among hockey players of this role, the most common are athletes with a predominance of phlegmatic typological characteristics. However, athletes with the extraverted type are also found quite often.

Conclusions. The study of individual typological characteristics of athletes is one of the directions in determining the playing role and success of an athlete. When determining the playing role of 14-year-old hockey players, it is advisable to use identified marker indicators, which are largely innate and serve as an informative indicator of predisposition to perform certain gaming tasks.

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Innovative aspects of varieties of serve in modern men's volleyball

UDC 796.325



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Abstract

Objective of the study was to determine the innovative content of serve efficiency performed by highly qualified volleyball players.

Methods and structure of the study. The software of the Italian company Data Project was used: Data Volley 4Pro, through the built-in functionality of which various statistical indicators of competitive activity are analyzed. Indicators of the effectiveness of serve execution were determined in various ways during the Russian Volleyball Championship among men's teams. 80 games of leading teams with the participation of 96 athletes were analyzed.

Results and conclusions. 1. It has been established that at the present stage of development of volleyball, the number of power serves and the efficiency of their implementation is one of the leading characteristics of highly qualified volleyball players. 2. It was revealed that the innovative content of serving by top-class volleyball players is the transition from planning and power to a «hybrid serve». The growth of professional skills of volleyball players is accompanied by the directional dynamics of the use of the specified serve during competitive activity. 3. The concept of «hybrid serve» is formulated, which is defined as an upper straight serve in a jump, the main content of which is the speed of the ball and the degree of its rotation.

Keywords: ball serve, efficiency, trends, highly qualified athletes, volleyball, hybrid serve.

Introduction. Serving in volleyball is the only technical technique of the game for which the athlete has 8 seconds of time, determined by the rules. During this time, the player chooses the place, method of execution and direction of the serve in order to win a point or make it difficult for the opponent to organize an attack [3]. Analysis of the effectiveness of served serves is a component of analytical analyzes of the gaming activities of teams of various levels of preparedness [1]. In Russian Championship games, teams that win matches are ahead of their opponents in terms of the complexity of their serves [5]. The results of a large number of statistical studies have enriched the theory of volleyball, identified problems and prospects for training volleyball players [4]. Trends in the efficiency of serving are revealed in connection with the qualifications of volleyball players; they reflect the general direction of development of men's volleyball, the characteristics of which are power and speed dynamics. The efficiency indicators obtained during the study in performing various methods of serving by highly qualified volleyball players make it possible to determine

the directions of development and can act as goals of the training process.

Objective of the study was to determine the innovative content of serve efficiency performed by highly qualified volleyball players.

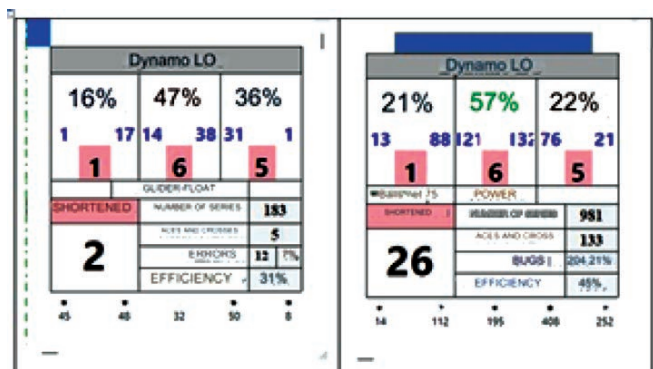
Methods and structure of the study. The software of the Italian company Data Project was used: Data Volley 4Pro. Data Volley 4Pro software is a recognized world leader in its application during the competitive activities of volleyball players. It is mandatory for use within the framework of the Russian Championship among Super League teams and Major League "A" teams. Through the built-in functionality of the Data Volley 4Pro program, which allows for the analysis of various statistical indicators of the competitive activity of volleyball players, the serve performance of each volleyball player was registered and the obtained results of the team as a whole were processed. Indicators of the effectiveness of serve execution were determined in various ways during the Russian Volleyball Championship among men's teams. 80 games of leading teams with the participation of 96 athletes were analyzed.



To statistically process the results obtained from the sample, the Microsoft Office Excel 2021 and STAT-GRAPHICS 18 computer program package was used.

Results of the study and discussion. To achieve this goal, pedagogical observation was carried out, data was collected and the indicators of highly qualified volleyball players performing serves in various ways were analyzed. The Data Volley 4Pro program allows you to obtain results in the form of a generalized table and diagrams of the implementation of various feeding methods. The figure shows three supply zones (zone 1, 6, 5) and the percentage of the zones' load, as well as the directions between the zones and pressing to the side lines. The stars below show where the players served from and how many times. The diagram shows: the number of serves, the number of aces (serves with a point) and passed balls, errors on serve, efficiency of serves, as well as the number of shortened serves.

Statistical analysis of serve performance during competitive activity indicates the compliance of qualified volleyball players with model indicators. Teams average 4 200 innings per season with an efficiency of 46%.



Examples of schemes for implementing various feeding methods

It was determined that on average per season, teams of qualified volleyball players perform 1056,22±36,7 planning serves, the effectiveness of which is 41,5±31,29%. The use of an accuracy serve is justified in situations where the organization of an opponents attack is disrupted by removing the connecting player from the attack; serves between players at the reception; serves along the lines or into free areas of the court. The obtained indicators indicate that the players solved the tactical problems. The average number of errors made by players when performing a planning serve is 6,4±2,55%.

The choice of the direction of the planning serve in zones reflects the player's ability to analyze the arrangement of the opposing teams players at the reception, the location of the libero player and the level of technical and tactical preparedness of the receiving players. On average, players of volleyball teams served into zone 5 7,4±3,5 times, with an efficiency of 19,5±14,5%, into zone 6 they served on average 9,5±6,1 times, with an efficiency of 33,3±40%, 1 zone was supplied on average 3,2±2,4 times, with an efficiency of 31,7±13,4%.

Highly skilled serve volleyball players try to take risks in order to make it as difficult as possible for their opponent to receive a serve or to win a point outright (ace). For this purpose, a power serve in a jump is used. On average, team athletes performed 3145,33±30,5 power jumping serves during the season, their efficiency was 49,25±12,8%. The average number of errors players make when performing such serves is 22,0±12,1%. The choice of the direction of serve in zones is carried out taking into account the arrangement and characteristics of the receiving players. It was found that an average of 20,1±17,9 serves were performed in the 5th zone of the court, the effectiveness of which was 37±17,9%. More often than in other zones, qualified volleyball players serve in the 6th zone of the court. 57% of all serves were completed in this direction and more points were scored (5,1±4,7 points). The average number of serves in zone 6 was revealed – 43,4±32,9 times, with an efficiency of 36,1±17,8%. Qualified volleyball players serve the least into zone 1 of the court; on average, the number of such serves is 16,8±13,2 times with an efficiency of 35,7±19,7%. Indicators of the effectiveness of serving by qualified players are presented in the table.

Indicators of serving performance by qualified volleyball players

Indicators	X±Sx
Number of planning innings in teams	1056,22±36,7
Number of errors during planning feed, %	6,4±2,55
Efficiency with gliding feed,%	41,5±31,29
Number of power serves in teams	3145,33±30,5
Number of errors during power delivery,%	22,0±12,1
Efficiency during power supply,%	49,25±12,8

The identified results demonstrate the trend of serving in modern men's volleyball - the ratio of the number of planning serves, popular and relevant in the 70s of the twentieth century, and the power serve,



which has been firmly established in men's volleyball since the 90s of the twentieth century, is 1:4. Video analysis of games confirms the opinion of experts that winning a match is ensured by the criterion - every third serve must pose a threat or be executed without error, only every sixth serve can be erroneous. The risk of executing a serve when there are a large number of errors made by the team during the game and a small number of serves won increases the number of ball losses [2].

Statistical registration of the execution of a serve using an additional recording code in teams of highly qualified volleyball players made it possible to identify a «hybrid serve», which has characteristic features when executed. It is more aggressive and unpredictable for the receiving side, leads to errors in reception and allows you to score points without further playing the ball. The execution of this serve by three to four athletes ensures a score of points per serve of up to 7%, which is a high indicator for the competitive activity of highly qualified volleyball players. This determines the prospects for its use in the competitive activities of highly qualified volleyball players and indicates the vector of research. Based on the analysis of statistical data and video recordings of games, the concept of «hybrid serve» was formulated, which is defined as an upper straight serve in a jump, the main content of which is the speed of the ball and the degree of its rotation. The emergence of «hybrid serve» is a development trend in modern volleyball.

Conclusions. It has been established that at the present stage of development of volleyball, the number of power serves and the efficiency of their implementation is one of the leading characteristics of highly qualified volleyball players. It has been revealed

that the innovative content of serving by top-class volleyball players is the transition from planning and power serves to a «hybrid serve». The growth of professional skills of volleyball players is accompanied by the directional dynamics of the use of the specified serve during competitive activity. The concept of «hybrid serve» is formulated, which is defined as an upper straight serve in a jump, the main content of which is the speed of the ball and the degree of its rotation.

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Relationship of biological and pedagogical aspects in children's early sports training

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Abstract

Objective of the study was to identify features of the age-related development of some body systems of 6-year-old children, depending on physical activity.

Methods and structure of the study. Peculiarities of age-related development were studied as a marker of the influence of various physical activities in 6-year-old children. Contingent: hockey players (41 people, training experience $1,32 \pm 0,84$ years), football players (19 people, training experience $1,79 \pm 0,79$ years) and untrained children (17 people). The following were studied: total dimensions and proportions of the body of the limbs, labile components of body weight; abilities: psychomotor (tests: tapping, RDO, PZMR, attention, noise immunity), cognitive (visual, verbal, spatial-logical, analytical-synthetic thinking); motor (30 m run; shuttle run 3×10 m; running with alternation 3×10 m (smooth, attached alternating, back forward); standing long jump; grip strength). Stepwise discriminant analysis was used to analyze the data.

Results and conclusions. A low level of discrimination between groups of six-year-old children with different physical activity was revealed in the presence of traces of external influence, differentiating the contribution of various activity support systems to the differences between groups. The greatest difference between athletes and untrained children is inherent in cognitive development, which reflects the leading role of consciousness in the development of skills of various properties and characteristics of learning. Motor and psychomotor abilities, which differ in the manifestation of the strength of the nervous system and the quality of coordination, are consistent with the priority of the importance of the development of movement control structures in accordance with the characteristics of motor activity and learning. Morphofunctional development does not reflect the characteristics of motor activity. It is assumed that already at the very early stage of systematic sports activities, the influence of means and methods of preparation is noted, which requires taking into account the individual and age-related cognitive development of the child.

Keywords: *morphofunctional and psychological characteristics, physical fitness, 6 years old, hockey, football, untrained children.*

Introduction. The problem of early sports training is updated by the developmental features of modern children: the deterioration of children's health against the background of the replacement of physical activity with attractive contact with the world through gadgets with access to the global network. The natural result of reality is overweight and obesity in children, which, according to WHO and Russian experts, has become a pandemic and increases from 6 to 10 years to a greater extent in boys, which limits physical activity, and as a consequence, physical fitness in one third of young children, limiting the sports reserve pool [12].

Changes in the regulations of the Federal Standards of Sports Training for 2022-2023, which deter-

mined 6-8 years as the age for enrollment in the initial training stage in 37 Olympic sports (64%), opened up opportunities for early involvement of children in sports in order to form a sustainable interest in activities, mastering motor skills and techniques, increasing the level of comprehensive physical fitness [7].

Despite the fact that physical activity in children is recognized as a means of long-term improvement of quality of life, there are serious disagreements regarding the initiation of systematic sports activities. The reasons for skepticism are frequent injuries and overtraining due to the child's insufficient readiness to learn [11]. Early start of sports activities occurs during periods of ontogenesis with biologically natural het-



erochrony and a sequence of alternating quantitative and qualitative transformations of the morphological, physiological and psychological spheres, which determine the range of opportunities and readiness to learn skills and develop skills that are promising for motor development, taking into account the features of the priority development of various systems organism in the form of sport [8].

Objective of the study was to identify features of the age-related development of some body systems of 6-year-old children, depending on physical activity.

Methods and structure of the study. Data is presented that allows one to evaluate: physique: total dimensions, proportions of the body and limbs; muscle and fat mass (anthropometry, caliperometry); abilities: psychomotor (NS-Psychotest Sport: tapping test, simple and complex visual-motor reactions: VMR, RDO and noise immunity (PU)), cognitive (visual and verbal-logical (ZLM and VLM); visual-spatial; analytical-synthetic (Raven's color progressive matrices - CPMR) thinking, attention (Bourdon's correction test), indirect memory and physical (30 m run; shuttle run 3x10 m; variable running - T-test: with alternation (smooth 10 m), attached variable 5 m x 2, back forward 10 m; grip strength, kg, % hand dynamometry DK-25) [1-6]. In a number of cognitive tests, additional processing time was taken into account: step-by-step discriminant analysis (Statistica 13.0).

Subject population: 77 six-year-old boys, including young athletes involved in hockey (41 people, experience $1,32 \pm 0,84$ years) and football (19 people, experience $1,79 \pm 0,79$ years) in sports and fitness groups, as well as untrained children of preschool educational institutions in Moscow (17 people). Each of the groups

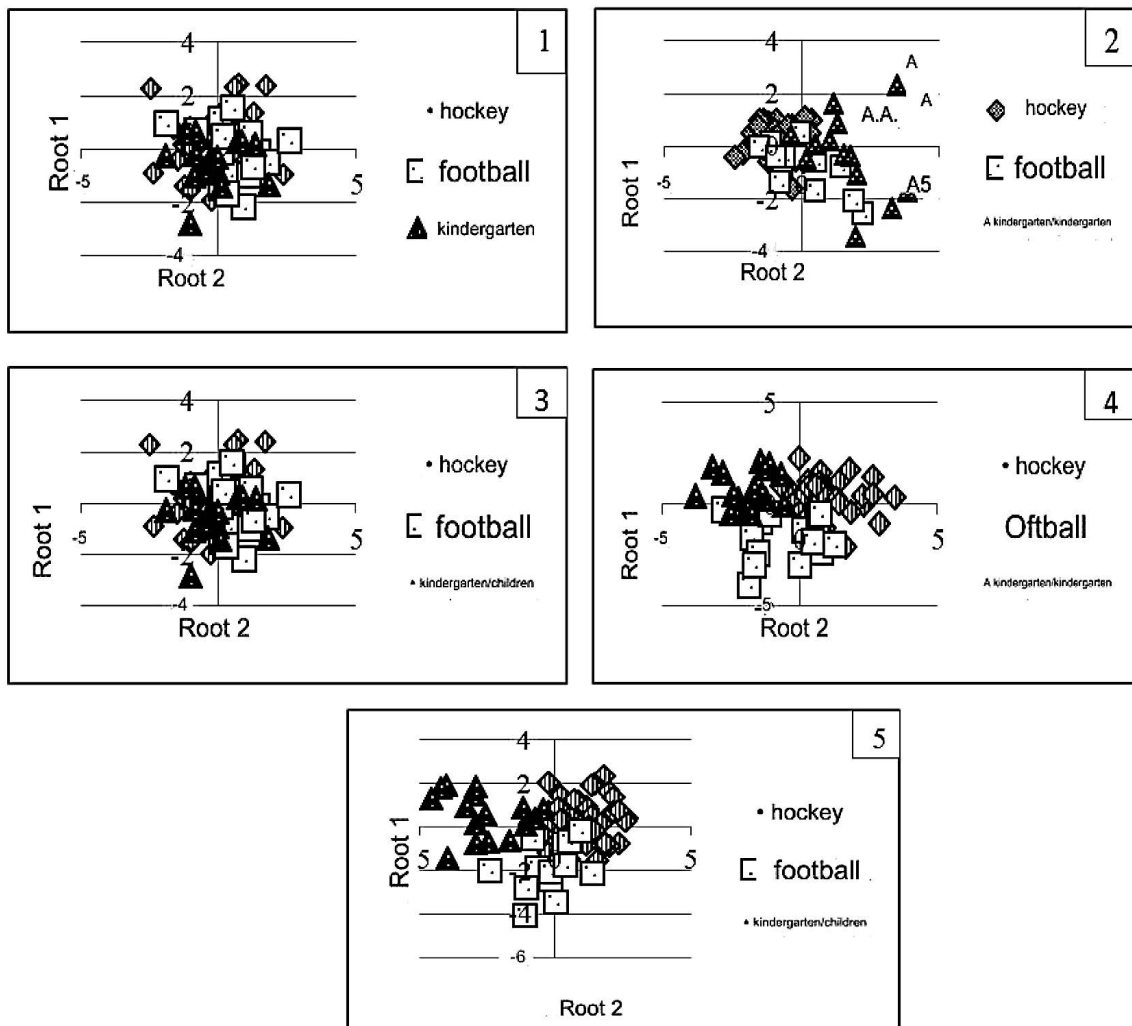
of young athletes of a particular sport trained according to a single plan: during the week, hockey players performed 5 training sessions on the ice for 75 minutes each and 2-3 general physical training training sessions for 60 minutes each; football players – 3 training sessions of 75 minutes. Untrained children had physical activity for 30-40 minutes 2 times a week. The examinations were carried out with the consent of the parents.

Results of the study and discussion. The ontogeny of children is determined by the differentiated contribution of various body systems to the course of the general development process under the influence of environmental factors. Indicators of physique, motor, psychomotor and cognitive abilities (critical threshold F-exclusion: 2,55). This made it possible to assess the contribution of the indicators of each of the blocks under consideration and the probability of discrimination (D, %) of groups of 6-year-old children based on physical activity (see table, figure).

Sizes, proportions of the body and limbs, labile components of body weight do not differ in the groups of hockey, football and untrained children, with the largest, but insignificant, contribution to the differences in the relative indicators of leg length and fat mass (%). Motor abilities highlight the superiority of groups of athletes relative to untrained children, differing to a lesser extent in physical abilities between hockey players and football players, mainly in terms of coordination abilities. Psychomotor abilities most significantly distinguish the leadership of sports groups in terms of the strength of the nervous system, mainly in motor reactions, and to a lesser extent in complex visual-motor reactions. The groups of children differ

Discrimination indicators (D) of groups of 6-year-old children with different physical activity

Indicator	F-remove	p-value	D, %	Indicator	F-remove	p-value	D, %
Body type				Motor abilities			
Leg length/body length	2,19	,110	55,1	Shuttle run	4,75	,012	75,0
Fat mass,%	1,74	,181		Grip strength, %	4,43	,016	
				Running T-test	3,26	,045	
Psychomotor abilities				Cognitive abilities			
Tapping test, quantity	6,31	,003	71,8	CPMR (B), point	7,45	,001	87,3
RDO, ms	3,28	,044		HWP, min	5,06	,010	
PU, ms	3,24	,046		CPMR, min	4,68	,013	
A set of informative indicators				VLM, point	4,31	,018	
VLM, point	4,98	,010	87,3	ZLM, point	3,62	,034	
Grip strength, %	4,97	,010		Short-term memory	3,53	,036	
CPMR, min	4,09	,022					
Running T-test	3,64	,033					



Scatter diagram of groups of athletes and untrained children in the canonical space of discriminant functions taking into account physique (1), motor (2), psychomotor (3), cognitive (4) abilities and a set of informative discrimination indicators (5).

most significantly in the level of cognitive abilities with the greatest contribution from indicators of analytical-synthetic thinking and processing of visual and verbal information. Discriminant analysis, taking into account the selected informative indicators, determined the range of leading markers that differentiate groups of children, including indicators of the cognitive spectrum, combining analytical and synthetic processing of verbal and visual information, and physical fitness, including manifestations of the qualities of strength and coordination.

The results of the study indicate a low level of separation of groups of 6-year-old children with different physical activity. However, playing sports from six months to 2,5 years in preschool age already forms traces of external influence, differentiating the

contribution of activity support systems to the differences between children, taking into account the type of physical activity. The greatest distinction between young athletes and untrained children is characteristic of indicators of intellectual development, which is manifested in both autonomous and complex analysis of indicators of the cognitive spectrum, reflecting the dominant role of consciousness not only in the development of skills of various properties, but also in the characteristics of learning [8]. Motor and psychomotor abilities, differing in the manifestation of the strength of the nervous system and the quality of coordination, are consistent with the priority of the importance of the development of movement control structures in accordance with the nature of motor activity, the direction of means and methods of training [9, 10].



On the contrary, the processes of growth and morpho-functional development at this age are not affected by various motor activities.

Conclusions. The data obtained allow us to assume that already at the very early stage of systematic sports activities, vectors of influence on the development of the child's body of means and methods of training in accordance with the requirements of sports appear, which takes into account the individual and age-related cognitive development of the child in the first position when planning training. The issue requires further research within the framework of long-term monitoring.

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Influence of increasing weights on the motor characteristics of running in track and out sprinter athletes

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Abstract

Objective of the study was to evaluate the influence of increasing load on the kinematic and ergometric characteristics of sprinters when performing a specific exercise, to identify the relationship of these characteristics with the results of competitive activity.

Methods and structure of the study. 16 male sprinters were examined, qualifications: I sports category - master of sports. The Optogait optical-electronic system, Witty electronic timing and Sprint 1080 traction device are used to record the ergometric and kinematic characteristics of running.

Results and conclusions. Biomechanical indicators of sprinters were identified that influence the efficiency of performing a competitive exercise (tempo 5 m, 30 m, V 30 m, Acc 30 m, tk 30 m). In subjects of various sports levels, the biomechanical characteristics of running are determined to a greater extent by speed abilities (tk5m; pace 5 m) rather than by strength abilities (Acc 30 m; W/kg). Qualitative differences in fatigue make it possible to increase the objectivity of assessing the state of athletes sports form.

Keywords: control over special preparedness, kinematic, ergometric characteristics, fatigue

Introduction. Intensification and individualization of the sports training of a highly qualified athlete cannot be realized in the absence of an objective assessment. The inclusion of control testing in the training process makes it possible to evaluate the various effects of long-term adaptation, including those that arise during delayed recovery of the athletes body [3]. Important advantages of the proposed experimental methodology are: specificity of testing, the possibility of using a testing protocol and the necessary equipment for recording and analyzing data in laboratory or field conditions [1, 2, 4].

Objective of the study was to evaluate the influence of increasing load on the kinematic and ergometric characteristics of sprinters when performing a specific exercise, to identify the relationship of these characteristics with the results of competitive activity.

Methods and structure of the study. The study was carried out on the basis of the State In-

stitution "TsSTISK" Moskomsport from May to September 2023, on a voluntary basis. 16 sprinters of different sports levels were examined (1st sports category - master of sports): age $20,4 \pm 1,8$ years; height $178 \pm 5,82$ cm; body weight $72 \pm 6,88$ kg. The heterogeneity of the sample is manifested in the division into two conditional groups - athletes specializing in short and long smooth sprints. Statistical processing: Statistica Basic Academic 13,0, MS Excel 2021. Distribution estimates – Shapiro–Wilk test; correlations – Spearman rank coefficient; intergroup differences – Mann–Whitney test; statistical significance $p \leq 0.05$.

The testing protocol involved 7 runs of maximum intensity from a low start in blocks on a 30 m long rubberized track in the hall. The work-rest time cycle is 5 minutes from the moment of finishing. Registration of kinematic parameters was carried out by an Optogait electron beam measuring system and a Witty electronic timing system (Microgate). Values were record-



ed at distances of 0–5 m from the start inclusive; 5–30 m inclusive and 0–30 m.

Registration of energy characteristics (average relative power, W/kg) of running was carried out with a traction device - Sprint 1080. Each run was performed with constant resistance throughout the entire distance and increased as follows: run № 1–1 kg (zero load), № 2–2 kg, № 3–4 kg, № 4–6 kg, № 5–8 kg, № 6–10 kg, № 7–12 kg.

The information content of specific running testing was determined by identifying correlation relationships between the integral average speed indicator over the entire distance of 30 m, the average speed indicator in the first 5 m of the distance and the results of competitive activity at 100 and 200 m. The information content of running testing was determined by the correlation between the average running speed indicator 30 m and the results of the 100 and 200 m competitions.

When considering the kinematic and energy indicators characterizing the level of special preparedness of the subjects, phases (segments) and the corresponding parameters were identified: speed of running a distance of 0–5 m (exit from the starting blocks), distances of 0–30 m (starting run), distances of 5–30 m.

The following were studied: vertical oscillation indicator (h_{5m} , cm), flight and contact indicators (tp_{5m} , tp_{30m} and tk_{5m} , tk_{30m} , s), running frequency (tempo $_{5m}$, pace $_{30m}$, sh/s), lactate concentration in capillary blood (La, mmol/l), power (25m, W/kg), running time (t_{30m} ,

s), running speed (V_{5m} , V_{30m} , m/s), acceleration (Acc $_{30m}$, m/s²), running stride length (L $_{5m}$, L $_{30m}$, cm).

The division of the total sample was made according to the median value of the average running speed identified during testing.

Results of the study and discussion. Correlation analysis revealed low information content of the indicators of the flight phase of running with the results of competitive activity (Tables 1, 2).

It turned out that it was impossible to determine the average indicators of the running stride length, flight time and vertical oscillation height in the «distance running» and «finishing» phases for a short footage of the testing protocol. The «leaving the starting blocks» and «starting run» phases involve intense and fast pushing, which is necessary to quickly reach the maximum possible running speed. The identified differences between the correlations of CA (competitive activity) 100 and 200 meters may indicate the presence of heterogeneity in the sample.

The lack of differences between the samples in terms of the level of special preparedness (flight phase of running) is the result of athletes being included in the sample not according to the typological profile, but according to the average speed for all runs (Tables 3, 4). Moreover, each group included athletes who showed both high and low running characteristics, which were often compensated by pace and pushing force.

The use of a traction device also made it possible to evaluate changes in various running charac-

Table 1. Ergometric and kinematic testing indicators

№	Parameters	Total sample			High level athletes			Reduced level athletes		
		UQ	Me	LQ	UQ	Me	LQ	UQ	Me	LQ
1	t_{30m} , s	4,53	4,64	4,85	4,47	4,56	4,63	4,71	4,88	5,17
2	V_{5m} , m/s	4,77	4,92	5,04	4,97	5,00	5,10	4,58	4,75	4,84
3	tp_{5m} , s	0,06	0,06	0,07	0,06	0,06	0,07	0,06	0,06	0,07
4	tk_{5m} , s	0,17	0,18	0,20	0,17	0,17	0,18	0,18	0,20	0,20
5	temp $_{5m}$, w/s	3,84	4,10	4,32	4,09	4,31	4,41	3,65	3,83	4,10
6	L_{5m} , cm	102	106	108	104	107	108	102	105	107
7	h_{5m} , cm	0,50	0,55	0,67	0,51	0,55	0,61	0,49	0,58	0,69
8	25 m, W/kg	7,78	8,27	8,83	8,28	8,65	8,83	6,77	7,72	8,36
9	V_{30m} , m/s	6,53	6,81	6,95	6,91	6,97	7,16	6,23	6,52	6,66
10	Acc $_{30m}$, m/s ²	0,44	0,49	0,43	0,51	0,54	0,51	0,38	0,43	0,46
11	L_{30m} , cm	148	151	154	151	153	156	147	150	151
12	tp_{30m} , s	0,09	0,09	0,10	0,09	0,09	0,10	0,09	0,09	0,10
13	tk_{30m} , s	0,14	0,14	0,14	0,13	0,14	0,14	0,14	0,15	0,16
14	temp $_{30m}$, w/s	4,15	4,32	4,13	4,36	4,39	4,36	3,86	4,13	4,22
15	La, mmol/l	6,19	7,31	8,92	7,29	8,41	10,16	5,34	6,42	7,41

Legend: UQ – 1st, LQ – 3rd quartile, Me – median.



Table 2. Correlation analysis of the results of competitive activity (CA) and indicators in the experiment

Nº	Parameters	CA at 100 m	CA at 200 m	V _{5m} , m/s	V _{30m} , m/s
1	t _{30m} , s	0,54	0,63	0,94	- 0,97
2	V _{5m} , m/s	- 0,51	- 0,55	-	0,93
3	tp _{5m} , s	0,23*	0,29*	- 0,64	- 0,67
4	tk _{5m} , s	0,56	0,64	- 0,70	- 0,62
5	temp _{5m} , w/s	- 0,59	- 0,67	0,80	0,76
6	L _{5m} , cm	- 0,08*	- 0,12*	0,49*	0,51
7	h _{5m} , cm	0,22*	0,29*	- 0,56	- 0,57
8	25m, W/kg	- 0,58	- 0,62	0,61	0,62
9	V _{30m} , m/s	- 0,60	- 0,70	0,93	-
10	Acc _{30m} , m/s ²	-0,68	- 0,72	0,80	0,92
11	L _{30m} , cm	- 0,19*	- 0,25*	0,53	0,63
12	tp _{30m} , s	0,20*	0,28*	- 0,43*	- 0,44*
13	tk _{30m} , s	0,63	0,71	- 0,75	- 0,76
14	temp _{30m} , w/s	- 0,63	- 0,73	0,80	0,80
15	La, mmol/l	-0,37*	-0,37*	0,46*	0,55

Legend: * – values below r_{crit} = 0,50.

Table 3. Difference in indicators of athletes with high and reduced levels of special preparedness in running testing

Nº	Parameters	Difference of indicators (Uamp)	Difference in %
1	t _{30m} , s	8,5	7
2	V _{5m} , m/s	8,5	5
3	tp _{5m} , s	27,5**	1
4	tk _{5m} , s	10	19
5	temp _{5m} , w/s	10	11
6	L _{5m} , cm	28,5**	2
7	h _{5m} , cm	31,5**	4
8	25m, W/kg	15	11
9	V _{30m} , m/s	0	6
10	Acc _{30m} , m/s ²	3	20
11	L _{30m} , cm	20**	2
12	tp _{30m} , s	32**	1
13	tk _{30m} , s	6	14
14	temp _{30m} , w/s	8,5	5
15	La, mmol/l	15	22

Legend: ** – no statistically significant differences

teristics and the increase in physiological fatigue. High-level athletes demonstrated a smoother decline in ergometric and kinematic running indicators after the 7th run and over all attempts in general. At the same time, running testing was more difficult for high-level subjects: the La concentration for all testing was 8,41 mmol/liter (initial – 3,47, after the 7th run – 11,07) than for subjects with lower results:

all testing – 6,42 (initial – 3,47, after the 7th run – 7,56). It is obvious that athletes of lower qualifications are not capable of achieving maximum values in physiological processes due to the level of physical fitness.

Conclusions. Biomechanical indicators of sprinters have been identified that influence the efficiency of performing a competitive exercise.



Table 4. Changes in running characteristics during testing

№	Parameters	Dynamics of characteristics between attempts 1, 3, 4, 7 (%)			
		High level athletes		Reduced level athletes	
		№ 4 (6 kg)	№ 7 (12 kg)	№ 3 (4 kg)	№ 7 (12 kg)
1	t_{30m} , s	9	21	11	27
2	V_{5m} , m/s	7	12	6	16
3	tp_{5m} , s	8	8	14	14
4	tk_{5m} , s	0	6	3	8
5	pace _{5m}	0	2	4	3
6	L_{5m} , cm	5	8	6	14
7	h_{5m} , cm	24↑	6↓	2↑	32↓
8	W/kg	145↑	271↑	89↑	252↑
9	V_{30m} , m/s	9	18	7	20
10	ACC _{30m}	20	41	17	56
11	L_{30m} , cm	6	14	5	18
12	tp_{30m} , s	4	9	2	12
13	tk_{30m} , s	4	10	1	17
14	temp _{30m} , w/s	1	3	1	5
15	La, mmol/l	68	116	43	91

Legend: ↑ – increase, ↓ – decrease in indicator by more than 5% compared to the first run.

In subjects of different athletic levels, the dependence of the biomechanical characteristics of running is determined to a greater extent by speed abilities (tk_{5m} ; $tempo_{5m}$) rather than by strength abilities (Acc_{30m}; W/kg). Qualitative differences in kinematic and physiological indicators of fatigue make it possible to increase the objectivity of assessing the state of athletes sports form.

Using this method, identification and subsequent correction of missing qualities of special preparedness allows one to increase the level of sprinters and improve competitive results.

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Automated system for collection and differentiated evaluation of functional and special physical fitness of swimmers of different level of qualifications

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Abstract

Objective of the study was to justify and develop an automated system for collecting and differentiated assessment of functional and special physical fitness of swimmers of different skill levels.

Methods and structure of the study. An automated system for collecting and differentiated assessment of swimmers preparedness (ASSOPP) has been developed. The central link in the functioning of this system is the methodology for differentiated assessment of the functional and special physical fitness of swimmers at different stages of long-term training.

Results and conclusions. The structure of an automated system consists of a «manual processes» component and an «automatic processes» component. The «manual processes» component combines the process of differentiated diagnostics of swimmers level of readiness and the process of data entry. The «automated processes» component combines a number of procedural actions carried out using specialized computer software: normalization of all entered indicators (reduction to a single scale), differentiated assessment of each entered indicator, calculation of an integrative (average) assessment of the entire set of entered indicators, ranking and comparison of assessments of individual indicators, ranking and comparison of integrative assessments, visualization of assessments of all modalities, collection and archiving of information in a data bank, issuance of information to users. It is noted that the automated system for collecting and differentiated assessment of swimmers preparedness allows, in remote access mode, to collect and differentiated assessment of the functional and special physical preparedness of swimmers of different skill levels.

Keywords: *automated system, differentiated assessment, swimmers, special physical preparedness, functional preparedness.*

Introduction. At the present stage of development, sports, including competitive swimming, are distinguished by a high level of intensification of training and competitive activity and a steady increase in sports performance [1, 5]. It is noted that record achievements in competitive swimming are demonstrated by athletes who have a unique set of morphofunctional and mental abilities [1, 5]. In this regard, the search for effective ways and methods of high-quality selection of talented athletes and their further accompaniment during many years of training is especially urgent.

The solution to this problem can be successfully accomplished with the help of constant monitoring of

the level of special physical and functional readiness of a wide range of athletes at all stages of the development of sports skills [1, 2, 12]. The use of monitoring as diagnostic tools in the system of long-term training of swimmers allows one to objectively assess the level of functional and special physical fitness of athletes and, on this basis, effectively manage the training process [1]. At the same time, diagnostics and assessment of all aspects of athletes' preparedness should be built using modern informative methods and automated technologies based on specialized software [12]. However, at present in Russian swimming there is no comprehensive automated system for dynamic



monitoring of the level and dynamics of swimmers' preparedness, and the manual method of diagnosing and assessing the data obtained significantly reduces the possibility of analyzing information.

At the same time, dynamic monitoring of swimmers' preparedness can now be implemented with the help of modern information and communication technologies [3].

Thus, it seems extremely relevant to develop and implement information systems for monitoring the condition and readiness of athletes of all qualification levels.

Objective of the study was to justify and develop an automated system for collecting and differentiated assessment of functional and special physical fitness of swimmers of different skill levels.

Methods and structure of the study. Currently, digital transformation of all aspects of physical education and sports activities is being carried out. New approaches to diagnosing and assessing the preparedness of those involved in physical culture and sports are being developed. For example, a number of automated systems for dynamic monitoring of the state and physical fitness of the body have been implemented in a number of areas of physical education and sports training, which have shown their effectiveness [6, 7, 10, 11, 12].

An automated system for collecting and differentiated assessment of swimmers' preparedness (ASSOPP) was studied. The central link in the functioning of this system is the method of differentiated assessment of the functional and special physical fitness of swimmers at different stages of long-term training, developed and described by us earlier [8, 9].

Results of the study and discussion. ASSOPP consists of a «manual processes» component and an «automatic processes» component.

The «manual processes» component combines the process of differentiated diagnostics of the level of functional and special physical fitness of swimmers using a developed set of tests and samples. The key component of the diagnostic complex is swimming tests assessing various aspects of energy supply to muscle activity, developed on the basis of the results of our own research and data from literature sources [1, 4, 13].

The athlete data entry process ensures the creation of «passport» data and the results of all tests. In this case, the information is entered through remote access of an authorized user to the personal

account of the online service located on a special website.

The «automated processes» component combines a number of procedural actions carried out using specialized computer software.

After entering data on the test results, the functionality of the computer program sequentially and automatically carries out the following processes:

- normalization of all input indicators (all test results of different sizes and different modalities are brought to a single scale);

- assessment of each indicator, differentiated depending on the individual typological characteristics of the swimmer, the main method of swimming, distance specialization and skill level on a special scale, taking into account the ranking (weight) coefficient reflecting the significance of a specific indicator for ensuring special physical performance (sports result) at a certain level of preparedness;

- calculation of the integrative (average) assessment of the entire set of entered indicators;

- ranking and comparison of estimates of individual indicators in a series of dynamic repeated measurements and in comparison with the indicators of other examined athletes;

- ranking and comparison of integrative assessments of each examined athlete both in the dynamics of successive measurements and in comparison with other examined athletes;

- visualization of assessments of all modalities (assessments of individual indicators, integrative assessments, dynamics of assessments in repeated measurements, etc.). At the same time, it is possible to receive assessment information both in digital and analog (graphic) form;

- collection and archiving of information in a data bank located on a special server;

- delivery of information to users, as well as data entry, is carried out through remote access via the Internet. In this case, both the entire volume of information and only part of it may be available, depending on the user's status.

Conclusions. Thus, the well-founded and developed ASSOPP allows, in remote access mode, to collect and differentiate in an automatic mode the functional and special physical fitness of swimmers of different skill levels. Based on the assessment of testing data and their ranking, it is possible to more effectively carry out selection and sports selection in children's and youth swimming, form ratings of swim-



mers, and form national teams of all levels. In addition, a comprehensive assessment of the various components of the functional and special physical fitness of swimmers will make it possible to quickly, if necessary, adjust training influences and optimize training management. For the practical implementation of the functionality of the proposed automated system, it is necessary to resolve a number of issues of an administrative and managerial nature, staffing, and information security. ASSOPP should act as a distributed system at the federal or departmental level with regional segments.

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Digital educational content «moscow electronic school» in the students learning and training process

UDC 796



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Abstract

Objective of the study was to justify the introduction of digital tools for learning the content of the «Moscow Electronic School» (MES) in the practice of the educational and training process of students for the accelerated development of new types of sports.

Methods and structure of the study. The experiment took place on the basis of the Russian Economic University named after G.V. Plekhanov and Financial University under the Government of the Russian Federation. Two equal groups were created: experimental (N1, n=50) and control (N2, n=50). In group N1, digital learning tools «Libraries of electronic materials» of digital educational content «Moscow Electronic School» (MESH) have been implemented: video files, images, audio files, arranged in thematic blocks by sections of training, levels of training. In group N2, traditional learning technologies were used.

Results and conclusions. The use of the educational content «Moscow Electronic School» (MES) in the practice of the educational and training process in the elective discipline Physical culture and sport in the university increases the effectiveness of the educational process due to the use of digital learning tools and information computer technologies in the real conditions of the educational and training class and in a remote format; for the teacher – a selection of electronic scenarios of the educational and training session in accordance with the preparation section, the level of preparedness of the participant at the current moment; for a student who has started to master a new kind of sport - to quickly and correctly form an idea about a new element of technique and implement it in motor activity with a minimum number of errors; raise the level of physical and functional preparedness independently.

Keywords: *Moscow Electronic School (MES), digital learning tools, distance learning.*

Introduction. The social order of the Government of the Russian Federation on the strategic direction in the field of digital transformation of physical culture and sports until 2030 (Order of the Government of the Russian Federation dated February 7, 2024 No. 264-r) involves the collection of data in the field of physical culture and sports, carried out in electronic form, including through information systems used by government authorities of the constituent entities of the Russian Federation. The digital ecosystem in this industry is just being formed, despite the fact that digital technologies have been successfully used in the field of education for a long time. As an example, the structure of digital educational content «Moscow Electronic School» (MES), which in the modern digital education ecosystem of Russia represents a unique repository of

educational electronic materials and tools that combine traditional education and digital technologies, allowing all participants in the educational process to learn and teach in a new way. The use of digital learning tools of the «Moscow Electronic School» in non-sports universities in the discipline of Physical Culture and Sports is relevant in modern conditions [1, 2, 6, 8]. Firstly, many students choose new sports to practice; secondly, by the end of the first semester (after about 4 months), students need to receive their first pass in their chosen sport. Accordingly, a contradiction arises between the time limit allotted for learning new technical elements of a sport and the requirements for the result of mastering. The advantages of the content are: a new format for interaction between student and teacher; modern technologies in education; availabil-



ity of electronic educational materials; the ability to access content from any computer connected to the Internet; the ability to create your own training lesson scenario, work remotely, and use the «Library of Electronic Materials». The content of the Moscow Electronic School is recognized by the Russian and foreign communities. The list of awards includes: Runet Prize in the category «Science and Education» (2017); handerDB «100 best global innovations in education»; Runet Award in the category «Technology vs Corona Virus» (2020); Competition of Russian developers «Digital Peaks» (2020); International IT World Awards in the category «Team of the Year during COVID-19».

Objective of the study was to justify the introduction of digital tools for teaching the content of the «Moscow Electronic School» (MES) into the practice of the educational and training process of students for the accelerated development of new sports.

Methods and structure of the study. The experiment took place on the basis of the Russian Economic University named after G.V. Plekhanov and the Financial University under the Government of the Russian Federation from September 2021 to May 2023. Two equal groups were created: experimental (N1, n=50) and control (N2, n=50).

To solve the problems, the following research methodology was used:

Diagnosis of technical readiness was carried out using standard tests used in the training of athletes at the initial stage of training. In particular, in the «Basketball» section, we used materials on teaching techniques for the basic elements of entry-level basketball (stands, dribbling the ball on the spot and in motion, throwing on the spot and on the move, passing the ball). A total of 11 technical elements were selected, rated on a 6-point scale of the form: 5, 4, 3, 2, 1, 0.

Diagnosis of the level of functional readiness of students during the learning process was carried out using electronic fitness bracelets «Qumann QSB 10». The following methods were used: pulsometry (to determine the level of individual functional fitness); timing (to measure time spent on certain activities).

Indicators of the level of physical fitness were recorded in the developed «Health Card» of the student.

To determine the level of satisfaction of students and teachers with the digital learning tools of the Moscow Electronic School (MES) platform, a digital constructor for online surveys «EXAMINARE» was used. The questionnaire contained questions to determine the level of readiness of teachers to use new digital

educational technologies in the educational and training process in real conditions of an educational and training session; for students - to train independently in a distance format.

Group N1 has implemented digital learning tools «Libraries of electronic materials» of digital educational content «Moscow Electronic School» (MES): video files, images, audio files, organized into thematic blocks by sections of training, levels of training. To increase the level of functional and physical fitness of students in conditions of independent work in a remote format, video sets of exercises were individually selected for each student and links were attached to the educational portal. In group N 2 traditional teaching technologies were used.

The results of testing (cuts) of technical, physical and functional readiness of students of groups N1 and N2 were carried out in September, December, February, May.

Since it is not possible to install the interactive panel of digital educational content «Moscow Electronic School» in the gym, we installed a computer with Internet access and a portable screen to demonstrate the educational material of the digital educational platform «Moscow Electronic School» (MES) in real conditions of the educational and training classes.

Results of the study and discussion. In group N1, by the end of the school year, the average score for correct execution of technical elements was 4,85 points. The increase in the indicator of correct execution of technical elements was 2,76 points, respectively, it significantly improved by 49% ($p < 0,05$). In group N2, the average score for correct execution of technical elements was 3,2 points, which corresponded to an unreliable improvement of 0,95 points ($p > 0,05$).

Indicators of physical fitness of students in group N1 significantly improved ($p < 0,05$); in group N2 they improved insignificantly ($p > 0,05$).

The coefficient of variation gradually decreased from 7,93% to 4,20%, which confirms the reliability of the rating scale. In group N1 students, the restoration of heart rate (HR) to initial values at the beginning of the academic year was 33 beats/min; at the end of the school year - 20 beats/min. The increase in the indicator significantly improved and amounted to 3,9% ($p < 0,05$). In group N2 students, the restoration of heart rate to initial values at the beginning of the academic year was 36 beats/min; at the end of the school year 33 beats/min. The increase in the indicator did not significantly improve and amounted to 0,8% ($p > 0,05$). A



good level of physical and functional fitness is a reliable foundation for quickly and correctly mastering the technique of a new motor action.

Conclusions. Digital learning tools of the Moscow Electronic School platform are effective in university practice. The introduction of digital tools for teaching the content of the «Moscow Electronic School» (MES) into the practice of educational and training sessions for students at a university allows you to quickly and correctly teach the elements of technique of a new sport; select an individual program to improve physical and functional fitness, work independently in a remote format. The use of digital tools for teaching educational content «Moscow Electronic School» (MES) in the practice of the educational and training process in the elective discipline Physical Culture and Sports at a university increases the efficiency of the educational process due to: 1) the use of digital teaching tools and information computer technologies in real educational conditions. training sessions and in distance format; 2) for the teacher - selection of electronic scenarios for educational and training sessions in accordance with the section of training, the level of preparedness of the student at the moment; 3) a student who has begun to master a new sport - quickly and correctly form an idea of a new element of technique and implement it in motor activity with a minimum number of errors; increase the level of physical and functional fitness independently.

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Features of the hemodynamic state in female athletes with disabilities

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Abstract

Objective of the study was to identify the features of the hemodynamic state and aerobic performance of athletes with disabilities to optimize the training process.

Methods and structure of the study. Hemodynamic parameters and the results of stress testing were studied in athletes with disabilities involved in cyclic sports (skiing, athletics, swimming and orienteering (n=59). All data obtained were further compared with similar indicators of healthy female racers (n =89).

Results and conclusions. It was revealed that, despite the fact that a decrease in resting heart rate determines the physiological adaptation of the cardiosystem to regular training in endurance sports, no significant differences in heart rate in the orthotest were found in the groups of examined female athletes. When analyzing the functional state of athletes, it is advisable to take into account the parameters of the hemodynamic state, especially in the vertical position of the body. For the full development of the sports potential of athletes with disabilities, stage-by-stage comprehensive control in the training process and its individualization are necessary.

Keywords: *hemodynamic monitoring, athletes, cyclic sports, health limitations, hemodynamic condition*

Introduction. Success in sports depends on many factors, including the body's reserves and the state of life-support systems [1, 2]. Moreover, the cardio-respiratory system, in the context of sports at all levels of training and in various sports specializations, is one of the leading ones and determines the achievement of high sports results. Considering the fact that adaptive sports is one of the important directions in the development of the sports movement in the world, understanding the characteristics of the internal state of athletes with disabilities will allow us to determine the direction of the training process and the realization of the sports potential of this group of people. Hemodynamic monitoring is one of the informative and accessible methods for assessing the functional state of the cardiorespiratory system, manifestations of its adaptation to training loads in order to timely adjust the training process.

Objective of the study was to identify the features of the hemodynamic state and aerobic performance of athletes with disabilities to optimize the training process.

Методика и организация исследования.

The scientific work was carried out on the basis of the laboratory of "Functional testing and comprehensive control in sports" of the Institute of Physical Culture and Medicine of UrFU. The hemodynamic state was assessed in an active orthotest using the monitor of a resuscitator-anesthesiologist MARG-10-01 (Microlux, Russia) and veloergospirometry using a FitmatePRO metabolograph (COSMED, Italy) and a stress testing system SHILLER AG (Switzerland) according to the maximum test protocol with continuously increasing load. The study involved 59 athletes with disabilities involved in cyclic sports (cross-country skiing, athletics, swimming and orienteering), as well as 89 healthy female racers. Both groups of athletes were divided into the same age subgroups, while all the girls successfully performed at official regional competitions in selected sports and had age-appropriate training experience. The group of athletes with disabilities consisted of individuals with varying degrees of severity of hearing and vision impairment. Anthropometric data of groups of female athletes are presented in table 1.



Table 1. Anthropometric data of female athletes of the study groups

Age	Groups	Number, persons	Weight, kg	Growth, cm	BMI, kg/m ²
11-12	Disabilities	16	44,65±5,33 (38,2–52,8)	154,42±5,39 (146–162,5)	18,67±1,2 (17,2–20)
	Female skiers	12	42,57±8,39 (33–54,1)	154,29±6,95 (143–162,5)	17,9±2,21 (16,2–21)
13-14	Disabilities	14	56,15±6,81 (46,9–62,2)*	164,5±8,58 (155–174)*	21,6±2,01 (19,5–23,5)*
	Female skiers	26	56,05±8,47 (42–72)**	167,04±7,13 (156,5–180)**	20,3±1,97 (18,1–23,8)*
15-17	Disabilities	14	49,63±10,19 (38,4–63,1)	162,5±10,85 (147–170)	19,4±2,12 (17,8–21,8)
	Female skiers	36	59,17±6,88 (47,1–68)	168,36±8,21 (154–177,5)	20,73±1,77 (17,3–22,6)
18-20	Disabilities	15	55,12±9,07 (44–64,8)	166,8±6,14 (159–174)	19,7±1,88 (17,4–21,7)
	Female skiers	15	57,97±5,73 (45–69)	168,18±4,14 (162–175)	20,96±1,09 (19,6–22,9)

*differences are significant ($p < 0,05$) between the marked group and the previous age group

**differences are significant ($p < 0,01$) between the marked group and the previous age group

In the process of hemodynamic monitoring in an active orthotest using the rheovasography method with synchronous ECG recording, indicators such as heart rate (HR, beats/min), stroke volume (SV, ml), end-diastolic volume (EDV, ml), and of course -diastolic index (CDI, ml/m²) in the supine and standing position [3]. Since SV and EDV are proportionally related to each other by the ejection fraction, and also to level the anthropometric indicators of athletes, the relative EDV, equal to the ratio of EDV to body surface area, was chosen as the main hemodynamic indicator.

When analyzing the results of bicycle ergospirometry, we analyzed indicators that were more dependent on the hemodynamic state, namely the relative power at the aerobic threshold (AeP power, W/kg), MIC, ml/min/kg and the rate of heart rate recovery (bpm) after testing.

Statistical data analysis was carried out using Excel software packages (Microsoft Office 2016). The mean (M), standard deviation (SD), minimum and maximum values were calculated. Comparative analysis was carried out using Student's t-test; differences were considered significant at $p < 0,05$.

Athletes who took part in the study were informed about the goals and methodology of the study, which was conducted in accordance with the principles of the 2013 World Health Organization Declaration of Helsinki. All participants and/or their official representatives gave written voluntary informed consent to participate in the study in an anonymized form, as well as further processing of the obtained data for scientific purposes.

Results of the study and discussion. According to hemodynamic monitoring data in an active orthotest in groups of athletes with disabilities, despite the age-related decrease in heart rate typical of athletes of cyclic sports, no significant decrease in either the lying or standing heart rate was detected (Table 2).

The end-diastolic volume of the heart in the supine position in female athletes with disabilities increases from 112.17±7.31 (100–121) ml at 11-12 years old to 150±32.9 (117–202) ml in the group of female athletes 18 -20 years. A significant increase in the supine CDI occurs in training athletes with disabilities at the age of 13-14 years compared to 11-12 years, however, at an older age, no significant changes in either the supine CDI or the standing CDI were detected. At the same time, the KDI of female racers has a constant significant increase, increasing by 20% from the age of 11-12 years to 20 years. If at the age of 11-12 years the CDI of lying and CDI of standing in athletes with disabilities and healthy athletes did not have significant differences, then at the age of 13-14 years the CDI of standing of female skiers was significantly higher, and at an older age there was a tendency for a significant superiority of CDI of female skiers over athletes with HIA applies to both positions: lying down, as in medical examinations, and standing, as in competitive activities.

A reliable dependence of high physical performance [1, 2] on large volume parameters of the heart has been established. However, in athletes with disabilities, despite sufficient volumetric parameters of the cardiosystem in the supine position at the ages of 13-14 years and 18-20 years, a significantly low power at



Table 2. Age-related features of the hemodynamic state of female athletes involved in endurance sports

Age, years	Groups	Heart rate, bpm		CDI, ml/m ²		MOC, ml/min/kg
		Lying down	Standing	Lying down	Standing	
11-12	Disabilities	70,33±5,2 (65–80)	86±6,07 (78–94)	81±6,96 (69–90)	70,17±4,67 (65–77)	45±6,61 (37,5–53,9)
	Female skiers	65,75±4,59 (59–75)	82,83±10,84 (65–99)	86,75±6,62 (77–99)	73,83±6,15 (66–83)	45,4±5,16 (36,8–49,1)
13-14	Disabilities	60±12,25 (45–75)	74,25±20,01 (54–100)	94,25±3,2 (91–97)**	75,75±7,5 (68–86)	43±7,48 (37–51,4)
	Female skiers	62,11±7,53 (48–76)	79,28±10,57 (56–90)	95,83±4,74 (87–104)*	81,78±7,2 (68–96)	53,1±9,15 (36,2–72)
15-17	Disabilities	64,25±2,22 (61–66)	81,25±8,06 (70–88)	90,75±10,21 (85–104)	72,75±9,84 (60–84)	54,1±4,66 (50,3–59,3) *
	Female skiers	57,9±6,65 (46–73)	75,27±9,06 (60–88)	99,92±5,98 (85–113)*	82,06±6,77 (70–94)	53,8±5,94 (44,7–68,5)
18-20	Disabilities	56,2±13,55 (37–72)	73,2±15,66 (46–86)	94,6±12,5 (82–114)	81,6±12,36 (63–97)	48,1±9,12 (35–56,3) *
	Female skiers	55,44±5,2 (47–65)	71,44±7,89 (54–78)	103±10,17 (91–120)*	86,78±5,8 (82–100) *	53,83±3,25 (49–59,2)

* differences are significant ($p < 0.01$) between the marked group and the previous age group

**differences are significant ($p < 0.05$) between the marked group and the previous age group

▲ the differences are significant ($p < 0.05$) between the group of healthy athletes and athletes with disabilities

the aerobic threshold was revealed relative to healthy athletes, reduced power at the ANNO and, accordingly, the power of the VO_2 max, which is determined low oxygen consumption. The probable reasons for low powers at the physiological thresholds of energy supply are not strength abilities, but insufficiently high CDI standing, limiting the aerobic abilities of female athletes. At the same time, female athletes of the same age do not have significant differences in heart rate values on AeP and PANO, and also have an equally high recovery rate (more than 30 beats/min).

The average value of modulators that describe the hemodynamic state of athletes, namely volemia (fullness of the vascular bed, or the correspondence of the volume of circulating blood to the volume of the vascular bed), inotropy - the force of contraction of the heart muscle and vascular tone in groups of athletes of the same age did not have significant differences.

It is important to note that the coefficient of variation (the ratio of the standard deviation to the mean value) in groups of young athletes with disabilities is in the range of 3-10%, and in the age groups of 15-17 years and 18-20 years of athletes with disabilities it is 13-15%, that is, in older groups of athletes with disabilities, the data varies more widely. Thus, the data obtained justify the need to individualize the training process of athletes with disabilities with stage-by-stage complex control for timely correction in the training process.

Conclusions. Despite the fact that a decrease in resting heart rate determines the physiological

adaptation of the cardiosystem to regular training in endurance sports, no significant differences in heart rate in the orthotest were found in the groups of female athletes examined. When analyzing the functional state of athletes, it is advisable to take into account the parameters of the hemodynamic state, especially in the vertical position of the body. For the full development of the sports potential of athletes with disabilities, stage-by-stage comprehensive control in the training process and its individualization are necessary.

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Blood lactate profile when highly qualified swimmers perform a special serial test

UDC 796.11

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Abstract

Objective of the study was to assessment of the relationship between the lactate profile and the level of development of special endurance, which determines the competitive results of highly qualified swimmers.

Methods and structure of the study. Athletes performed a serial swimming test 8x200 m in a 5-minute mode with intensity from low to maximum. The values of the rate of lactate accumulation in the blood determined the nature of the curve depending on the swimming speed. Lactate tolerance was defined as the differential rate between blood lactate concentrations of 5.0 and 10.0 mM (LT 5–10).

Results and conclusions. Analysis of blood lactate levels obtained during the 8x200m swim test revealed significant improvements in endurance performance over a one-year training cycle. Improvement in lactate parameters is associated with an increase in maximum 200 m swimming speed under training conditions; the relationship between the blood lactate profile and changes in competitive results is insignificant.

Keywords: *highly trained swimmers, blood lactate profile, special endurance*

Introduction. In endurance sports, blood lactate profile analysis is widely used to monitor changes in athletes fitness levels. Most of the work is aimed at identifying the lactate threshold (LT), which characterizes the intensity of physical activity at which a rapid increase in blood lactate levels occurs. A stable value of lactate concentration acts as a criterion for assessing special endurance [5].

The traditional approach is to construct curves of the rate of blood lactate accumulation based on repeated exercise tests. In this case, the curves are checked for the significance of improvement, stabilization or deterioration of sports form over time [6].

The characteristic shift of the lactate-velocity curve to the right is hypothesized to reflect training-induced improvements in endurance performance. To provide a more objective approach, researchers have proposed a number of different quantitative procedures

to calculate the rate or power output of the lactate threshold [1, 7].

It has been proven that the dynamics of blood lactate and LT are objective criteria for assessing the state of sports form and the basis for modeling the frequency of training and predicting the results of the training process [2, 4].

Despite the fact that a multi-stage construction of a blood lactate profile is representative for diagnosing the functional readiness of swimmers, the question of the relationship between the obtained data and the results of competitions is relevant [3].

Objective of the study was to assessment of the relationship between the lactate profile and the level of development of special endurance, which determines the competitive results of highly qualified swimmers.

Methods and structure of the study. The test group included 10 highly qualified male swimmers



aged $20,5 \pm 0,5$ years, specializing in various swimming methods.

The educational and training process was carried out on the basis of 10 workouts per week, including a combination of aerobic and sprinting loads. The average training volume of swimming was $50,6 \pm 7,4$ km per week.

To assess the level of development of special endurance, athletes performed a serial test in swimming 8×200 m in a 5-minute mode with intensity from low to maximum. The final eighth segment was performed with maximum swimming intensity; the speed of its passage was a criterion for assessing the athlete's functional readiness.

The test included step-by-step recording of indicators on the basis of which cardiovascular (heart rate), metabolic (blood lactate) and biomechanical (frequency and number of strokes) responses to an increase in swimming speed were assessed. During the annual macrocycle, swimmers were examined four times. Testing was carried out in a 50-meter pool.

The swimmers were tasked with maintaining an even pace and the same swimming time during the first 100-meter segment and in the final half of the distance.

Immediately after the completion of each segment, heart rate was measured using a Polar Sports PE tester (Finland). Individual perceived exertion (RPE) was assessed using the Borg Perceived Exertion Scale. Lactate concentration was measured using an Accusport blood lactate analyzer (Germany).

Blood lactate values for each test were plotted against swimming speed. Lactate velocity curve analysis included velocity at LT (VLT), calculated as a function of the slope and axis intercept of the lactate velocity curve. Lactate tolerance was defined as the differential rate between blood lactate concentrations of 5,0 and 10,0 mM (LT 5–10).

Results of the study and discussion. The maximum swimming speed at a distance of 200 m during training increased from $139,7 \pm 4,2$ s to $136,9 \pm 3,7$ s. The same results, expressed as a percentage of the best personal time of each swimmer, were $91,6 \pm 2,6\%$ (1st test); $91,9 \pm 0,7\%$ (2nd testing); $92,4 \pm 5,5\%$ (3rd testing); and $94,3 \pm 2,6\%$ (4th testing).

The obtained lactate values were $69,6 \pm 4,3$ mM (1st test); $71,7 \pm 4,2$ mM (2nd testing); $72,7 \pm 3,2$ mM (3rd test); $71,6 \pm 4,1$ mM (4th testing).

The lactate tolerance rating (LT 5-10), defined as the difference between the lactate concentration rate

of 5,0 and 10,0 mM, decreases mid-season: $5,9 \pm 0,3$ s/100 m (1st test); $6,8 \pm 0,2$ s/100 m (2nd testing); $7,7 \pm 0,3$ s/100 m (3rd testing); $6,4 \pm 0,2$ s/100 m (4th testing).

The relationship between changes in LT, competition performance and maximum swimming speed in training was studied. A significant relationship was observed between change in VLT and LT 5 ($r = 0,78$); between change in VLT and swimming speed ($r = 0,79$); between early season VLT improvement and overall LT improvement 5-10 ($r = 0,65$). Changes in VLT and LT 5-10 throughout training were also significantly correlated ($r = 0,69$).

Analysis of blood lactate levels obtained during the 8×200 m swim test revealed significant improvements in endurance performance over a one-year training cycle. Derived measures of LT and exercise capacity improved in parallel with maximal training performance, highlighting the representativeness of the use of all three measures of functional status in elite swimmers. While improvements in lactate parameters are associated with increases in maximum 200 m swim speed during training, the relationship between blood lactate profiles and changes in competitive performance is not significant.

The small range of changes observed in swim speed (2,5%) and VLT (3%) throughout the 20-week season indicates little change in swimmers' specific fitness.

The fact that improvements in VLT early in the season correlate with improvements in LT 5-10 late in the season supports the widely held belief that base endurance and LT should be developed in more specific and more intense training regimens that maximize oxygen uptake and tolerance lactate. Deterioration in LT 5-10 mid-season may reflect improved lactate clearance, disruption of glycolytic flux, or possibly chronic depletion of muscle glycogen as a consequence of high training volumes.

Improvements in VLT and LT 5-10 over the course of the season indicate that the training program was effective in developing various aspects of endurance. The parallel improvement in swimming speed during training supports the idea that fitness levels and performance can be improved, including in highly skilled swimmers.

Competition results showed that performance levels remained virtually unchanged between the two main competitions included in this study.

The lack of correlation with improved perfor-



mance may also be due to the relative specificity of the 8x200m swim test when assessing performance in sprint swimming.

Conclusions. The study of the relationships between data obtained during diagnostics, training and competitive results shows that testing is an informative means of monitoring changes in indicators of special preparedness and training results. The results of this study indicate that current physiological testing of blood lactate levels is quite accurate in diagnosing changes in endurance performance in elite swimmers, but these measures are not fully related to competitive performance in sprint swimming.

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Dynamics of homocysteine precursors and methylation index in high-class biathletes at the stages of the preparatory period of the annual cycle

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Abstract

Objective of the study was to identify the dynamics of S-adenosylmethionine, S-adenosylhomocysteine and methylation index in high-class biathletes at the stages of the preparatory period of the annual cycle.

Methods and structure of the study. Participants in the experiment are athletes of the Russian national biathlon team (n=23). Quantitative analysis of homocysteine precursors in blood samples of study participants was performed on an ultrafast liquid chromatography-mass spectrometer with triple quadrupole LCMS-8060 (Shimadzu, Japan).

Results and conclusions. The features of the dynamics of the concentrations of homocysteine precursors and the methylation index were studied within the preparatory period of the annual cycle of high-class biathletes. At the stages of the preparatory period of different orientation, intensity and specificity of the preparation means used, the frequency of occurrence of cases of a reduced level of the methylation index was revealed: at the general preparatory stage – 14,52%, at the special preparatory stage – 32,26%, at the pre-competition stage – 5,00%. It was established that the decrease in the methylation index during the training period under consideration is due to a shift in the direction of training loads towards high-intensity motor modes.

Keywords: *methylation index, S-adenosylmethionine, S-adenosylhomocysteine, biathlon, preparatory period.*

Introduction. Various physical exercises induce changes in circulating inflammatory RNAs and microRNAs previously proposed as biomarkers of heart disease [2]. Several studies have reported elevated levels of homocysteine (Hcy) in the blood of athletes in endurance sports [5, 7], which were negatively correlated with work time [3]. At the same time, there is no consensus regarding the effect of regular physical exercise on Hcy content due to the high variability of loads used by athletes in the annual training cycle, which differ in intensity, duration and modes of muscle work.

Hcy is a non-protein sulfur-containing amino acid, the increased concentration of which in plasma is a risk factor for cardiovascular diseases (CVD) caused by endothelial dysfunction, oxidative stress mechanisms and inflammatory vascular processes [5]. Hcy is

also associated with one-carbon metabolism and epigenetics through S-adenosylmethionine-dependent (SAM) DNA methylation [6], the product of which is S-adenosylhomocysteine (SAH), which can be transformed to Hcy. The latter is converted into methionine through the process of remethylation, followed by potential conversion to SAM, thus completing the methyl donor cycle. High bioavailability of SAM is necessary for the synthesis of methyl compounds spent during training for recovery (DNA, adrenaline, acetylcholine, carnitine, creatine) [4] and the synthesis of creatine phosphate, an energy source for muscle contraction [10]. SAH and its hydrolysis product, Hcy, are biological inhibitors of transmethylation. Because of this tightly coupled metabolism, biochemistry and medicine have considered SAM, SAH, and their ratio as an indicator of cellular methylation potential or ca-



capacity index [8] and have proposed their use as sensitive markers for CVD prognosis [10]. At the same time, studies aimed at studying the influence of high-intensity physical activity performed by athletes as part of the training process on the dynamics of the levels of Hcy precursors and the methylation index have not been previously conducted.

Objective of the study was to identify the dynamics of SAM, SAH and the methylation index in high-class athletes specializing in CVS (using the example of biathlon) at the stages of the preparatory period.

Methods and structure of the study. The experiment involved 23 athletes undergoing centralized training as part of the Russian men's national biathlon team (age – 25,29±3,20 years; body weight – 76,02±7,60 kg; body length – 179,5±6,7 cm; relative content of muscle and fat mass, respectively, 51,58±1,59% and 9,45±1,45%; MIC per kg of body weight – 69,61±6,65 ml/min/kg.). All participants were healthy; at least 24 hours before the examination, they were prohibited from performing developmental loads of a cyclic and strength nature. The study was approved by the ethics committee of the Federal Scientific Center VNIIFK (protocol No. 2 of April 1, 2021) and was conducted in accordance with the Declaration of Helsinki. The work was carried out within the framework of the state assignment of the Federal Scientific Center VNIIFK No. 777-00001-24 (subject code No. 001-22/3).

Biochemical control was carried out at the stages of the preparatory period of the annual training cycles of athletes 2021–2023. Quantitative analysis of SAM and SAH in plasma was performed on an ultrafast liquid chromatography mass spectrometer with triple quadrupole and external heated flow electrospray ionization source LCMS-8060 (Shimadzu, Japan).

Results of the study and discussion. The average SAM concentration calculated at the stages of the preparatory period was in the range of 38,54±5,84 ng/ml, which corresponds to the physiological norm for healthy untrained individuals [1]. Statistical analysis did not reveal significant differences between the levels of SAM concentration in the plasma of highly qualified biathletes within the stages of the preparatory period.

In the dynamics of SAH concentration on average for the group of biathletes during the training period under consideration, a more pronounced wave-like character was noted. The average group concentration of SAH at the end of the general preparatory stage (GPE) had a slight tendency to decrease, but did not

reach a significant value. At the beginning of the special preparatory stage (SPE) (in July), its value was the highest for the entire period and significantly higher than at the previous stage of preparation (April–June) and the pre-competition stage (PSE) ($p < 0,05$). There was also a significant ($p < 0,05$) increase in SAH during preparation for the SPE. When moving from SPE to PSE, the concentration of SAH decreased, but only at the trend level ($p > 0,05$). On average for the group, the methylation index at the beginning of the SPE (July) was significantly lower than the same parameter at the SPE and PSE ($p < 0,05$), while no significant differences were found within the SPE itself ($p > 0,05$). The methylation index in the middle of the EPE (August) was significantly lower relative to the values measured at the end of the EPE (June) and at the ESE (October) ($p < 0,05$).

As part of the OPE of the annual cycles under consideration, athletes performed physical exercises mainly in a low-speed motor mode under normoxic conditions. Starting from the second half of the stage (from June), the specificity of the exercises gradually increased, determined by the degree of their similarity to the competitive movement in the mode of muscle work, and the proportion of exercises simulating individual phases of the competitive movement and performed with increased intensity of muscle effort increased. During the SPE, the specificity of the muscle work mode in exercises biomechanically similar to competitive exercises increased even more: from low-speed, high-intensity to high-speed, high-intensity modes, simulating competitive and super-competitive motor modes of muscle work. In September, the final month of SPE, the intensity of the muscle work regime reached its maximum, with high-intensity exercises performed under hypoxic conditions.

The identified features of the dynamics of SAH concentration and methylation index in biathletes in terms of the training loads performed, differing in the modes of muscle work, allow us to conclude that the use of variants of low-speed modes of work – low-intensity and high-intensity – in the OPE does not entail a decrease in the functional capabilities of the cardiovascular system. A shift in the direction of training loads towards high-intensity motor modes, characteristic of SPE, leads to an increase in SAH concentration and a decrease in the methylation index.

Previous studies have found that a decrease in the methylation index to 4,4 and below is associated with



oxidative stress and impaired endothelial nitric oxide synthesis [9]. Using this criterion as a grouping variable when conducting frequency analysis in our pilot study, it was possible to identify differences between the stages of the preparatory period in the frequency of occurrence of cases of decreased methylation index in this group of biathletes: in the OPE – 14,52%, in the SPE – 32,26% , on PSE – 5,00%. Taken together, the features of the dynamics of the methylation index identified in the study with changes in the direction and intensity of the load at the stages of preparation allow us to consider this indicator as one of the markers of the functional state of the CVS of athletes of the central nervous system.

A decrease in the cardiorespiratory performance of athletes with a shift in the direction of training loads could theoretically be associated with the accumulation of SAH. By causing feedback inhibition of SAM-dependent methyltransferases, an increase in SAH concentration can affect the pattern of DNA methylation and gene expression, as well as induce apoptosis in endothelial cells [11], contributing to a decrease in the functionality of the cardiovascular system under the influence of high-intensity cyclic loads localized in this area. preparation stage.

Conclusions. For the first time, a quantitative determination of the concentrations of SAM and SAH in the plasma of high-class biathletes was carried out, the methylation index was calculated, and differences in the nature of the dynamics of indicators of this complex were identified within the preparatory period of the annual cycle. It has been established that a decrease in the methylation index at the stages of the preparatory period is associated with a shift in the direction of training loads towards high-intensity motor modes.

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Diagnostics of psychoemotional readiness for competitive activities of young basketball players

UDC 796

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Abstract

Objective of the study was to assess the level of personal anxiety, self-esteem and the state of mental reliability of young basketball players.

Methods and structure of the study. The basis for the study was the Olympic reserve sports school «Kupchinsky Olympus» in the Frunzensky district of St. Petersburg (hereinafter referred to as «Olympus»). 10 girls born in 2009 of the training stage group (sports specialization stage) «Olympus» took part in the survey. To conduct the study, two Spielberger questionnaires were used.

Results and conclusions. The results of the first survey (Study of situational anxiety) showed that a high level of anxiety was detected in 40% of respondents, 40% had an average level of anxiety, and 20% had a low level of anxiety. The results of the second questionnaire (Self-Assessment of Anxiety) did not reveal a low level of anxiety among players in general, 60% of girls were identified with an average level, and 40% with a high level of anxiety. The average level of mental reliability for the four components was determined as follows: a reduced level of reliability compared to the average data for 20% of respondents, an average level for 40%, and an increased level of reliability for 40% compared to the optimal data.

Keywords: *research, mental reliability, anxiety level, emotional stability.*

Introduction. The concept of «readiness for competitive activity» is more often considered as a synthesis of physical, functional, technical, tactical and mental components of readiness (N.S. Bezrodnaya, Yu.M. Bludov, V.V. Ivanov, G.I. Mokeev, N.N. Pilyuk, V.A. Plakhtienko).

In psycho-emotional readiness, the determining components are most often the level of the athletes anxiety and his mental reliability. Anxiety is an individual psychological feature that manifests itself in a persons tendency to experience frequent and intense anxiety. In sports, anxiety determines the individual sensitivity of an athlete to competitive stress. As a personality trait, it characterizes, to one degree or another, a tendency to experience apprehension and fear in most situations. An athlete's anxiety is associated

with the expectation of social consequences of his success or failure (V.L. Marishchuk, Yu.M. Bludov, V.A. Plakhtienko, L.K. Serova). The state of anxiety arises in connection with significant competitive situations. To determine the optimal level of situational anxiety under competition conditions, it is necessary to compare data on the pre-competition level of anxiety with successful performance. The optimal level of pre-competitive anxiety can also be identified in a reproductive way, by asking the test athletes to reproduce in quantitative assessments the state that they experienced before their most successful performance.

Mental reliability, considered as the stability of the functioning of basic mental mechanisms in difficult competitive conditions, consists of a number of components: competitive emotional stability, self-

regulation, motivational and energetic component, stability and noise immunity. Each of the components of mental reliability is characterized by a set of typical indicators (M.A. Deryabina, E.S. Vorobyova, V.D. Popov). Indicators of competitive emotional stability are the nature, intensity and duration of pre-competitive and competitive emotional arousal and its fluctuations, the degree of its influence on the nature of the performance, etc. Indicators of self-regulation: the ability to correctly recognize and evaluate one's emotional state, the ability to influence it in particular through verbal self-orders, the ability to reorganize in the face of struggle, the development of self-control over one's actions, etc. Indicators of the motivational sphere: love for sports in general and for one's own type of sports activity, desire for any form of competitive struggle, dedication in training and competitions, etc. Indicators of stability and noise immunity: stability of the internal functional state, stability of motor skills and sports equipment, immunity to the effects of various types of interference, etc. (V.L. Marishchuk, Yu.M. Bludov, V.A. Plakhtienko, L.K. Serova).

Objective of the study was to assess the level of personal anxiety, self-esteem and state of mental reliability of young basketball players.

Methods and structure of the study. The basis for the study was the Olympic reserve sports school «Kupchinsky Olympus» in the Frunzensky district of St. Petersburg (hereinafter referred to as «Olympus»). 10 girls born in 2009 of the training stage group (sports specialization stage) «Olympus» took part in the survey. To conduct the study, two Spielberger questionnaires were used. Charles Spielberger's first questionnaire consists of two subscales: measuring anxiety both as a personality trait and as an emotional state. The second questionnaire examines the state of anxiety that arises in connection with significant competitive situations and is measured using a self-esteem scale. Also, to determine mental reliability, a questionnaire developed by V.E. Milman, an employee of the research institute, was used.

Results of the study and discussion. In the direction of «Studying the state of situational anxiety» (Figure 1), it was found that only two players have a low level of anxiety, four basketball players have an average level of anxiety, and four have a high level of anxiety. Two girls with low levels of anxiety answered «Exactly», that they are calm, do not feel regret and feel good. Female basketball players with average levels of anxiety equally stated that they were not nervous

or excited, but they were worried about possible failures. Four girls with high levels of anxiety responded that they were tense, worried about possible failures, and also that they were nervous.

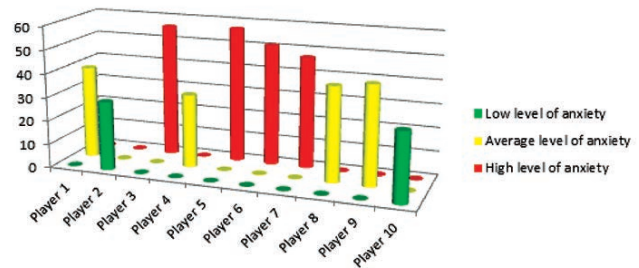


Figure 1. Self-esteem scale for situational anxiety

Research in the area of «Assessing the level of personal anxiety» (Figure 2) has shown that no one in the team has a low level of anxiety at all, which is very alarming. We were interested in which of the 20 questions the respondents answered exactly the same. As a result, six female basketball players with an average level of anxiety unanimously answered that they are balanced, but sometimes lack self-confidence. Four girls with high levels of anxiety stated that they were very worried about the anticipation of difficulties, they got tired quickly and could cry easily.

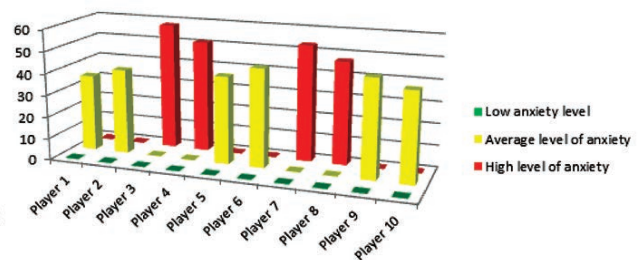


Figure 2. Personal self-esteem scale

An assessment of the mental reliability of the Olympus team players showed the following (see table).

For the first component of the CES (competitive emotional stability, the range of scores is from 12 to 5 points), all girls have a reduced level of reliability compared to optimal data.

For the second component of SR (self-regulation, rating range from 10 to 6 points), three girls had a reduced level of reliability compared to the average data, four had an average level, and three had an increased level of reliability compared to the optimal data.

*Assessments of the mental reliability of the Olimp team players*

Player	Components of Mental Reliability			
	CES	SR	M-E	St-N
1	-7	-2	+4	+1
2	-3	+3	-1	+1
3	-15	0	1	-2
4	-8	-1	2	1
5	-7	0	-1	-6
6	-6	-1	0	0
7	-8	2	1	1
8	-15	0	-1	-2
9	-4	0	-1	2
10	-11	1	-4	1

Note. A score of 0 points corresponds to the average level of mental reliability; a score with a “-” sign indicates a decrease in the level of reliability for this component compared to the average data; a rating with a “+” sign indicates an increased level of expression of one or another component of mental reliability compared to the average.

For the third component of M-E (motivational-energetic component, the range of scores is from 10 to 7 points), five girls have a reduced level of reliability compared to the average data, one has an average level, and four have an increased level of reliability compared to the optimal data.

For the fourth component St-N (stability-noise immunity, rating range from 6 to 3 points), three girls have a reduced level of reliability compared to the average data, one has an average level, and six have an increased level of reliability compared to the optimal data.

Conclusions. It has been established that a level of high anxiety and a reduced level of mental reliability is present in almost half of the team’s players, but athletes with such indicators should be given special attention, especially when preparing for important tournaments. It is known that during competitions, especially at a high level, the intensity of emotional stress is very high, and it is not easy for young basketball players to cope with this condition. The emotional background has a significant impact on performance in basketball, and, despite a high level of physical and technical preparedness, a player may not be able to cope with emotions. In this regard, based on the re-

sults of the survey, we can recommend to the mentors of our respondents psychological and pedagogical support for athletes during competitions in order to develop adaptation to stressful situations in competitions and teach them to control their condition in important games.

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Changes in muscle tension of body segments in children with cerebral palsy

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Abstract

Objective of the study was to identify changes in muscle tension in body segments in children with cerebral palsy for an objective analysis of the state of their motor system and the search for effective methods of pedagogical influence on the muscular system in the process of rehabilitation measures.

Methods and structure of the study. Children from 6 to 14 years old with a diagnosis of cerebral palsy of varying severity took part in the scientific work. Children were distributed according to the levels of development of gross motor functions on the GMFCS scale. Muscle imbalance, their symmetry, as well as the degree of tension in the muscles of the face, back, back and front of the legs were measured. The studies were carried out using the MES 9000 EMG computer diagnostic system.

Results and conclusions. An uneven distribution of muscle tension in the muscle segments of the face and body was revealed, predominantly on the left side (from 34 to 160 mV) in both boys and girls diagnosed with cerebral palsy. Tension of the tibialis muscle of the left leg was noted, which was 135,2 mV and strong tension of the calf muscles of both the left (158,4 mV) and right legs (143,4 mV) with support compensation on the toe of the left leg (60%). Diagnosis of muscle tension and identification of the developmental features of skeletal muscles in children with cerebral palsy is a necessary condition for an objective analysis of the state of their motor system and the search for effective methods of pedagogical influence on the muscular system in the process of rehabilitation measures.

Keywords: cerebral palsy (CP), muscle tension, asymmetry, body segments, postures.

Introduction. When forming a particular active posture and stability in space, the necessary tension of the skeletal muscles that carry out the anti-gravity function of the body is of great importance. Maintaining the balance of the body and its individual parts is one of the criteria for the physical condition of the body, since a certain stability requires the development of the musculoskeletal system necessary to perform appropriate efforts and timely redistribution of the tone of body segments [1-3].

In children with cerebral palsy at the early stage of the disease, disturbances in muscle tone are observed, which lead to limitation of the child's functional capabilities, ultimately creating a motor deficit. Uneven muscle tension leads to disturbances in the shape of the body, the proportions of its elements and asymmetry, which is one of the main causes of

motor disorders in children with cerebral palsy. If children have spastic tensions of variable tone due to athetosis or cerebellar disorders, not only the structure of movement in space changes, but also the shape, direction, amplitude, which distorts the spatial structure of the child's movement and interferes with its further development [4, 5]. Shortening or lengthening a muscle reduces the force of contraction, leading to mechanical failure. Over time, pathological attitudes are formed, leading to the formation of contractures, subluxations and dislocations of the joints [6, 7]. Children with cerebral palsy can remain in a certain position for a long time, so it is necessary to know the state of their muscle tone in order to understand the process of formation of the musculoskeletal system during the period of growth and development of the child.



Objective of the study was to identify changes in muscle tension in body segments in children with cerebral palsy for an objective analysis of the state of their motor system and the search for effective methods of pedagogical influence on the muscular system in the process of rehabilitation measures.

Methods and structure of the study. Children from 6 to 14 years old with a diagnosis of cerebral palsy of varying severity took part in the scientific work. Children were distributed according to the levels of development of gross motor functions on the GMFCS scale. Muscle imbalance, their symmetry, as well as the degree of tension in the muscles of the face, back, back and front of the legs were measured. The studies were carried out using the MES 9000 EMG computer diagnostic system, which monitors and processes indicators of muscle tension from superficial muscles and measures the activity of each muscle 240 times per second. The static test asymmetry indication indicates the percentage of imbalance between the left and right sides of the body, how their values differ, and which side has higher activity.

Results of the study and discussion. It has been shown that in children with cerebral palsy, with various changes in body position, the facial muscles of the face of varying degrees of severity are strongly tensed. This is due to the lack of coordination of various receptors that communicate between the vestibular, visual analyzers and analyzers of musculoskeletal sensitivity. It was revealed that different degrees of muscle tension of the masticatory and cleidomastoid muscles (44,6-

147 mv) lead to left-sided asymmetry of the face and tilt of the head to the left, resulting in instability of the spine and limbs in static conditions. Severe tension in the temporal and masticatory muscles does not allow the mouth to be completely closed and chewing fully, which usually occurs in children at level 5 on the GMFCS scale. In addition, severe tension in the temporal and masticatory muscles can lead to facial numbness and even mild deafness. In table Figure 1 shows the values of facial muscle tone in children diagnosed with cerebral palsy.

Studies have shown that maintaining a vertical posture when standing in children with cerebral palsy is achieved at the cost of muscle efforts that exceed the norm by an average of 30% of the maximum. Asymmetrical tension of body segments relative to their axis leads to muscle imbalance, poor posture (either hyperlordosis, or kyphosis, or displacement to the side, i.e. scoliosis).

In all groups of children diagnosed with cerebral palsy, left-sided body tension was detected, especially in the upper part of the trapezius muscle: in boys 46,4-136,5 mv, in girls 84-160 mv, with backward rotation of the shoulder girdle, with left-sided tension in the middle bundles of the trapezius muscle and asymmetry from 51 to 87% of cases. Strong tension is observed in girls of GMFCS level 5 in the area of the lower fascicle of the trapezius muscle with the greatest tone of 159 mV. Excessive tension of the latissimus dorsi muscle (184,2 mV) on the left, with minimal right-sided asymmetry (21% of cases) and a tension of 130 mV, causes

Table 1. Muscle tone (mv) of the face in children diagnosed with cerebral palsy

Level GM-FCS	Indicators	Frontalis muscles (frontalis)		Temporalis muscles (Anterior temporalis)		Chewing muscles(Masseter)		Cleidomastoid muscles (Sternocleidomastoid)	
		Left	Right	Left	Right	Left	Right	Left	Right
Boys									
I	$\bar{X} \pm \sigma$	61,0±43	31,0±3,9	52±54,7	41±57,4	44,6±43,7	21,8±30,5	32,4±47,6	19,0±19
II	$\bar{X} \pm \sigma$	90,2±86	80,9±84	110,6±106	125±99,7	119,0±109	82,0±93,5	116,1±111	53,4±68
III	$\bar{X} \pm \sigma$	67,5±65	75,1±57	81,1±99	150±91	114,6±93	61,6±63,2	94,4±86,1	44,8±46,5
IV	$\bar{X} \pm \sigma$	70,6±52	77,6±58	114,5±83	112,1±94	147,2±94	83,3±67	129,1±92,6	54,1±65
V	$\bar{X} \pm \sigma$	55,41±66	58,4±59	98,90±12	165±123	120,3±110	50,9±78,3	78±72,45	27,7±33
Girls									
I	$\bar{X} \pm \sigma$	75,8±88	37,2±33	66,9±91	59,0±81	47,7±79,7	44,9±69,6	50,3±82	29,7±32,0
II	$\bar{X} \pm \sigma$	96,6±90	82,1±86	119,5±79	127,8±96	112,8±81	57,7±69,6	106±81	48,3±59,7
III	$\bar{X} \pm \sigma$	72 ±86	81,5±86	138±121	210±103	134±98,5	90,6±84,1	99±86	51,9±64,3
IV	$\bar{X} \pm \sigma$	32 ± 46	78,3±77	112,5±119	122,4±114	116,3±109	76,6±75,8	76,4±78	34,2±44,1
V	$\bar{X} \pm \sigma$	96±110	139±105	137±133	170,9±121	161±101	117,1±98,8	123±89	29,8±8,6



Table 2. Muscle tone (mv) of the body in children diagnosed with cerebral palsy

Level GMFCS	Indicators	Upper trapezoidal beam (Splenius Capitus)		Scapular bundle of trapezoid (Upper Trapezius)		Middle beam trapezoidal (Middle Trapezius)		Lower trapezoidal beam (Lower Trapezius)		Latissimus muscle (Latissimus Dorsi)	
		Left	Right	Left	Right	Left	Right	Left	Right	Left	Right
Boys											
I	$\bar{X} \pm \sigma$	46 ±44	34±19	47,7±38	40,7±32	59±43	55,2±49	58±46	46,7±40	55,9±61	49,6±71
II	$\bar{X} \pm \sigma$	137±100	106±91	120,7±92	69,8±64	99,0±83	83,0±67	128±102	90,6±75	113±99	76,1±75
III	$\bar{X} \pm \sigma$	107±104	64,5±60	95,1±82	70,8±68	116±96	76 ±85	106±94,3	84±79,8	109±86	89,1±72
IV	$\bar{X} \pm \sigma$	120±95	101±87	114±77	69,9±76	115±86	59 ±62	117,2±72	59,7±45	119±104	68,0±69
V	$\bar{X} \pm \sigma$	102±84	76±77	94±84	58±64	139±92	95±72	106±102	79,5±79	109±91	66±66
Girls											
I	$\bar{X} \pm \sigma$	84±92	79,6±85	70,3±76	51,1±71	56,0±71,2	38,9±41,3	54,9±69	41,0±43	60,6±73	44,2±50,3
II	$\bar{X} \pm \sigma$	129±102	91±88	89±80	65±54	89±64	45,6±51	102±69	56±54	102±84	77,4±79
III	$\bar{X} \pm \sigma$	154±93	100±78	119±103	87±66	89±69	73,5±55	132±79,5	89±53	127±74	119±64
IV	$\bar{X} \pm \sigma$	90±79,5	63±77	68,2±76	72,7	78,7±66	62,9±59	104,8±59	44,9±54	76,7±74,	40±49
V	M	160±119	130±124	167±113	112±97	173±121	105± 93	159±135	136±117	184±122	129,5±97

its shortening. In this case, the spine begins to deviate from its axis and bend forward, which leads to a displacement of the pelvis. As a result, not only the back suffers, but also the internal organs.

Increased muscle tone and asymmetry (from 50 to 70%) in the upper bundles of the trapezius and latissimus dorsi muscles is observed in all children with cerebral palsy, more predominantly on the left than on the right, both in boys and girls, which is reflected in table 2.

In all children with cerebral palsy, tension in the left calf muscle was also detected, especially in children of GMFCS levels 2-5 (123-159 mV), the cause of which is shortening of the iliopsoas muscle. In level 4 boys, the greatest tension in the calf muscle of the left leg is 162 mV, and in level 5 girls it is 145,2 mV. The highest level of tension in the gastrocnemius muscle of the right leg was observed in boys at GMFCS level 2 and was 120 mV, and in girls at level 5 – 199,2 mV. The tension of the tibialis muscle with an asymmetry

of 63% and the tension of the calf muscles (mainly the left leg) is 159 mV for boys, 199,2 mV for girls), table 3.

Body imbalance in children with cerebral palsy leads to increased tone and asymmetry, as a result of which vicious positions of the body and limbs persist for a long time, forming secondary changes in muscles, bones and joints and the occurrence of contractures and deformities, which further complicates the development of motor skills and stability in life. space. It is believed that with an increase in muscle tone in the lower extremities, a pathological equinus position (equinus deformity) of the feet is formed, which is caused by an increase in flexor tone and immature support [1, 2].

Conclusions. Specific approaches to the formation of motor skills in children with cerebral palsy depend on which muscle groups or body segments are affected by spastic manifestations and the degree of their severity.

Table 3. Muscle tone (mv) of the anterior and posterior surfaces of the legs in children with cerebral palsy

Level GMFCS	Indicators	Boys				Girls			
		Tibial (Tibialis Anterior)		Calf muscle (Gastrocnemius)		Tibial (Tibialis Anterior)		Talf muscle (Gastrocnemius)	
		Left	Right	Left	Right	Left	Right	Left	Right
I	$\bar{X} \pm \sigma$	53,7±68	49,7±63	60,9±68,5	42,8±50,3	62±87,4	51,5±70,3	46,2±55	48,6±76
II	$\bar{X} \pm \sigma$	123±106	77,9±90	113,7±115	120,3±95	108±75,8	76,4±73,7	93,7±76,3	134,1±98
III	$\bar{X} \pm \sigma$	159±93	100,3±87	141±91,4	76,6±70,8	159±92,5	100,3±87,3	76,6±71	141±91,4
IV	$\bar{X} \pm \sigma$	141±113	101±90,5	162±62,5	64,9±61,0	213±86	183±130	101,9±133	185,9±31,1
V	$\bar{X} \pm \sigma$	159±93	100,3±87	141±91,4	76,6±70,8	185±129	115,4±114	145,3±82	199,2±168



Body imbalance is caused by dysregulation of muscles due to changes in the functioning of body segments. The muscle segments of the face, back and legs have different tensions depending on the level of development of motor skills on the GMFCS scale and the reflex adoption of various body positions.

Diagnosis of the stability of muscle tension and identification of its characteristics in children with cerebral palsy is a necessary condition for an objective analysis of the state of their motor system and the search for effective methods of pedagogical influence on the muscular system in the process of rehabilitation measures.

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Sports activity as a means of forming anti-stress resistance of students in an educational environment

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Abstract

Objective of the study was to increasing stress resistance of students on the basis of the development of emotional stability, adaptability of thinking and self-regulation in the process of zonation sports activities.

Methods and structure of the study. The research program of studying students reactions to various external stimuli is focused on identifying the potential of sports activity, which contributes to increasing personal self-esteem and the ability to manage stress. The diagnostic complex includes: the Spielberg-Khanina self-assessment methodology, the Eysenka test-questionnaire, the SAN test of psychoemotional reactions to stress.

Results and conclusions. A significant correlation of stress resistance with the SAN index (0,578), the ability to self-regulate (0,476), the level of subjective control (0,556) and a negative correlation with emotional lability (0,458) and the level of anxiety (0,632) was established. A system of sports and recreational activities has a high formative potential in achieving stress resistance of students.

Keywords: *students, stress tolerance, personal characteristics, educational environment.*

Introduction. Modern society is characterized by a complex multicomponent structure, which continuously changes depending on the social needs of the individual. The development and transformation of society is due to the rapid modernization of technology, which requires a new quality of labor resources.

One of the main requirements for specialists employed in various sectors of the economy is high resistance to stress, characterized by an integral manifestation of personal qualities that ensure the ability to withstand emotional, intellectual and physical stress without negative consequences for the health of the employee and others. Among the wide range of qualities that determine stress resistance, one can highlight emotional stability, adaptability of thinking and self-regulation [5].

Having the necessary set of personal qualities in a person to withstand the challenges of modern civilization is critical for maintaining mental health, success-

ful social adaptation and achieving personal goals [2].

Since higher education is the foundation for the reproduction of human capital, the search for effective tools for developing stress resistance in students becomes a strategic task in the new conditions of technological innovation [1].

The formation of stress resistance occurs throughout a person's life, however, at student age this process is the most targeted and pedagogically controlled [3, 4].

Objective of the study was to increasing stress resistance of students on the basis of the development of emotional stability, adaptability of thinking and self-regulation in the process of zonation sports activities.

Methods and structure of the study. The study involved management students aged 19,5±0,5 years, regularly attending sports clubs (47 people), and students not involved in sports (29 people).

The research program for studying students' reac-



tions to various external stimuli is focused on identifying the potential of sports activities, which, with appropriate pedagogical support, contribute to increasing personal self-esteem and the ability to manage stress, leveling its consequences.

The study was carried out in two stages. As part of the first stage, a rapid diagnosis of stressful conditions was carried out according to the method of K. Schreiner (1993), which makes it possible to determine the characteristics of the experience of stress, in particular, the degree of self-regulation and emotional lability in stressful situations. The technique is adapted for students of the appropriate age. The measurement was carried out on a 100-point rating scale: high level of stress resistance (0-29), average level of stress resistance (30-50), low level of stress resistance (51-100).

At the second stage, the relationship between the impact of sports activity factors and the contribution of various qualities of students to resistance to stressful situations in the educational process and student life was analyzed. The psychophysical effects of training are aimed at increasing the psychological intensity of sports training and competition, achieved through physical activity of increased intensity. The effective effectiveness of the model was assessed by the dynamics of growth of biological prerequisites for stress resistance of students: the degree of exposure to stress, self-regulation, emotional lability, level of subjective control, level of anxiety. The diagnostic complex includes: the Spielberg-Khanin self-assessment method, the Eysenck test questionnaire, the R. Cattell multifactorial personality study method, the K. Schreiner stress diagnostic method, the SAN test of psycho-emotional reaction to stress.

The statistical software package Statistica 6.0 was used to calculate the main indicators characterizing the reliability of the pedagogical impact in the research process.

Results of the study and discussion. Analysis of the results of testing students for stress resist-

ance indicates that the majority of young people cope relatively well with the impact of stress factors in the educational environment, which indicates the positive influence of the process of university psychological education, family and other aspects of life. In the context of the formation of a set of qualities that contribute to the effective counteraction of negative external stimuli, the high importance of sports activity in increasing the level of stress resistance of students has been established.

The peculiarities of sports activities determine the launch of physiological mechanisms that allow one to effectively withstand stressful situations in the educational process and the life of the university.

The most important physiological mechanism of schoolchildren's physical activity, which allows them to successfully withstand various types of stress, is the production of endorphins, which help reduce pain, improve mood and improve the emotional state. Systematic sports activities lead to an improvement in biological prerequisites and, as a result, strengthen the emotional stability of students to external challenges of the social environment.

The ability of young people to transition to an integral format of mastering sports and technical skills, developing physical qualities and improving personality traits, determined by its physiological characteristics and expanding the possibilities of emotional regulation of the general mental state, has been noted. The possibilities of additional use of resources of training and competitive activity are manifested in overcoming negative reactions to the consequences of the introduced large-scale requirements on the part of educational activities, which is confirmed by a decrease in anxiety to $35,7 \pm 9,8$ points; emotional lability up to $11,4 \pm 0,5$ points. At the same time, expanded abilities for self-regulation, adequate to the demands of educational activities, cause a positive reaction in the psychophysiological and socio-psychological state of students, which is manifested in an increase in the SAN index to $7,8 \pm 0,7$ points.

Indicators of personal characteristics of students based on the results of the training process

Indicator	Before	After	t	p
SAN Index, point	30,7±5,7	45,0±3,4	2,6	< 0,05
Ability of self-regulation, point	53,0±0,8	63,8±1,3	2,8	< 0,05
Emotional lability, points	16,3±0,7	11,4±0,5	3,6	< 0,05
Subjective control level, point	5,3±0,7	7,1±0,5	4,3	< 0,05
Level of anxiety, point	48,0±13,4	35,7±9,8	2,6	< 0,05



The distribution of adequate resources of sports training activities across the stages of sports training (mastering the basic fundamentals of a sport - initial sports specialization - achieving readiness at the level of sports categories) within the optimal boundaries of physical activity leads to the deployment of processes of searching for a balance between the tone of the sympathetic and parasympathetic nervous systems, which is the basis for the development of personal characteristics that determine students resistance to stress. The cumulative effect of the positive influence of sports training activities was expressed in the activation of psychological methods and mechanisms of emotional regulation as a kind of regulator of the individual activity of the students personality.

The use of the rank correlation method made it possible to establish a significant correlation between stress resistance and the SAN index (0,578), the ability to self-regulate (0,476), and the level of subjective control (0,556) and a negative correlation with emotional lability (0,458) and the level of anxiety (0,632).

Resistance to stressful factors in the educational environment was achieved due to an increase in affective tolerance and its relationship with the emotional characteristics of the individual (0,568), the use of psychoregulatory training in preparation for competitions (0,494) and the ability to verbalize emotional states (0,537). The dependence of stress resistance on the mastered competencies of sports and recreational activities sets guidelines for personal characteristics and health-saving strategies, which, when implemented sustainably in the context of educational activities, help improve the biological prerequisites for students' stress resistance.

Conclusions. The anti-stress strategy for implementing educational activities updates the methodology for the development of psychophysiological and

socio-psychological characteristics that determine emotional stability, mobility of nervous processes, strength of the nervous system, type and direction of behavioral reactions during stress.

The system of sports and recreational activities, being a projection processing model of educational activity, has a high formative potential in achieving stress resistance based on the development of subjective control and the ability for self-regulation of students.

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Digital monitoring of the exercise's heart rate as a tool for determining personalized physical activity norms

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Abstract

Objective of the study was to substantiate digital monitoring of the exerciser's heart rate as a tool for determining personalized physical activity standards.

Methods and structure of the study. Within the framework of the methodology for rationing physical activity of those engaged in health-improving physical culture, the totality of daily measurements of their heart rate is considered as a system of states of the human body. This solution is necessary when determining personalized physical activity standards based on daily heart rate data obtained using wearable devices. The problem of rationing physical activity has two contradictions: the mass distribution of wearable technologies and the insufficient use of their functionality to solve the problems of rationing health-improving physical activity; increasing the effectiveness of health-related activities and the lack of modern technologies for determining personalized standards. To solve the problem of personification of norms, it is proposed to use the theory of rank analysis, which is promising when studying daily non-Gaussian heart rate data obtained using wearable devices. The technology for rationing physical activity consists of the stages of preparation, collection and processing of data and development of proposals. Based on the results of the technology, based on the lower and upper limits and training potential, personalized values of physical activity standards are determined for three levels of training (beginner, intermediate, advanced). The recommendations obtained can be used as personal standards for physical activity and updated if necessary (after a month, quarter or year). Physical activity levels can be monitored using smart watches both during and after classes. At the same time, the obtained heart rate norms are personal and are suitable only for one person.

Results and conclusions. The proposed system of states of the human body creates the prerequisites for determining personalized standards of physical activity and developing effective physical education and health programs for those involved in health-improving physical culture.

Keywords: *health-improving physical culture, rationing of physical activity, pulse, heart rate, wearable devices.*

Introduction. Digital transformation of various sectors of the economy, social sphere, including the sphere of health-improving physical culture (HPC), is defined by the Decree of the President of the Russian Federation of July 21, 2020 No. 474 «On the national development goals of the Russian Federation for the period up to 2030» as one of the priority national development goals of the Russian Federation [2, 9]. However, despite the rapid development and mass distribution of digital wearable devices with the function of continuous heart rate monitoring with sufficient accuracy, most modern methods and approaches to standardizing physical activity do not take into ac-

count the data of all daily activity [5, 6, 7, 10, 11]. At the same time, the HPC emphasizes the importance of determining personalized standards of physical activity, since it is standardization that ensures the health effect of the load of those involved in physical culture, on the one hand, and the effectiveness of training, on the other. Personalized standards of health-improving physical activity contribute to effective training, while an insufficient standard does not bring the expected effect, and an excessive standard has a negative impact [1, 4]. Therefore, there is a need for personalized standardization of physical activity for those involved in OFC. In this case, a person involved in OFC is un-



derstood to be an adult who has no contraindications to exercise, who is engaged in (or plans to engage in) organized physical activity for the purpose of improving health, creating an optimal background for life, increasing the body's resistance to various factors and prolonging active longevity [1, 4, 5, 7, 10, 11]. When determining personalized standards of physical activity for those involved in OFC, the functional capabilities of their body should be taken into account. In practice, heart rate (HR) is the most common indicator of the body's response to physical activity [1, 4, 5, 7, 10, 11]. «Smart» watches (fitness bracelets) allow you to collect heart rate data throughout the day (usually using an optical sensor using the plethysmography method) [12, 13]. Having information about all the daily motor activity of the person involved - the entire set of heart rate for the day, you can determine his personalized physical activity standards.

Objective of the study was to justify digital monitoring of the exerciser's heart rate as a tool for determining personalized physical activity standards.

Methods and structure of the study. The analysis of the daily heart rate data showed that they belong to the type of non-Gaussian data (there are also unrelated and Gaussian data), for which the central limit theorems and the law of large numbers do not work. In mathematical statistics, non-Gaussian data are studied and processed within the framework of the theory of rank analysis developed by Professor B.I. Kudrin for non-Gaussian systems of various types [3, 8]. Therefore, it seems promising to use the tools of rank analysis in the theory of OFC in order to study the totality of heart rate data and further determine the norms of physical activity for those engaged in OFC [5, 6, 7, 10, 11]. To implement the tools of rank analysis, it is necessary to consider daily heart rate measurements as a system of human body conditions.

Results of the study and discussion. Let's consider the body of a person engaged in physical fitness as a system. The property of such a system is to transform the energy of food into the energy of the life of the person engaged in physical fitness. The indicator of the system is energy expenditure associated with energy exchange in the process of the life of the person engaged in physical fitness. The parameter of the system is the equivalent of calories - heart rate [1, 4]. Taking into account digitalization, it is proposed to replace the concept of HR with the minute heart rate (MHR) - this is one reading of the arterial pulse of an adult in the process of his life, taken on the radial artery by the method of plethysmography using an opti-

cal sensor and measured in the number of heartbeats per minute. One state of the system is understood as one measurement of MHR. Accordingly, there are 1440 such states per day.

Thus, the system of states of the human body (SSOC) is understood as the daily totality of the Ministry of Emergency Situations in the course of life of a person engaged in OFC. Figure 1 shows the life cycle of the data of the Ministry of Emergency Situations in the SSOC.

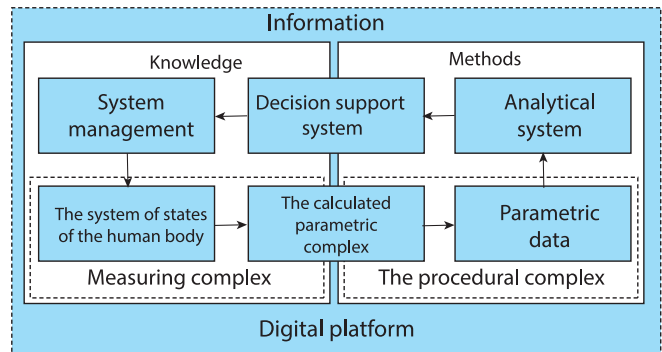


Fig. 1. The life cycle of the data in the SSOC

After measuring the MCHS, the calculated parametric complex (RPC) is an interconnected set of parametric data of the MCHS formed by the results of measuring the MCHS, reflecting from the quantitative, qualitative, and dynamic sides the functional properties of both one state individually and the system of states of the human body as a whole. An element of the RPC is the MOE database (Fig. 2). Further processing of MOE data, their analysis, interpretation and definition of personalized norms is carried out within the framework of the technology of rationing physical activity of the OFC (Fig. 3).

According to the results of the technology, personalized values of physical activity standards for three levels of training are determined. The recommenda-

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	01.03.2018	02.03.2018	03.03.2018	04.03.2018	05.03.2018	06.03.2018	07.03.2018	08.03.2018	09.03.2018	10.03.2018	11.03.2018	12.03.2018	13.3
2	0:00	53	50	51	48	48	50	50	56	56	52	55	48
3	0:01	52	50	53	49	50	52	65	56			50	48
4	0:02				50	49	50	63	63			48	49
5	0:03				49	49	51	50	57			53	51
6	0:04				50	54	51	49	57	55	52	49	52
7	0:05	53	49	49	49	46	51	50	56	54	51	49	53
8	0:06	50	49	50	50	46	51	50	56	58	52	50	52
9	0:07	50	50	50	50	48	51	54	57	55	50	49	53
10	0:08	52	50	51	49	48	50	47	70	56	51	50	54
11	0:09	51	50	49	50	49	51	48	58	58	51	51	47
12	0:10	60	51	50	49	51	51	48	54	60	50	50	48
13	0:11	55	58	50	49	55	55	49	53	62	51	50	49
14	0:12	49	50	50	50	55	48	49	53	59	51	50	50
15	0:13	52	49	49	50	49	49	50					
16	0:14	50				58	49	51					
17	0:15	50				49	49	52					
18	0:16	51				48	49	53	56	61	50	48	51
19	0:17	56	52	50	50	47	48	52	55	64	59	48	51

Fig. 2. The Ministry of Emergency Situations database



tions received can be used as personal standards of physical activity and, if necessary, updated (in a month, quarter or year).

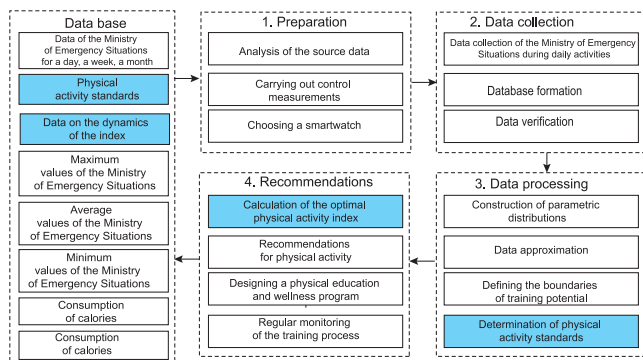


Fig. 3. Stages of physical activity rationing technology

Let's consider the process of determining personalized norms of physical activity. As an example, let's analyze two female students (subject A and B) of the same age (24 years old), weight (52 and 54 kg) and height (159 and 160 cm). Figure 4 shows graphs of the daily heart rate data of the subjects and the results of approximating the average heart rate values of all days. As can be seen from the graphs, the nature of their daily activity is different and, accordingly, the approximations of average heart rate values are different.

Also, during the implementation of the normalization technology, in order to determine the upper and lower limits of the training potential, approximation curves of days with and without OFC training were constructed. As a result, personalized values of physical activity norms for three levels of physical fitness were obtained for the subjects (corresponding to the limits of training potential). The table shows the physical activity standards for subjects A and B.

As can be seen from the table, the obtained values of the norms for the subjects are different. Thus, for the beginner level of fitness, the difference in the volume of physical activity is 13%, for the average - 30%, and for the advanced - 125% (more than twice).

Thus, the technology of standardizing physical activity allows you to determine personalized norms. In this case, the system of states of the human body acts as a tool for this technology.

Further, the subjects themselves (those engaged in physical fitness) or the trainer act as a decision support system. They create physical education and health programs (select the necessary exercises) based on the obtained physical activity standards and monitor their implementation. The obtained physical activity standards are tracked using smart watches both during and after physical fitness classes. In this case, the obtained MHR standards are personal and are suitable only for one person.

Conclusions. Within the framework of the technology of standardizing physical activity of those engaged in general physical culture, the set of daily heart rate measurements is considered as a system of human body states. This solution is necessary when determining personalized physical activity standards based on daily pulse data obtained using wearable devices. The proposed system of human body states creates the prerequisites for determining personalized physical activity standards and developing effective physical culture and health programs for those engaged in health-improving physical culture.

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Physical activity standards (volume and intensity) for subjects A and B

Heart rate zone name	Heart rate, bpm	Level of preparedness					
		Beginning		Average		Advanced	
Anaerobic	176 – 196	0	0	0	2	1	8
Threshold	157 – 175	1	1	2	3	2	9
Aerobic	137 – 156	5	6	7	10	9	22
Average	118 – 136	16	18	24	28	27	49
Total training time, min	–	22	25	33	43	39	88
Test subject		A	B	A	B	A	B

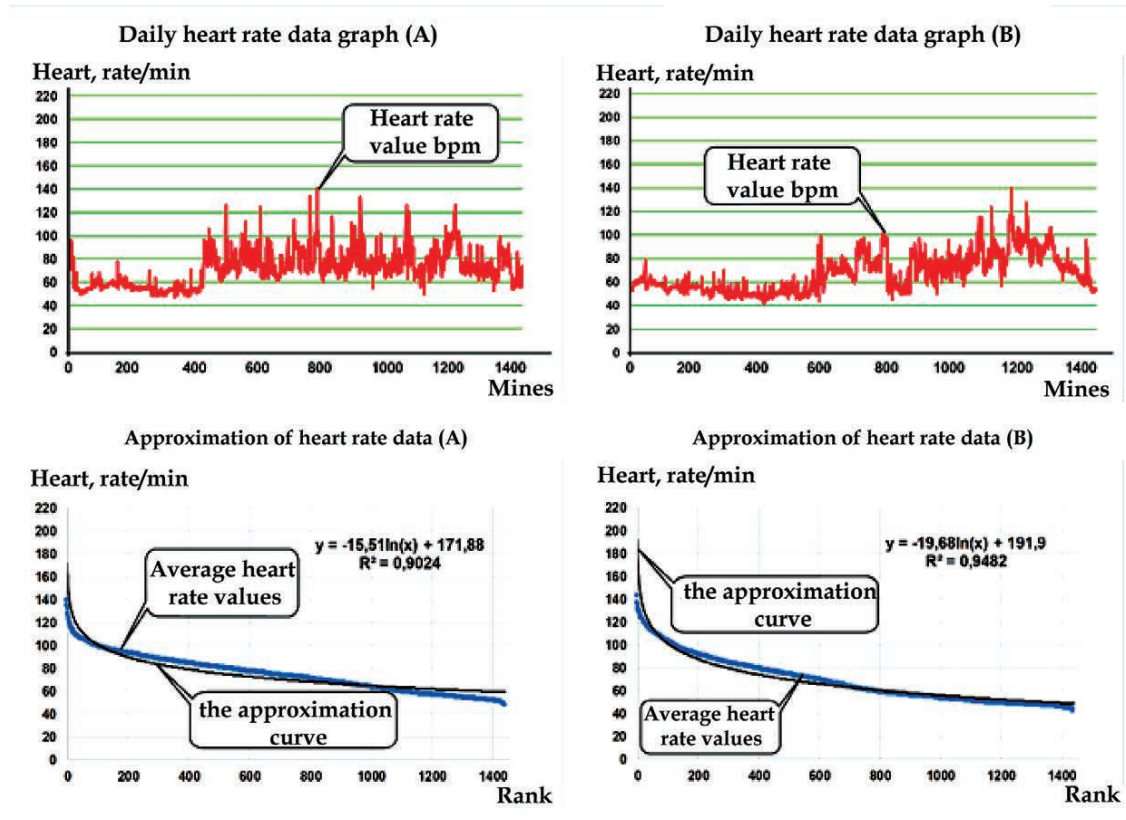


Fig. 4. Graphs of the daily heart rate data of the subjects and the results of approximating the average heart rate values of all days

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Dynamics of psychophysical health profile of female medical university students

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Abstract

Objective of the study was to study the dynamics of the psychophysical health profile: physical development, physical fitness, self-esteem of health and addictive behavior of first- and final-year medical university students.

Methods and structure of the study. We examined the dynamics of physical development and physical fitness of 147 first- and final-year students of a medical university. The respondents took part in psychological testing: the «self-assessment of health» test (SH according to V.P. Voitenko) and the «diagnostics of addictive behavior» test (according to N.N. Telepova).

Results and conclusions. It is shown that the anthropometric indicators of the subjects do not change during the training period. At the same time, the indicators of strength and speed-strength abilities decrease. Self-assessment of health among freshmen and graduates remains approximately at the same level. However, graduate students develop the prerequisites for addictive behavior. Thus, the study showed the presence of negative changes in physical fitness and the formation of addictive behavior among senior female students. At the same time, the level of self-assessment of health status did not change throughout the entire period of study.

Keywords: *dynamics of physical development, motor qualities, self-assessment of health, level of addiction.*

Introduction. The process of training a specialist in higher education is associated with significant mental and emotional stress, combined with a decrease in physical activity [4]. Being under long-term stress cannot but affect the state of one's health and creates preconditions, among other things, for the formation of addictive behavior. Theoretical analysis showed that there is a lack of research materials describing changes in students' health that occur during the study period. Most often, such scientific research works cover one or two years of study at a university. These studies are devoted either to the processes of adaptation of yesterday's schoolchildren to studying at the university, or to the applied aspects of the use of individual sports disciplines in the physical education course.

Objective of the study was to study the dynamics of the psychophysical health profile: physical development, physical fitness, self-esteem of health and ad-

dictive behavior of first- and final-year medical university students.

Methods and structure of the study. 147 full-time students of the Kirov State Medical University (KSMU) of the first (n=113) and final (n=34) courses were examined. The average age of the girls was $18.41 \pm 0,08$ years in the first year and $23,41 \pm 0,21$ years in the last year of study. At the time of the study, no one made any complaints about their health; all students gave voluntary consent to participate in the survey. To implement a comprehensive survey system, we used the following methods and techniques. To identify the level of physical development, body length, weight, and chest circumference (CHC) were measured. The state of the cardiovascular system was determined by heart rate (HR, palpation) [3]. To assess the state of the respiratory system, the respiratory rate was measured, the Stange test and the Genchi test were performed. To determine physical fitness, the level of



development of basic motor qualities was assessed in the conditions of the gym and stadium in the following exercises: standing long jump, bending from a standing position on a bench, flexion and extension of the arms in a lying position; the students also underwent psychological testing: the «self-assessment of health» test (POP according to V.P. Voitenko) [1] and the test «diagnostics of addictive behavior» (according to N.N. Telepova) [2]. The research results were subjected to statistical processing using parametric statistics methods in the Microsoft Excel software package on an Intel Pentium computer. The arithmetic mean (M) and standard error of the mean (m) were calculated, which was expressed in the text and tables as $M \pm m$. Differences were assessed using Student's t-test for independent samples and were considered significant at $p < 0,05$ (indicated in the text as «*»).

Results of the study and discussion. Analysis of the dynamics of physical development shows that anthropometric indicators generally do not change (Table 1). However, there is a decrease in physical fitness indicators: strength and speed-strength abilities.

This is due to an insufficient level of physical activity. Physical education classes included in the curriculum cannot fully compensate for this negative trend.

At the same time, years of study at the university had virtually no effect on the self-assessment of health among first-year and final-year students (Table 2). There are no statistically significant differences either in the average self-esteem scores ($11,07 \pm 0,36$ points for first-year girls, $9,79 \pm 0,99$ points for fifth-year girls), or in the ratio of groups that «fit» into certain ranges of scores. The average POP scores of the subjects are at the upper limit of the normal range (6-10 points). This indicates that female students have not yet accumulated a «burden» of chronic diseases, and the body's capabilities make it possible to compensate for the high psychophysical stress and stress that arise during the learning process.

Nevertheless, tension exists and finds outlet in addictive behavior. Thus, for two signs of addiction («change in tolerance» and «loss of control»), a statistically significant increase was recorded among graduate students compared to first-year students.

Table 1. Physical development, physical fitness and functional state of female students

Parameters	First course			Graduation course		
	n	M	m	n	M	M
Age		18,21	0,03		23,19	0,08
Body length, cm		163,86	0,27		165,28	0,51
Body weight, kg		56,80	0,38		58,55	0,77
Chest circumference, cm		86,80	1,17		85,85	0,54
Bend forward from a standing position, cm		12,26	0,52		13,07	0,55
Standing long jump, m		161,60	1,20		153,79*	1,93
Flexion and extension of the arms while lying down, once		10,44	0,40		9,07*	0,54
Heart rate, beats/min		80,84	0,47		77,90	1,14
Respiration rate per 1 min,		17,11	0,20		17,03	0,19
Stange test, s		45,94	0,65		48,01	1,23
Genchi test, with		29,15	0,43		27,99	0,71

Note: * – differences are significant, $p < 0,05$.

Table 2. Self-assessment of health and diagnosis of addictive behavior

Parameters	First course		Graduation course	
	M	m	M	m
POPs, points	11,07	0,36	9,79	0,99
Diagnosis of addictive behavior				
Changing tolerance	4,04	0,31	6,40*	0,63
Withdrawal syndrome	2,88	0,31	3,77	0,72
Losing control	4,70	0,34	6,63*	0,82
Failed attempts to abstain	3,09	0,28	2,63	0,65
Using «Despite...»	2,23	0,21	2,68	0,67
Denial of your addiction	3,49	0,24	4	0,5
Drastic changes in lifestyle	3,81	0,27	3,31	0,63
Total amount	24,23	1,61	29,59	3,56

Note: * – differences are significant, $p < 0,05$.



Also, during the period of study, the proportion of female students whose addiction is not traceable or is in the initial stage decreases significantly – from 62,8% to 40,9%.

Conclusions. The results of the study showed the presence of negative changes in physical fitness and the formation of addictive behavior among senior female students. At the same time, the level of self-assessment of health status does not change throughout the entire period of study.

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Physical activity and general motor mode of the adult population in the system of ontogenesis

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Abstract

Objective of the study was to identify the influence of physical activity during preparation for testing the GTO complex on the habitual motor mode of the adult population in various periods of age development.

Methods and structure of the study. The experiment involved 480 men and 480 women aged from 25 to 70 years. To assess exercise tolerance, the Borg Rating of Perceived Exertion Scale (Borg CR10 Scale) was used. Heart rate and the number of steps taken per day were recorded using individual fitness gadgets.

Results and conclusions. It was found that the most effective balance of load and recovery time is achieved with two classes per week. The implementation of the research results will help optimize preparation for performing tests of the GTO complex based on a balanced combination of household and physical activity, ensuring a high level of performance, improving physical qualities and motor skills, and the ability to fulfill the state requirements of the GTO complex for insignia while maintaining health.

Keywords: *adult population, physical activity, motor mode, heart rate, training effect, physical fitness, tests of the GTO complex.*

Introduction. Features of physiological life support systems determine individual, potentially probable modes of human motor activity in each age period. At the same time, any human motor activity is produced, ensured and regulated in the interaction of the neuromuscular, cardio-respiratory, endocrine and other systems of the body. At the same time, systematic physical activity optimizes the functional capabilities of the practitioner's body, influencing overall well-being, readiness to perform professional, household and physical activities in the process of life [2, 3, 9]. In this regard, one of the conditions for increasing performance is the balance of load and recovery, as two interrelated aspects of a single process of adaptation of the body to physical activity: with the correctly selected amount of impact of physical exercise (load) on the body of those in-

involved, an optimal combination of work and rest is ensured, it is noted positive effects of training; when the load exceeds the body's capabilities, redundancy of the adaptive reaction is observed and, as a consequence, tension in compensatory functions; at a low level of load from the proposed magnitude of impact, a weakening of adaptation processes occurs and a decrease in the training effect on the body [4, 5, 7, 8]. In this regard, when working with the adult population during the implementation of the GTO complex, taking into account the various functional capabilities of the body within wide age boundaries, the study of the body's recovery response under different volumes of training loads, as an indicator that determines the optimal frequency of training in a weekly cycle, for ensuring readiness to perform VFSK GTO tests while maintaining the usual physical activity.



Objective of the study was to identify the influence of physical activity during preparation for testing the GTO complex on the habitual motor mode of the adult population in various periods of age development.

Methods and structure of the study. The experiment involved 480 men and 480 women aged from 25 to 70 years with different levels of physical activity, who were admitted to prepare for testing the GTO complex. Participants in the experiment are characterized by normal heart rate values at rest ($70 \pm 7,8$ beats/min – men and $72 \pm 7,2$ beats/min – women) with increased values of body mass index ($30,8 \pm 2,2$ kg/m² – men, $25,9 \pm 2,3$ kg/m² – women). Preparation was carried out during complex independent training for 8 months according to individual programs with a frequency of 1 to 5 lessons per week, lasting at least 60 minutes.

The study examined the body's response to physical activity, including the subjects' subjective assessment of recovery time. To assess physical activity, the Borg Rating of Perceived Exertion Scale (Borg CR10 Scale) [10] was used. A comparison was made of the overall habitual daily motor pattern (in steps) within one month before the start of training and four weeks of preparation for performing tests of the GTO complex. Registration of heart rate during training sessions and the number of steps per day was carried out using individual fitness gadgets. The results of monitoring physical activity (the number of locomotions per day, heart rate indicators during exercise) were sent for processing to the laboratory of the PFC and MS of the Federal Scientific Center VNIIFK. after each lesson; the recovery time after the load was recorded and reported after the disappearance of subjective symptoms of fatigue and the appearance of the desire to

Table 1. Subjective assessment of the severity of physical activity in a weekly physical activity regime according to the Borg scale (n=960)

Age	Average score on the Borg Self-Esteem Scale (point)	Average recovery time after exercise (hour)	Average value of weekly physical activity before the experiment (number of steps)	Average value of weekly physical activity after 4 weeks of exercise (number of steps)	The difference between the number of steps before the experiment and after 4 weeks of the experiment (in%)
1 training session per week					
25-29	3,4±0,8	12,1±4,2	76599,3±10286,4	74228,6±9489,2	3,1
30-39	3,8±0,9	15,0±8,4	77413,4±10562,4	74488,2±9497,4	3,8
40-49	3,5±0,5	21,0±2,8	80815,9±11145,7	74772,1±11188,6	7,5
50-59	3,3±0,5	22,0±2,2	66908,4±5780,3	60385,6±5499,5	9,7
60-69	4,0±0,7	31,8±6,4	60395,2±10186,8	51634,9±8722,0	14,5
70+	4,2±0,7	40,4±6,4	51155,6±8459,0	43769,4±7885,0	14,4
2 training sessions per week					
25-29	4,0±0,6	25,9±4,2	86273,6±8879,2	77479,2±8975,4	10,2
30-39	4,1±0,5	26,5±4,4	89128,0±5880,8	79569,8±6266,1	10,7
40-49	4,3±0,5	28,2±5,0	84473,6±8267,0	74279,2±9514,8	12,1
50-59	4,5±0,6	31,5±6,2	78474,4±5697,7	67878,7±6181,9	13,5
60-69	4,7±0,7	43,2±8,8	67087,7±7548,5	56712,1±7077,3	15,5
70+	4,9±0,7	45,4±9,4	59274,4±6036,2	49278,7±6411,4	16,9
3 training sessions per week					
25-29	4,7±0,5	57,2±6,4	100207,9±11636,7	81780,7±11327,3	18,4
30-39	4,9±0,6	59,8±7,7	97505,9±6225,8	79121,7±9240,4	18,8
40-49	5,0±0,6	60,7±6,9	94087,9±3481,8	72009,5±5603,6	23,5
50-59	5,2±0,5	62,9±6,1	92567,9±2481,1	70669,5±5024,9	23,7
60-69	5,4±0,5	69,4±11,6	83995,5±4528,2	63906,2±9037,4	23,9
70+	5,6±0,5	73,9±11,8	77967,5±5609,4	57469,5±5901,5	26,3
4-6 training sessions per week					
25-29	5,7±0,5	78,1±8,9	104426,0±9386,8	84981,2±9156,8	18,6
30-39	5,8±0,5	79,1±8,8	99528,0±5806,3	80022,1±7119,2	19,6
40-49	5,9±0,5	79,7±10,2	98051,6±6073,3	74047,0±3111,9	24,5
50-59	6,1±0,3	85,2±3,6	89851,6±5662,5	64247,0±2573,0	28,5
60-69	6,2±0,4	86,9±5,2	80344,4±6206,9	54307,8±2563,2	32,4
70+	6,4±0,5	88,3±5,8	70051,6±6663,5	40347,0±5339,8	42,4



Table 2. Index of adaptation potential of the cardiovascular system in men and women by age groups in the process of preparation for testing the GTO complex (according to R.M. Baevskiy) (n= 960)

Gender	Parameter	25-29 years old	30-39 years old	40-49 years old	50-59 years old	60-69 years old	70-79 years old
Men	X	2,5	2,6	2,9	3,0	3,3	3,4
	σ	0,2	0,2	0,2	0,2	0,2	0,2
Women	X	2,3	2,5	2,6	2,9	3,1	3,3
	σ	0,2	0,2	0,2	0,3	0,3	0,2

train. To assess the balance of training effects during the preparation process, the adaptation potential (AP) of the cardiovascular system (CVS) was determined according to the method of R.M. Baevskiy [1]. The obtained data was processed by the method of mathematical statistics using mathematical and statistical programs Stadia 6.0 (Russian Federation).

Results of the study and discussion. In the modern GTO complex, the level of physical fitness of participants is assessed based on the results of testing the basic physical qualities and motor capabilities provided for by the state requirements of the complex. Accordingly, in the preparation process, subjects use a wide range of physical training means, which are predominantly complex in nature. The decisive role in influencing changes in the functional state of the body is played by the balance of the volume of physical activity and the speed of recovery of the body [6].

The data obtained during the study indicate that the perceived severity of physical activity in preparation for performing tests of the GTO complex in men and women varies from moderate at the age of 25-29 years to very severe at 70 years and older (Table 1).

Analysis of the data obtained indicates that an increase in the frequency of exercise in a weekly cycle leads to significant shifts in the assessment of the subjective perception of physical activity and the duration of recovery time, being an indicator of the risk of maladjustment. The most optimal combination of load and recovery time was found with two classes per week - recovery time ranges from 25 to 45 hours. With four or more training sessions per week, there is a significant increase in recovery time in all age groups (over 3 days).

Monitoring of indicators of dynamic control over the state of the AP of the cardiovascular system engaged in preparation for testing of the GTO complex demonstrates various gender and age variations: at 25-29 years old - a satisfactory state of adaptation mechanisms; at 30-59 years old for men and at 40-59

years old for women – tension in adaptation mechanisms; at 60 years of age and older – a decrease in the functional capabilities of the body with unsatisfactory adaptation to training influences (Table 2).

A comparative analysis revealed a tendency for a negative relationship between the volume of motor activity and the frequency of training sessions (per week): performing one training session per week reduces the volume of habitual motor activity by 8,8% on average for all age groups; with two training sessions per week – by 13,1%; with three training sessions per week – by 22,4%; with 4-5 sessions – by 27,7% (Table 1). In addition, the negative effect of the frequency of training loads on the usual volume of physical activity increases in accordance with age-related and involuntary changes. For example, in the case of one training session per week, a decrease in the volume of physical activity is observed from 3,1 (25-29 years) to 14,4% (70 years), while with four or more training sessions - from 18,6 (25-29 years) to 42,4% (70 years), indirectly demonstrating the likely limits of the functional capabilities of providing motor activity with load factors of varying magnitude and content in different periods of ontogenesis.

Conclusions. The study revealed the effect of exposure to varying amounts of physical activity on the habitual motor pattern during the day. The new knowledge obtained indicates that two sessions per week with a duration of 50 minutes each correspond to the basic training effect (allowing you to prepare for performing tests of the GTO complex at the bronze badge level), have a slight effect on reducing habitual physical activity during the day, ensuring readiness for the next lesson within 48 hours.

The motor mode with 3 or more training sessions per week with a duration of 50 minutes each is more suitable for individuals who have a fairly high level of functional fitness, ensured by an adequate response of adaptive systems to loads of varying magnitude and specificity. Accordingly, when planning preparations



for performing tests of the GTO complex, it is necessary to combine household and physical activity in such a way as to ensure the optimal time (48 hours) for restoring the functional capabilities of the body, which will help maintain a high level of performance during the day, improve physical qualities and motor skills and skills as the basis for fulfilling the state requirements of the GTO complex for insignia.

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Comparative assessment of management systems in the field of physical education and sports in the brics countries

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Abstract

Objective of the study was to conduct an assessment of the sports management system in the BRICS countries.

Methods and structure of the study. As part of the scientific work, an institutional approach was used to study the organizational structure of government bodies implementing policies in the field of physical culture and sports in the BRICS countries, using the method of structural analysis, comparative analysis and generalization.

Results and conclusions. Using the example of the activities of government authorities in the field of sports, various approaches to organizing a management system in sports are shown using the example of the BRICS countries, where some countries implement the classical approach to management headed by the relevant government body in the field of physical culture and sports (Russian Federation, South Africa), and others, in addition, have specialized second-level departments that perform the role of specialized government agencies (Brazil, India, China). At the same time, within each of the identified models there are specific features of the organization of the management system in sports, which is due to the specifics of the regulatory system, socio-economic development and national culture of each country.

Keywords: *management in the field of physical culture and sports, government authorities, state policy in the field of sports, BRICS countries.*

Introduction. The development of sports is a key policy direction of most modern states. Research on the sports management system in the BRICS countries deserves close attention not only because up to 41% of the world's population live on their territory, providing a total of 35% of global GDP, but also because the development indicators of the sports sector of these countries remain very high. For many years, the Russian Federation and the People's Republic of China have maintained the status of leading countries in world Olympic sports, and the indicators of sports achievements of other BRICS countries also continue to gradually grow. Thus, Brazil took 12th place in the overall medal standings of the Games of the XXXII Olympiad 2020 in Tokyo, winning 21 medals, compared to 13th place and 19 medals won at the home Olympic Games in Rio de Janeiro, and India increased the

number of medals from 2 at the Games of the XXXI Olympiad in 2016 to 7 at the Games of the XXXII Olympiad in 2020 in Tokyo.

Objective of the study was to conduct an assessment of the sports management system in the BRICS countries.

Methods and structure of the study. As part of the scientific work, an institutional approach was used to study the organizational structure of government bodies implementing policies in the field of physical culture and sports in the BRICS countries, using the method of structural analysis, comparative analysis and generalization.

Taking into account that new members have joined the BRICS association since January 2024, it should be noted that the analysis of the sports governance structure in this article is presented on the basis of the



public policies of the five traditional BRICS members: Brazil, the Russian Federation (RF), India, the People's Republic of China Republic (PRC) and the People's Republic of South Africa (South Africa).

Results of the study and discussion. The development of physical culture and sports is a traditionally important direction of Russian state policy, which is designated as a priority goal of the Strategy for the Development of Physical Culture and Sports in the Russian Federation for the period until 2030 [3]. The target indicator is to increase the proportion of citizens systematically involved in physical culture and sports to 70%, as outlined in the Presidential Decree "On National Development Goals" for the period until 2030 [4]. This task sets the vector for the development of the country's sports industry in the coming years, determining the need to improve the implemented state policy in the field of physical culture and sports at the federal, regional and municipal levels [1]. The management system in the field of sports is based on coordination of the activities of the Ministry of Sports of the Russian Federation as the leading federal executive body in the field of physical culture and sports with the All-Russian Union of Public Associations "Russian Olympic Committee", public organizations "Russian Paralympic Committee" and "Russian Deaflympic Committee", their regional branches, all-Russian sports federations, non-profit and public organizations. At the regional level, policy in the field of physical culture and sports is carried out by the federal executive authorities of the constituent entities of the Russian Federation, represented by relevant ministries (departments, committees) for sports affairs, and at the municipal level - by specialized committees and departments in the structure of municipal administrations.

A largely similar model with the central role of the state executive body in the field of sports operates in all BRICS member countries. Thus, in the People's Republic of China, policy in the field of sports is carried out by the General State Administration for Physical Culture and Sports, operating within the structure of the State Council of the People's Republic of China, in Brazil - the Ministry of Sports, while in India and South Africa it is supervised by ministries for related issues - the Ministry of Affairs Youth and Sports of India and the Ministry of Sports, Arts and Culture of South Africa, respectively.

It should be noted, however, that in Brazil and India, in addition to the relevant government body in the field of sports - the Ministry of Sports of Brazil and the Ministry of Youth and Sports of India - there are also special gov-

ernment agencies that act as a link between the relevant government body and the national sports movement.

Such a body is the National Sports Council of Brazil (Conselho Nacional do Esporte), an institution subordinate to the Brazilian Ministry of Sports, created in 2002 [5]. This is a collegial advisory body consisting of 22 members appointed by the Minister of Sports, who heads this Council. The National Council is authorized to develop key regulatory documents in the field of sports. Thus, in 2005, the Council developed the National Sports Policy, the goals of which are to provide the right to engage in physical activity and mass sports, as well as elite sports, in the context of considering sports as a tool of social integration [7].

India, like Brazil, has a two-tier system of government. Moreover, if the first level of government in the field of sports is represented by the Ministry of Youth Affairs and Sports of India, within which there is a specialized Department of Sports, then the second level is represented by the Sports Authority of India (SAI), established by the Ministry of Youth Affairs and Sports as a subordinate organization directly subordinate to the Department of Sports, Ministry of Youth Affairs and Sports of India.

The Sports Authority is also a collegial body, which consists of 36 members (as of 2024), appointed by the Minister of Youth and Sports [8]. Being subordinate to the Ministry, the department receives state funding from the federal budget, and at the same time has the right to conduct extra-budgetary activities within the framework of its powers. As in Brazil, the Sports Authority of India participated in the formulation of the National Sports Policy of 1984, which became the first regulatory document that laid the foundation for the formation of the current system of sports governance in the country, and later the National Sports Policy of 2001 [6].

To a certain extent, the management system in the field of sports of the PRC can also be attributed to this two-level model, since under the auspices of the Main State Administration for Physical Culture and Sports the All-China Sports Federation has been operating since 1952, which was in many ways the ancestor of the Olympic Committee of the PRC, which subsequently separated and became independent and an independent organization in 1979. The All-China Sports Federation continued its activities as a subordinate organization of the General State Administration for Physical Culture and Sports, ensuring interaction between the ruling Communist Party, the government and the national sports movement of the PRC. Along with the Main State Administration, the Federation

takes an active part in the process of developing strategies for the development of sports, and also provides consultations and represents the interests of the government in the decision-making process on issues in the field of sports policy [2].

In South Africa, in accordance with the national Law on Sports and Recreation of 1998, the Ministry of Sports, Arts and Culture, which is part of the government of the country, operates [9]. In the absence of a system of subordinate institutions, the Ministry works closely with the South African Sports Confederation and Olympic Committee, providing in fact direct government funding from the federal budget and the national lottery. The committee, in turn, distributes this funding among national federations by sport.

In Russia, the sports management system is represented by the Ministry of Sports of the Russian Federation as a government body, which has a number of subordinate organizations. At the same time, in addition to the ministry, the role of a collegial body participating in the process of developing policy in the field of physical education and sports is the Public Council, consisting of 24 members, which participates in the development of draft documents, which are subsequently sent for approval to the Ministry of Sports of Russia, as well as exercises public control over the activities of the ministry.

Conclusions. It should be noted that in the BRICS countries, in addition to the relevant government bodies, there is an extensive system of governing bodies, often represented by subordinate government organizations performing the functions of agencies: the All-China Sports Federation in the PRC, the Sports Administration in India, the National Sports Council of Brazil, and a number of subordinate institutions Ministry of Sports of the Russian Federation, which ensures delegation of powers to the relevant government body and promotes closer interaction with public sports organizations of these countries, including national sports federations.

The similarity in the regulation of the sports industry in Brazil, India and China is that they have a two-level system of organizing management in the field of sports, while domestic experience, as well as the experience of South Africa (and a number of countries in Europe and Asia), shows a traditional a classic approach to management in the field of sports with the central role of the government body in the field of sports and a system of subordinate organizations, without the allocation of specialized second-level de-

partments with the status of government agencies.

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Competence-oriented task as a means of achieving educational results in future specialists in physical education and sports

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Abstract

Objective of the study was to theoretically develop and experimentally substantiate the effectiveness of using competency-oriented tasks in pedagogical disciplines at a physical education university.

Methods and structure of the study. To achieve the goal, the following methods of pedagogical research were used: analysis and synthesis of literature on the research problem, study and analysis of regulatory documents, pedagogical observations, survey in the form of conversations with colleagues and students, pedagogical experiment, methods of mathematical statistics. The study was conducted on the basis of the Department of Pedagogy of NSU. P.F. Lesgafta, St. Petersburg.

Results and conclusions. The experiment conducted allows us to state the effectiveness of theoretically developed and experimentally substantiated competency-oriented tasks in pedagogical disciplines. Their use ensures that future specialists in physical culture and sports develop interdisciplinary professionally oriented knowledge, skills, and work actions that contribute to the successful implementation of labor functions, the effective monitoring of which is carried out within the framework of professionally oriented and scientific-pedagogical practices.

Keywords: *competency-oriented task, educational process, educational results, universal, general professional and professional competencies, physical education university students.*

Introduction. The construction of a higher education system at the present stage is focused on the implementation of a competency-oriented approach, which involves the formation of universal, general professional and professional competencies in students. One of the means of such formation is the design of a competency-oriented task, as well as its implementation in the educational process of the university.

Objective of the study was to theoretically develop and experimentally substantiate the effectiveness of using competency-oriented tasks in pedagogical disciplines at a physical education university.

Methods and structure of the study. An analysis of literature and regulatory documents, pedagogical observations in training sessions was carried out, which made it possible to theoretically develop competency-oriented tasks in pedagogical disciplines and test their effectiveness in experimental work carried

out at the Department of Pedagogy of NSU. P.F. Lesgafta, St. Petersburg.

Results of the study and discussion. «A competency-oriented task is an integrative didactic unit of competency-oriented education, including technology, content, monitoring the quality of education, aimed at the effective formation of professional competencies of university students» [6, p. 115]. As part of the design of a competency-based assignment, the following requirements must be taken into account: the content of the assignment and the result obtained must reflect professional significance for the student, the possibility of developing the necessary knowledge, skills and possessions and their transfer to the professional field of activity, i.e. formation of professional competence; the formulation of the task should be designed as a problem situation, as well as a method for solving it; the implementation of independent



activity of students associated with both mastering the necessary knowledge and finding ways to solve a task will allow us to formulate a methodology for solving the task and ensure effective transfer to similar tasks, etc. [2, 6].

The structure of a competency-oriented task involves the following components: 1. Stimulus - involves the formation of the student's motivation to complete the task, the implementation of the indicative basis of the student's activity. 2. Task formulation – providing the text of the task itself with a clear definition of the need for students to implement independent activities to complete it. At this stage, a task form with a prescribed algorithm for its presentation can also be presented. 3. Source of information - databases. 4. Verification tool – rating scale, methods and criteria for evaluating the result.

Designing competency-oriented tasks, which can also be considered as test and measurement materials, involves, in our opinion, the following actions: «1. Determine the competence, the formation of which occurs through the development of an academic discipline. 2. Determine the system of labor actions and labor functions formed within the framework of the educational process, based on the implementation of professional standards. 3. Determine the system of knowledge, skills and possessions that make up the substantive and procedural components of the specified competence, taking into account the formed labor actions, labor functions and the subject content of the academic discipline. 4. Determine the indicators of the formation of a system of knowledge, skills and possessions (indicators of achievement) that make up the substantive and procedural components of the specified competence, taking into account the formed labor actions, labor functions and the subject content of the academic discipline. 5. Develop a system of control and measurement materials that determine the maturity of the system of knowledge, skills and possessions... 6. Determine the criteria for the formation of a system of knowledge, skills and possessions... within the framework of the implementation of control and measurement materials» [1, pp. 161, 164-165].

Thus, for the formation and assessment of the ability: «To develop socially significant personal qualities, to form moral values of fair sports competition» (Labor function A/06.6, Professional standard «Trainer-Teacher») [4, p. 18] as a component of general professional competence in The following competen-

cy-oriented tasks have been developed in the discipline «Pedagogy of Physical Culture and Sports»: 1. Develop at least two methods of pedagogical diagnostics in order to study the degree of manifestation of students good manners. Study the level of development of personal qualities (hard work, responsibility, discipline, goodwill, etc.) in the group of students and in each student, draw a conclusion. 2. Formulate general and specific educational tasks, determine ways to solve them. Develop the content of an ethical conversation, taking into account the results of diagnosing the education of students, their age characteristics, as well as the requirements for the use of this method. Conduct an ethical conversation, as well as an analysis of the conversation carried out, noting the advantages and disadvantages.

In the process of studying the discipline «Professional Ethics», in order to form the same competence, students were asked to complete the following tasks: assess the degree of formation of certain professional and ethical qualities in themselves, compare their assessment with an expert assessment, draw a conclusion and suggest ways for their further development; prepare a report with a presentation and speak in front of an audience (one of the evaluation indicators is compliance with ethical standards); find a way to solve the ethical problem proposed by the teacher, etc. The results of the formative experiment (n=30) indicate that the level of ethical knowledge among students in the experimental group (n=15) increased from the level of «above average» to «high», the level of professional ethical skills from «average» to «above average», the level of manifestation of professional and ethical qualities (restraint, responsibility, integrity) from «average» to «above average» [5]. The reliability of the differences between the results of expert judges assessment of the level of development of ethical knowledge, skills, professional and ethical qualities in the control and experimental groups after conducting a pedagogical experiment based on the use of the Mann-Whitney U test was fixed at a significance level of 0,05 [5].

Let us give another example of a competency-oriented assignment in the academic discipline «Scientific and Methodological Activities» of the training area 49.03.04 – Sports. This academic discipline develops students research skills and prepares the graduate to solve research-type problems within the categories «Scientific Research» and «Systemic and Critical Thinking».



1. Stimulus: the professional competence of a teacher as an integrative characteristic of a specialist includes a research component as a factor of self-development, self-improvement and professional self-determination, on the one hand, and at the same time a necessary condition for the implementation of future academic and educational work, on the other hand. As part of this task, research skills and mastery of the methodological apparatus of scientific research are developed.

2. Task formulation: Draw up a plan-prospectus for research on the topic of the future research project. As a result of completing this assignment, students acquire knowledge about the structure of scientific research, its methodological characteristics, expand knowledge about research methods and their choice for solving research problems, and gain experience working with scientific texts.

3. Sources: university website (extensive requirements of the State Academy of Sciences), lecture notes, theoretical materials posted on the website of the University, literature in accordance with the work program of the discipline.

4. Verification tool: protection of the prospectus plan, evaluation criteria - literacy and correctness of methodological characteristics; validity of the choice of research methods; degree of teamwork.

Taking into account the structural components of a competency-oriented assignment, we give an example of such an assignment for undergraduates in the direction of training 49.04.01 - Physical education, focus (profile) - Professional education in the field of physical culture and sports within the framework of the academic discipline «Professional pedagogical activity of a teacher», through which professional competencies are formed: «Able to carry out scientific, methodological and educational support for the implementation of educational programs of higher education in the field of physical culture and sports» and «Able to teach educational programs of higher education and additional professional education in the field of physical culture and sports» [3, p. 35].

Incentive: the professional activity of a teacher involves the implementation of all types of teaching activities, which determines the formation of professional competence of a specialist in this field. As part of the implementation of a competency-oriented task, knowledge, skills and knowledge are formed in the field of the basics of organization and control of educational activities, the use of pedagogically sound

forms, methods, techniques for organizing control and assessment of the development of a training course in classes of various types within the framework of the implementation of higher education programs in the field of physical education. culture and sports.

1. Problem formulation: Compose test tasks for the academic discipline. Create a test card specification. Conduct and process the results. Students are provided with a plan for completing the task, a form for filling out the test specification; formula for processing the result; algorithm for presenting analysis of results. Testing is possible using digital tools.

When completing the task, students update their knowledge of the essence of the concepts «pedagogical control», «pedagogical testing», «test specification», take into account the types and requirements for the development of test tasks, the requirements for drawing up test specifications, and the criteria for assessing the results of test tasks. The teacher performs the function of advising students as part of the design of the assignment.

3. Source of information: information resources; lectures; textbooks on the discipline «Pedagogy»; tutorials, etc.

4. Verification tool: task completion model key; oral control (practice-oriented implementation). Among the evaluation criteria are: completeness of the answer, its breadth; logic and consistency of presentation; knowledge of terminology; validity and evidence of the results; structuring your own position.

Conclusions. As a result of the application of theoretically developed and experimentally substantiated competency-oriented tasks in pedagogical disciplines, future specialists in physical culture and sports develop knowledge, skills and proficiency in the field of teaching, which allows them to perform labor functions reflected in professional standards at a sufficiently high level. The knowledge, skills, and possessions acquired during the learning process are successfully implemented by them within the framework of professionally oriented and pedagogical practices.

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Designing a program for forming professional-values orientations in future bachelors of adaptive physical culture

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Abstract

Objective of the study was to determine the priority of key organizational and methodological provisions for designing a Program for the formation of professional and value orientations among future bachelors of adaptive physical education (in the process of learning a foreign language).

Methods and structure of the study. The methodology is based on axiological, personal-activity and professionally-oriented approaches to training students in the direction 49.03.02 «Physical education for persons with health problems (adaptive physical education)». The main research methods are theoretical and methodological analyzes (study and analysis of regulatory documents, innovative teaching experience), diagnostic method (questioning) to study students' attitudes towards their future profession. The experiment was conducted at the Institute of Physical Education, Sports and Life Safety of Yelets State University named after I.A. Bunin in the 2022-2023 academic year. A total of 103 1st year students participated in the experiment.

Results and conclusions. The main organizational and methodological provisions of the Program for the formation of professional and value orientations among future bachelors in adaptive physical education: the creation of a psychologically comfortable microclimate in a foreign language lesson for the development of a student as a moral person with clear life guidelines; an axiological approach to the selection of foreign language content, taking into account the principles of humanistic orientation, professional guidance and educational intentions; activation of communicative interaction (teacher-group; student-student) in the classroom through the use of active learning methods (projects) that provide a high degree of dialogue communication as a way of value-semantic interaction among students; application of modern technologies for effective thinking and productive activity; updating reflection and self-reflection of students; activation of their professional position by acquiring their own experience of value-conscious activities.

Keywords: *bachelor, adaptive physical education, professional and value orientations, Program, organizational and methodological provisions, foreign language teaching.*

Introduction. Important importance in the process of university training of future specialists is given to the formation of professional and value orientations [3, 5]. In the scientific literature, the concept of «value orientation» is defined differently: as «an individuals focus on certain values» [1, p. 112], as an individuals subjective attitude to social values [2], as social values [5]. Their content is based on values that serve as a guide for human behavior. In the process of educational activity, students devel-

op not only cognitive processes, but also the value-semantic, motivational sphere, they form affiliation with a certain professional group, master and internalize its values, and develop a complex of professionally significant qualities. The problem of forming professional and value orientations is presented in various philosophical, sociological, psychological and pedagogical studies. However, despite the extensive theoretical material and in-depth analysis of the problem under consideration, it seems



to us that the issue of developing professional and value orientations among future bachelors in adaptive physical education in foreign language classes has not been sufficiently developed. The discipline «Foreign Language» with its potential educational, educational and developmental resource, which, unfortunately, is often underestimated by students, has great opportunities for the formation of professional value orientations.

Objective of the study was to analysis and prioritization of key organizational and methodological provisions for the design of the Program for the formation of professional and value orientations among future bachelors in adaptive physical education in foreign language classes (hereinafter referred to as the Program).

Methods and structure of the study. The methodology is based on axiological, personal-activity and professionally-oriented approaches to training students in the direction of 49.03.02 Physical education for persons with health problems (adaptive physical education). The main research methods are theoretical and methodological analyzes (study and analysis of regulatory documents, innovative pedagogical experience), diagnostic method (questioning). The study was conducted at the Institute of Physical Education, Sports and Life Safety of Yelets State University named after I.A. Bunin in the 2022-2023 academic year. A total of 103 1st year students participated in the experiment.

Results of the study and discussion. We understand the professional and value orientations of future bachelors in adaptive physical culture as a relatively stable, professionally determined orientation of the individual towards universal human dominants that make sense for the student's future profession, an orientation towards professionally defined models of behavior, ways of achieving them, expressed in the form of personal qualities and competencies that ensure future professional success.

The study and analysis of regulatory documents [4, 6] showed that a bachelors degree graduate must be able to introduce people with certain health conditions to adaptive physical culture. The Federal State Educational Standard requires the bachelor to have both theoretical and physical preparedness, as well as a clear assimilation of production and social norms of behavior, and the presence of business and personal qualities necessary to perform labor functions [6]. The standard dictates the need for the

future bachelor to master the skills to establish pedagogically appropriate relationships with students, parents (legal representatives); organize value-semantic dialogue communication.

At the beginning of the 2022-2023 academic year, we interviewed first-year students of the institute regarding their understanding of the importance of developing professional value orientations and their determination of the importance of business and personal qualities for their successful future professional activities. First-year students were asked to indicate the leading motives for entering a higher educational institution, as well as to choose, in their opinion, the most significant knowledge, abilities, skills and qualities for their future profession. An analysis of the results of a survey of first-year students showed that «awareness of the social significance of this profession» is far from being the most important motive for enrolling them in college. The main motive for choosing a future profession for 43 people was students showed «interest in sports activities», «desire to further improve physical training» (41,7%). The next most important motive for choosing a future profession is «achieving material well-being» (23 people, 22,3%): «working as a coach is prestigious and well paid, especially in large cities». Of no small importance for students was the «convenient location of the university» (in their hometown or nearby in the region) (16,5% 17 people), the relatively small competition among applicants for admission to the university «could not enroll in another direction» (10%). Interest in the profession, formed as a result of acquaintance with representatives of this profession, which served as the reason for entering this field of training, was shown by only 17 respondents (16,5%). 9,5% of respondents chose their profession due to family traditions. Regarding the identification of professionally significant skills and qualities, students most highly rated the importance of the cognitive component of their future profession: high level of education, competence in a wide range of sports problems (72 people 69,9%); desire for constant improvement of professional knowledge (70 people 67,3%), and special physical training (64 people 61,6%). Many students highlighted the ability of self-education (25 people 24,0%). The majority of respondents underestimated the socio-behavioral components of their future profession. Only 25 students identified an emotionally positive attitude towards people. Also, such



characteristics of the model of successful professional behavior of future bachelors as «tolerance», «empathy», «delicacy and tact», «sensitivity» did not find a wide response among the respondents. «Humanity, mercy» was noted by 21 people. (20,4%); social intelligence (the ability to adequately perceive and analyze social situations and other people) was rated low (10 people (9,7%). One fifth of the respondents noted unselfishness, honesty, decency, responsibility, and high morality as important qualities for a future profession. Among the least prioritized were communication skills and teamwork skills (9%).

Taking the data from the survey results of first-year students, we believed that when designing the Program it is important to concentrate on students mastering and understanding in class the values of their future profession; understanding of educational inclusion, development of tolerance, communication abilities and organization of teamwork with a group of people with disabilities. We have developed the following organizational and methodological provisions that form the basis of the Program.

Proposition one: creating a psychologically comfortable microclimate in the classroom for the development of the student as a moral person with clear life principles. The atmosphere in the classroom creates an idea for students about a healthy lifestyle. Switching students to another type of activity (somewhat entertaining) helps restore their physical and spiritual strength.

Proposition two: an axiological approach to the selection of foreign language content, taking into account the principles of humanistic orientation, professional guidance and educational intentions. The selection of language and text materials is aimed at the optimal development in students of qualities relevant to the chosen specialty (demandingness, sensitivity, politeness, tact, friendliness, composure, integrity, energy and humanity). These are videos, dialogues and texts related to the future profession, the new realities of modern life, and the spiritual and humanistic education of students. Of particular importance are materials containing the basics of social prevention and educating students about the unacceptability of antisocial manifestations.

Proposition three: activation of communicative interaction (teacher-group; student-student) in the classroom through the use of the project method,

providing a high degree of dialogue communication, corresponding in form and content to future professional interaction. The ability to work in a team during their development provides interdependent positive qualitative dynamics in the development of value orientations of the student's personality.

Proposition four: the use of modern technologies for effective thinking and productive activity. In the process of studying foreign language content, it is important to develop in students the ability to analyze, reason, compare, generalize, and critically evaluate; willingness to acquire new information. In terms of studying each lexical topic, the teacher needs to create conditions for achieving positive behavioral changes in the individual, which is facilitated by humanistically oriented communicative tasks aimed at solving socially significant problems of society.

Proposition five: acquiring one's own experience in value-based, professionally oriented activities. To achieve this, it is planned to establish coordination of the educational process with inclusive volunteer activities of students. As social partners of Yelets State University named after I.A. Bunin, participating in the implementation of the educational program are the State Budgetary Educational Institution «Special Boarding School of Yelets», the Public Institution «Yelets Social Rehabilitation Center for Minors «Ark», a non-profit organization (Center «We Are Together»). In classes, we practice discussing the results of students volunteer activities as part of the study of lexical topics: My future profession, Famous people, Business communication, etc. Teaching students the skills of reflective analysis leads to positive dynamics in solving specific pedagogical situations. In the classroom, reflection and self-reflection of students is updated, promoting their awareness of their real practical activities, which subsequently ensures the achievement of professional success.

Conclusions. The program for the formation of professional and value orientations in foreign language classes in a future bachelor of adaptive physical education can be interpreted as a process of development, self-improvement and self-actualization of the student, aimed at stimulating his increased interest in the profession, correction of his qualitative characteristics, acquisition of new personal qualities and values orientations. The implementation of this Program will ensure increased



competitiveness of the future bachelor in the labor market. Teaching practice shows that the formation of qualities and skills, professional and value orientations can be continued both in the process of studying other disciplines and during educational practice.

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Proposals for the edition of the federal standard of sports training for the sport «Wrestling»

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Abstract

Objective of the study was to present recommendations on the revision of the Federal Standard of Sports Training for the sport «Wrestling».

Methods and structure of the study. The work analyzed the content of the federal standard of sports training for the sport «wrestling» (order of the Ministry of Sports of the Russian Federation dated November 30, 2022 No. 1091).

Results and conclusions. The analysis showed that the Standard needs to be finalized in accordance with the requirements of the theory and practice of training athletes in the following areas: first - the unification of types of sports training in the structure of the educational and training process, their volume and dynamics at the stages of sports training, second - standards for monitoring the level of special physical preparedness.

Keywords: *federal standard, wrestling, types of training, physical fitness standards.*

Introduction. Federal standard of sports training by type of sport «wrestling» (order of the Ministry of Sports of the Russian Federation dated November 30, 2022 No. 1091) (hereinafter referred to as the Standard) defines: requirements for the structure and content of approximate additional educational programs for sports training, including their theoretical and practical sections in relation to to each stage of sports training; physical fitness standards and other sports standards taking into account age and gender; requirements for the participation of persons undergoing sports training and those carrying it out in sports competitions; requirements for the results of sports training in relation to the stages of sports training; features of sports training in individual sports disciplines of the sport «wrestling».

Familiarization with the Standard made it possible to identify fundamental contradictions and inconsistencies between its content and the system of training athletes [3, 4, 5], firstly, in the ratio and

combination of types of training at the stages of long-term training (Appendix No. 5); secondly, most tests for monitoring the level of special physical fitness of Appendix No. 6-9 of the federal standard are only partially suitable (physical qualities are tested selectively and do not reflect the specifics of competitive activity) for monitoring the level of general physical fitness.

From the above it follows that the Federal standard of sports training for the sport «wrestling» needs to be finalized in accordance with the requirements of the theory and practice of training athletes, as well as the specifics of the sport, which is an urgent task for children's and youth sports and elite sports [3, 4, 6].

Objective of the study was to present recommendations on the edition of the Federal Standard of Sports Training for the sport «Wrestling».

Methods and structure of the study. The study was carried out in two stages. At the first stage, the



works of the founders of sports science were studied and the best practices of coaches specializing in wrestling were summarized. At the second stage, an analysis of the Federal standard of sports training for the sport «wrestling» was carried out and recommendations for its correction were developed.

Results of the study and discussion. Having studied the contents of the Standard, we will focus on the three most important aspects that, in our opinion, require revision.

First of all. Combining types of sports training in the structure of the educational and training process at the stages of sports training. In the federal standard, types of training are identified and arranged into four groups as follows (Appendix No. 5): general physical training; special physical training; technical training; tactical, theoretical and psychological preparation, indicating the percentage of each group from the total volume of sports activities.

When planning and implementing the training of athletes, leading practitioners use the terms «technical-tactical skill», «technical-tactical training», «technical-tactical action», which indicates the close relationship between technology and tactics of the sport and implies the inextricable improvement of these two types of training.

The opinions of leading modern scientists also agree that in the system of sports training, tactical training should be considered with technical training as a single subsystem. So L.P. Matveev states that sports technique represents more or less perfect ways of performing competitive actions, and sports tactics is a form of combining the entire set of these actions in the process of achieving a competitive goal. This explains the close relationship between the technical and tactical training of an athlete, which can be separated only conditionally [3]. In the works of Yu.A. Shakhmuradov gives the following definition of a wrestler's tactics – «methods of implementing specific actions, methods of conducting a separate fight, methods of conducting the competition as a whole» [6]. Speaking about the tactics of a wrestler, we can highlight the main idea of O.G. Izhevskiy: tactics are closely intertwined and directly depend on the technical readiness of both the athlete himself and the capabilities of the opponent [1].

From the above it follows that technical actions (techniques) should be improved inextricably with the methods of their implementation, even at the

early stages of sports specialization, and then they are transformed into technical and tactical actions that the athlete will use in competition conditions.

V.N. Platonov also points out the deep relationship between technical and tactical training, noting that the level of tactical preparedness of athletes depends on their mastery of the means of sports tactics (techniques and methods of their implementation), its types (offensive, defensive, counterattacking) and forms (individual, group, team) [4]. The same idea is confirmed by the authors: Zh.K. Kholodov, V.S. Kuznetsov, stating that tactical preparedness is closely related to the use of various technical techniques, methods of their implementation, the choice of offensive, defensive, counterattack tactics and its forms (individual, group or team) [5].

Thus, the opinions of leading scientists and practitioners agree that when training athletes, it is not advisable to improve technique in isolation from tactics, therefore, in the federal standard it would be correct to combine these types of training into one.

Secondly. The volume and dynamics of types of training (special physical and technical) in the structure of the educational and training process at the stages of sports training.

In the federal standard (Appendix No. 5), only 6% of the time is allocated for technical training at the stage of initial training (the first four years of preparation), from 10% to 15% - at the stage of sports specialization (the next 3-4 years of preparation), 14% - at the stage of improving sportsmanship, from 12% to 14% - at the stage of higher sportsmanship. Scientific knowledge and experience in training athletes in sports with a large volume of techniques and actions (sports games, martial arts, complex coordination sports) shows that significantly more time is devoted to improving technical and tactical skills than is allocated by the standard.

From Appendix No. 5 of the standard it is clear that the volume of special physical training (20% in the first year of training) at the initial stage of training is greater than at the educational training stage (16% in the fifth year of training), and is equal to the volume at the stage of improving sportsmanship, which contradicts the system of training athletes.

Below we present the opinion of L.P. Matveev regarding the first two stages of preparation. At the initial training stage, classes are structured mainly according to the type of broad general physical training



with the integrated use of available means of comprehensive physical education and general «sports education». Best practice shows that one should not rush into a narrow focus on sporting interests at this stage. The main place in the content of training with the beginning of sports specialization continues to be occupied by broad general training; special training is also carried out using a wide range of special preparatory exercises, a large place among which is given to exercises aimed at systematically forming the fundamentals of the technique of the chosen sport [3].

Third. Standards for monitoring the level of special physical preparedness (SPP). Firstly, the standards from the Standard do not reflect the specifics of the sport; they are the same for freestyle and Greco-Roman wrestling. Secondly, these standards mainly evaluate only strength abilities and do not evaluate special speed, special flexibility, special agility and special endurance, which determine the success of competitive activity. Thirdly, it is not clear by what criterion the standards for monitoring general and special physical fitness are divided. So, for example, the standard «standing long jump with a push with two legs» refers to the standards for monitoring general physical fitness (GPP), and the standards «standing high jump» and «triple jump from standing» - to the standards for monitoring special physical fitness. Or the standard «flexion and extension of the arms in a prone position» is used as a standard for controlling general physical fitness, and the standard «flexion and extension of the arms in an emphasis position on the uneven bars» is used as a SPP. In our work [2], we developed tests for monitoring the special SFP of wrestlers, which take into

account the specifics of competitive activity in free-style wrestling and correlate with its success.

Conclusions. The federal standard of sports training for the sport «wrestling» requires modification in accordance with the requirements of the theory and practice of training athletes in the following areas: first - the unification of types of sports training in the structure of the educational and training process, their volume and dynamics at the stages of sports training, second - standards for monitoring the level of special physical fitness.

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