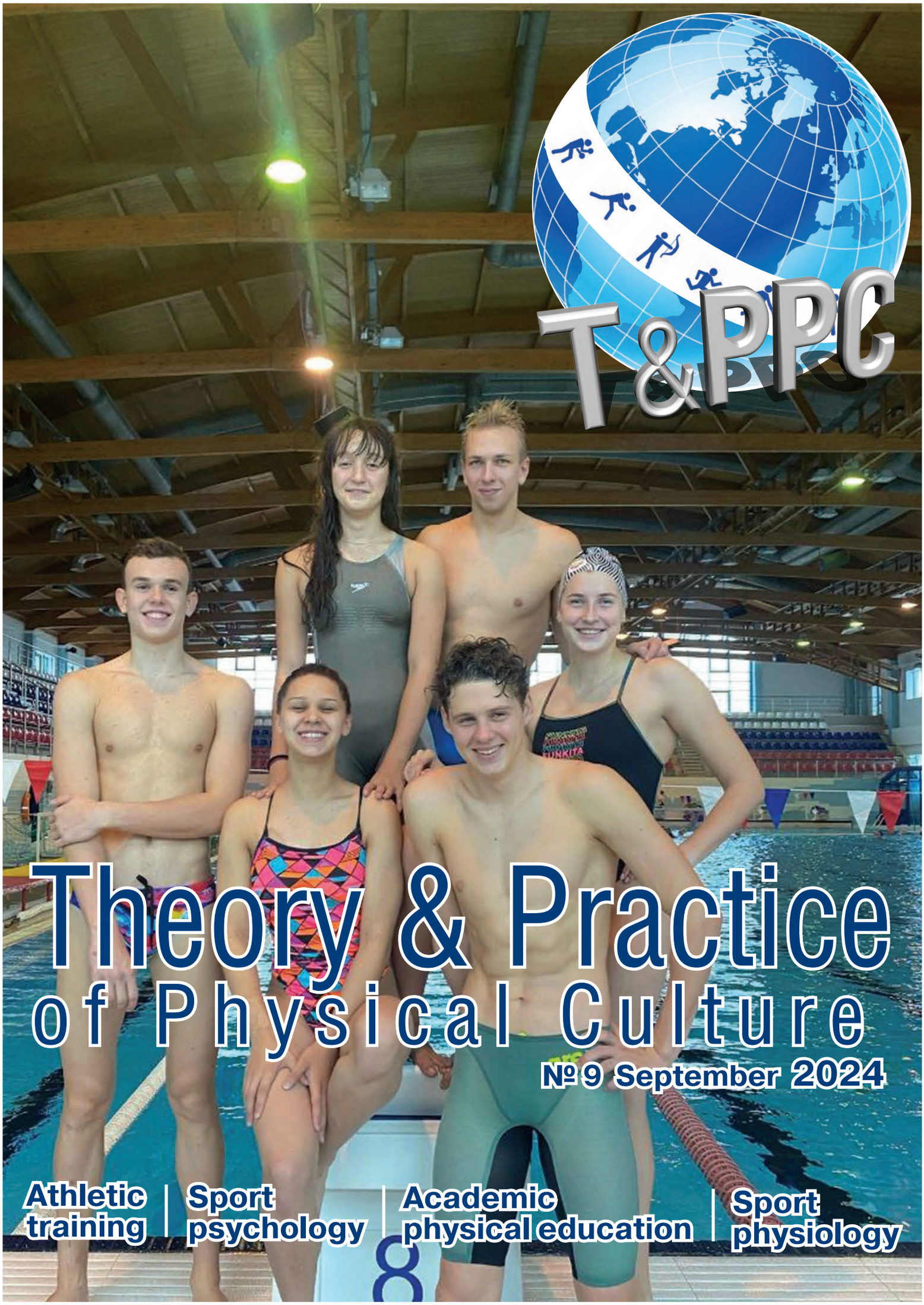

Theory & Practice of Physical Culture

№ 9 September 2024

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

Methodological foundations for the formation of a national doctrine for the development of sports culture

Sport is a modern socio–cultural phenomenon that is part of the life of any society and is subject to the same problems that dominate in this society.

It is known that Russian sport is under political pressure from international organizations, including the IOC. Taking into account the current circumstances, there is a need in the Russian sports community to develop and justify solutions that can provide answers to the following questions:

• should the commercialization and professionalization of Olympic sports be further realized; what will be the meaning of its future social purpose;

• which alternative Russian sports movements can receive worldwide recognition and support from governments, business and society.

To get an answer to these questions, it is necessary to search for and justify possible options for the development of sports movements from the position of scientific argumentation of ideologies, disclosure of the mechanism of implementation and evidence of their social significance in the expansion of the Russian sports space.

Today, along with the Olympic movement, sports movements are being implemented in Russia, mainly such as: "sport for all", youth sports, "mass sports", "public sports", "inclusive sports", "adaptive sports", "student sports". At the same time, in the theory and methodology of sports, as well as regulatory and program documents, vague and ambiguous interpretations and the content of these sports directions are given and used.

Ambiguity in understanding the essence of goal-setting causes weak management in the development and popularization of sports movements.In this regard, it is necessary to formulate the ideological foundations, which will provide an ideological basis for the development of strategic goal-setting in the development of the Russian sports movement.

Within the framework of the set strategic goals, sociological research occupies an important place to identify the mechanism for implementing a pool of sports movements, the results of which allow us to determine the needs for new forms of training and competitive activities, building sports infrastructure, and based on sociological analysis to build a mechanism for implementing the strategic goal of a sports movement.

The main feature of recent years is the use of sports facilities by young people to achieve training and developmental effects, as opposed to realizing the acquired potential in the process of competitive activity. One of the factors influencing the orientation and nature of sports movement, taking into account this feature, may be a system for building motivation to participate in competitions: shifting the emphasis of "sport for yourself" to "achievement sport".

The crisis of the Olympic movement forces us to pay special attention to the definition of priorities of state policy in the field of sports, which can be expressed in the adoption and improvement of regulatory support for the status of traditional and new sports movements.The mechanism of their state support and popularization will be the active deployment of information campaigns to promote a sporty lifestyle.

The conjugate interaction of sports movements creates a space for the development of the nation's sports culture, which becomes the ideological basis for building a state policy in the field of sports.

As an effective tool for state regulation of sports movements, it is proposed to develop a national doctrine for the development of sports culture as a system of views and provisions that establish vectors of development and forms of sportization of the country's social structures, as well as ways to solve a complex of problems at various levels of current society and create prerequisites for the formation of a civilization of the future.

In the context of building a national doctrine for the development of sports culture, it is appropriate to consider the phenomenon of sports culture, which, along with the development of human motor and intellectual potential, expands the ideology of the worldview associated with the new realities of the modern world. Intensive development of the values of sports culture determines the possibilities and prerequisites for solving such global problems as demography, ecology, and national security.

Determining the priorities of state policy towards building a national doctrine for the development of sports culture will make it possible in the near future to get away from the negative consequences of political confrontation by disclosing the internal resources of the domestic sports and sports movement, as well as to build a new vector for the formation of a sports civilization of the future.

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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Theory and Practice of Physical Culture

Contents

Vector modeling in pedagogical research on problems of physical education and sports

UDC 37.037.1+796

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Abstract

Objective of the study was to describe the capabilities of the vector modeling method in pedagogical research in physical education and sports.

Results and conclusions. The article presents a description of the vector modeling method. An overview of the dialectical-logical algorithm of the vector modeling method is given. The systematization of pedagogical models of physical education has been carried out. Health-adaptive, socially-oriented, personality-oriented and sports-recreational models of physical education are identified and analyzed. Their specific features, advantages and limitations in the practice of physical education are described. The prospects for using the vector modeling method in humanities research are shown.

Keywords: *vector modeling, dialectical-logical algorithm, categorical models, pedagogical models of physical education.*

Introduction. Pedagogical research on the problems of physical culture and sports is carried out at the intersection of humanities and natural sciences and involves a methodology of scientific research with the widespread use of interdisciplinary tools adequate to the objectives of the research [4].

It is generally accepted that a scientifically based choice of methods ensures a clear logic of the study and the reliability of its results. An analysis of dissertations on pedagogical problems of physical culture and sports showed that the arsenal of theoretical and humanitarian methods of scientific knowledge among applicants for academic degrees is not large [3, 5].

The theoretical research methods used by the authors do not always lead to a logically structured constructive-critical analysis of domestic and foreign scientific sources, showing the degree of development of the problem, the presence of «knowledge of ignorance» and «blank spots» in science that need to be investigated. The use of methods such as abstraction, concretization, modeling, classification and systematization in scientific work often causes difficulties for authors.

One of the key categories of modern cognitive theory and research practice is modeling, which is most often defined as a set of techniques, logical operations of cognition and practical actions performed to construct and study a model of an object for the purpose of its thorough study [4, 9].

Objective of the study was to describe the capabilities of the vector modeling method in pedagogical research on the problems of physical education and sports.

Results of the study and discussion. The vector modeling method shows how the content of logical operations can change within the framework of formal and informal logic. The method is based on an abstract comparison of the properties of various objects, that is, establishing their similarities and differences and identifying paired reflexive categories.

The method «... allows you to get «inside» a phenomenon and go «outside» (internal - external, essence - phenomenon) or determine the strength of the influence of one on the other (cause - effect, necessary - accidental)» [11].

The dialectical-logical algorithm - a set of rules that allows you to build categorical models of objects, was proposed by D.V. Pivovarov (1993). «To achieve the goals of cognition, the categories of dialectics and other paired categories of a high degree of generality can be analyzed as stratagems of action and technological chains can be built from them. The algorithm consists of three (or more) steps, and technological chains can take the form of a tetrad, an ennead, or an equation from the enneads» [10].

D.V. Pivovarov showed how in a holistic object of study it is possible to isolate paired categories (opposites) and the general measure of their unity to create a holistic idea of the object, namely: a tetrad around the dimensional category «body», then around a categorical square - a rhombus, the vertices of which became the vertices of a triangle , erected on the side of a square, connected by diagonals. Moreover, the initial goals of the analysis determine all its procedures. Since the opposites acted as sides of one object, they also had common features, and therefore there was a specific identity between them, in contrast to formal logical identification, taking into account their differences (Fig. 1).

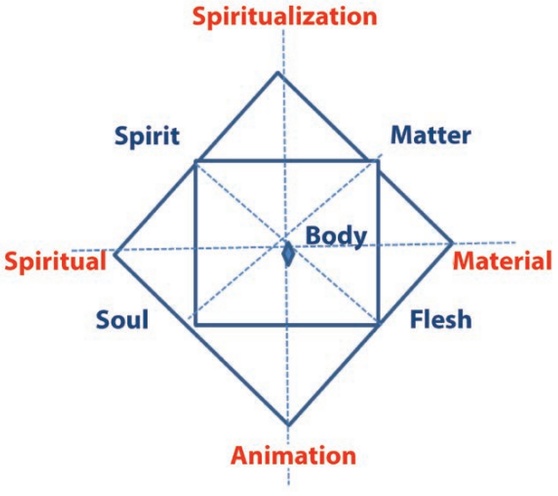

Fig. 1. Ennead - a three-dimensional model of a person according to D.V. Pivovarov (1993)

The presented Ennead helps, through simplification, to understand the origin of the three models of man (one-dimensional, two-dimensional and three-dimensional). The types of transformed corporeality are indicated at the vertices of the rhombus (Fig. 1).

Much later than Golubeva N.A. identified «heuristic possibilities of disymmetric analysis in the study of structural features and mechanisms of transformation of objects... Factors that determine the disymmetric lability of objects related to the social, cognitive and artistic spheres are considered» [2].

Artificially created models in pedagogical research are only diagrams that reflect the authors ideas about these phenomena. The vector modeling method allowed for cross-cultural analysis and systematization of pedagogical models of physical education.

Since the study of a person «from the inside» presupposes the comprehension of the modes of his spiritual and physical existence, and the consideration of a person «from the outside» is based on the interpretation of his relations with the surrounding world of nature and culture, we rely on the idea of subject integration of G.G. Natalova suggested that the real set of models of physical education is determined by their anthropological and ontological components, namely, one or another combination of two interrelated and interdependent vectors: «body-spirit» and «nature-culture» [7].

The above was the basis for identifying health-adaptive, socially-oriented, personality-oriented and sports-recreational models of physical education, extreme in their manifestations and differing in target orientations and mechanisms for achieving goals (Fig. 2) [8].

The health-adaptive model of physical education is inherently consonant with the nature-centric model of pedagogical activity (L.A. Belyaeva, I.G. Fomicheva) and fits into the biologizing direction of personality development, according to which a person is born with a certain set of qualities that manifest themselves in the process of his biosocial development , the task of training and education is «to follow human nature» [1, 13].

Within the framework of this model, the goal of physical education is to improve health, achieve normal age-sex physical development and general physical fitness, create an individual morphofunctional and motor base necessary for a person's adaptation to natural and social conditions of life.

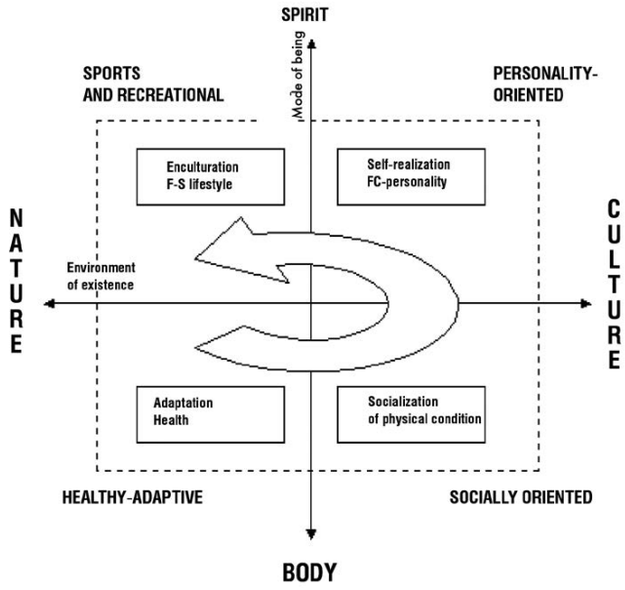

Fig. 2. Models of physical education

The socially oriented model of physical education is based on the sociological direction in the theories of personality development (classical conditioning, social learning), according to which the main influence on the formation of the personality and its behavior, regardless of natural inclinations, is organized by educational influences. The goals of socially-oriented physical education are determined based on the needs of the state and society. The educational process within the framework of this model takes the form of general physical preparation of a person for life in general and military-applied, sports-applied, vocational-applied training, taking into account the specifics of his activity for successful socialization in society.

The personality-oriented model of physical education is based on humanistic ideas in the theory of personality development and is consonant with the anthropocentric model of pedagogical activity (L.A. Belyaeva, I.G. Fomicheva), within which the main emphasis is on the formation of a holistic person, his self-realization through the development of subjectivity , abilities for goal setting and self-determination, harmonization of spiritual and physical potential. The target within the framework of this model is the formation of physical culture of the individual through the creation in the environment of an educational institution of conditions for mastering the values of physical culture based on the construction of elective trajectories of physical education and self-education, pedagogical support and accompaniment.

The sports and recreational model of physical education is based on the ideas of ecological psychology, or more precisely on the eco-behavioral studies of R. Barker, Willems, who proved the existence of «behavioral settings» and stable patterns of behavior tied to them, as well as the theory of possibilities of J. Gibson, according to which, the active principle of the subject mastering his living environment is emphasized, which confirms the idea of P.F. Lesgaft about the significant influence of the environment on the upbringing of a child [6, 12].

The semantic core of this model is variable sports and recreational activity, which, on the one hand, operates within behavioral settings according to the specifics of the physical environment (sports grounds, courts, balls, nets, etc.) and is regulated by the rules of sports governing the behavior of its participants, and on the other hand, it provides a range of opportunities for subjects to voluntarily choose the type, place, and mode of activity.

The goals of the sports and recreational model are related to the formation of a physical culture and sports lifestyle and physical culture and sports competencies of the younger generation for inculturation in the modern sociocultural environment. Its essence lies in the indirect management of the physical education of children and youth through the construction and enrichment of a sports environment that creates conditions and provides opportunities for personal self-expression.

The described models of physical education in real practice do not always exist in ideal terms, but interpenetrate one another, complementing and compensating for the specific shortcomings and limitations of each, which is quite justified in the conditions of variable education, but requires certain rules for their coordination [8].

Conclusions. The vector modeling method can complement mathematics and formal logic. It has great prospects for application in humanitarian research on the problems of physical culture and sports, provided that the dialectical-logical algorithm is adapted to specific material and is carried out on the basis of a careful selection of categorical pairs and combinations, discarding meaningless definitions.

Maintaining the priority of humanitarian specifics in research on the problems of physical culture and sports, in our opinion, is possible with a holistic consideration of man in the unity of modes of being - bodily, mental and spiritual and the environment of being

- nature and culture, based on an «organic combination of value-semantic and logical -epistemological approaches».

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Improvement of speed and strength qualities of football players at the stage of sports specialization

UDC 796.332(045)

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Abstract

Objective of the study was to develop test tasks that determine the level of speed and strength qualities of young football players.

Methods and structure of the study. Two groups of football players took part in the pedagogical experiment: 12–13 and 14 years old. Data analysis was carried out using intragroup and intergroup indicators. The evaluation coefficient made it possible to compare the statistical set of measurement results of various physical quantities in their corresponding physical units.

Results and conclusions. The proposed test tasks allow us to identify the level of development of speed-strength qualities. To increase the effectiveness of the educational and training process, focused on the development of speed and strength qualities, it is necessary to differentiate physical activity based on taking into account the individual characteristics of football players aged 12-14 years.

Keywords: *speed-strength abilities, dynamics, football players at the stage of sports specialization, control and assessment of speed-strength abilities.*

Introduction. The main problem of developing the speed-strength qualities of football players is the need for an optimal ratio of speed and strength exercises used in the educational and training process, using various means, which are determined taking into account the age characteristics of those involved.

Analysis of scientific and methodological literature shows that the opinions of various authors in assessing the sensitive period of development of speed-strength qualities of football players approximately coincide, and the most favorable age range is from 11 to 13 years.

This age period is characterized by intensive development of almost all physical qualities and is therefore favorable for practicing various sports. However, it is at this age that the maximum improvement in performance is observed, especially in the development of such physical qualities as speed, strength and agility, as well as technical elements are quickly and firmly absorbed, and the tactical thinking of young football players develops.

Considering that the development of speed-strength qualities in later years slows down, due to the age-related characteristics of the psychophysiological development of the body, the age of 11-13 years is the most favorable and therefore during this period it is necessary to competently plan the educational and training process with the predominant use of physical activity focused on development of the previously listed physical qualities of football players.

A fairly convincing example, as confirmation of what was said earlier, are the results of the study by O.B. Lapshin, where the work clearly shows the main sensitive periods of development of physical qualities of speed and strength, a significant increase in indicators of which is noted already at the age of twelve, provides indicators of changes in the development of speed-strength qualities of football players of two age groups, which were determined using test tasks (control exercises) at the beginning and after the end of the school year [3].

Speed qualities in modern football are, in our opinion, the most important. A team's successful play is only possible if its players are ahead of the opposing

players, gaining time and space from them. A significant influence on the level of development of speed, as well as other physical qualities, is exerted by the intensity of physical activity at an early age, since it is known that in two children with the same speed abilities, the level of development of speed in adulthood is usually higher. who were more active in childhood [4]. In addition, training, which includes improving the technique of movements and improving the rhythmic characteristics of the performed physical exercises of elementary and complex forms of manifestation of speed qualities, has a significant impact on the development of speed-strength qualities.

Objective of the study was to develop test tasks that determine the level of speed and strength qualities of young football players.

Methods and structure of the study. The age period of 12–14 years considered in the study (the stage of sports specialization) is the most optimal in the development of speed-strength qualities, since, to a greater extent, their changes occur against the background of a significant restructuring of the basic functional systems of the youth body. It is necessary to take into account that at the age of 12–15 years, the levels of development of speed-strength qualities up to 75% depend on the weight and height parameters of the body [1, 2].

In pedagogical practice, control exercises are most often used to assess the levels of development of speed-strength qualities: standing long jump and shuttle run 6x20 meters. However, they do not allow us to assess the level of their development to the required extent. In our opinion, this requires a set of test tasks that will allow us to objectively assess the level of development of speed-strength qualities of the main muscle groups, carry out a differentiated approach to the development of these abilities, and also increase the technical preparedness of football players.

Two groups of football players took part in the pedagogical experiment: 12–13 and 14 years old. The generated block of test tasks made it possible to differentiate individual achievements in terms of development of speed-strength qualities of young football players. Data analysis was carried out using intragroup and intergroup indicators. The evaluation coefficient made it possible to compare the statistical set of measurement results of various physical quantities in their corresponding physical units. Significance of the estimation coefficient: 0–10% – small; 11–20% – average; >20% – large.

Results of the study and discussion. Analysis of individual differences in the development of speed-strength abilities are observed in the following tests: flexion and extension of the arms, while lying down; jumping on a pedestal 40 cm high; pushing a medicine ball from the shoulder with your strongest hand (see table).

The smallest values of the shift values in the age range of 12–13 years were noted in the tests: lifting the body from a position lying on the back and deflection in a lying position on the stomach from 12 to 14%.

Dynamics of changes in indicators of development of speed-strength qualities of young men at the stage of sports specialization in different age periods

Test assignment	12-13 years old		14 years	
	Beginning of the school year	End of the school year	Beginning of the school year	End of the school year
Standing long jump (m)	18	20	13	15
Standing jump (cm)	24	22	17	20
Pull-ups on a high bar (number of times)	19	20	17	18
Bending and extending the arms while lying down (number of times)	34	31	29	32
Fast run from a high start at 30 (m/s)	19	17	20	17
Relay race 6x20 (m\s)	24	20	26	25
Body deflection in a prone position (number of times)	14	16	15	13
Raising the body from a position lying on your back (number of times)	13	12	13	14
Jumping on a pedestal 40 cm high (number of times)	30	28	27	31
Pushing a medicine ball from the shoulder with your strongest arm (m)	27	28	23	25

The results obtained in tests related to overcoming the resistance of one's own body weight are the highest. At the age of 14 years, the highest indicators were found in control exercises 4 and 9, and the lowest in control exercises 1 and 3. In the test results using 7 and 8 control exercises, after the end of the school year compared to its beginning, a negative trend in indicators was recorded.

In our opinion, minor multidirectional changes in test results using 4, 9, 7 and 8 control exercises, along with the natural process of development of the muscles involved in performing these exercises and, accordingly, an increase in muscle mass, can also be explained by the predominant use of physical activity in the educational process , focused on the development of these muscle groups.

Conclusions. The proposed test tasks allow us to identify the level of development of speed-strength qualities. To increase the effectiveness of the educational and training process, focused on the development of speed and strength qualities, it is necessary to differentiate physical activity based on taking into account the individual characteristics of football players aged 12-14 years.

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Comparative characteristics of anthropometric and bioimpedancemetric indicators of highly qualified wrestlers and boxers of Yakutia

UDC 572.022

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Abstract

Objective of the study was to identify the features of anthropometric and bioimpedancemetric indicators of highly qualified wrestlers and boxers from Yakutia.

Methods and structure of the study. 49 male athletes participating in the Republican Center for Sports Training of National Teams of the Republic of Sakha (Yakutia) took part in the scientific work. Of these, 36 athletes were engaged in freestyle wrestling, 13 – boxing. Body length and weight, chest circumference, waist and hips were measured. The bioimpedance study included the determination of active and reactance resistance and body components: fat mass, active cell mass, skeletal muscle mass, lean mass of athletes.

Results and conclusions. Athletes involved in freestyle wrestling showed significantly higher indicators of body weight, body mass index, hip circumference and chest circumference, and the absolute amount of skeletal muscle and lean mass. Frequency analysis of BMI determined the presence of overweight and obese individuals among the wrestlers. Among the boxers, there were no overweight or obese individuals based on BMI. According to the bioimpedance study, significantly higher rates of active and reactive resistance were found in boxers due to reduced body hydration. The resulting anthropometric and bioimpedance metrics provide valuable scientific data that can be used to improve the effectiveness and individualization of training, weight management and improve the overall performance of athletes involved in freestyle wrestling and boxing.

Keywords: *anthropometry, bioimpedancemetry, wrestlers, boxing, Yakutia, body components.*

Introduction. Anthropometric and bioimpedance studies play an important role in sports science, especially in contact sports such as wrestling and boxing [6]. It is known that athletes involved in different sports have certain morphofunctional characteristics that help them in sports activities [1, 2]. Understanding an athlete's physical characteristics helps coaches and physical training specialists individualize training programs, monitor progress, and prevent injury in athletes. All of this can allow the athlete to optimize fitness and performance to achieve their maximum potential.

Anthropometric and BIA characteristics of athletes can vary depending on many factors, including ethnicity, gender, age and level of physical activity [4, 5]. In this regard, the study of athletes from Yakutia is relevant.

Objective of the study was to identify the features of anthropometric and bioimpedancemetric indicators of highly qualified wrestlers and boxers from Yakutia.

Methods and structure of the study. 49 male athletes participating in the Republican Center for Sports Training of National Teams of the Republic of Sakha (Yakutia) took part in the scientific work. Of these, 36 athletes were engaged in freestyle wrestling, 13 – boxing. The average age of wrestlers was 21,4±0,51 years, boxers – 23,4±0,89 years. The qualification level of the examined athletes varied from master of sports to international master of sports. The purpose, methods, and exclusion criteria for the study were explained to all participants. The scientific work was carried out after they signed a voluntary consent. An anthropometric study was carried out with measurements of body length and weight, chest circumfer-

ence, waist and hips. Bioimpedansometry (BIA) was carried out using the ABC-01 Medass apparatus in order to determine bioelectrical parameters (active resistance - R5, R50; reactance - Xc5, Xc50) and body components (fat mass (FM), active cell mass (ACM), skeletal muscle mass (SMM), lean mass (LM) of athletes. The BIA protocols also include an assessment of the athletes body hydration (total, extracellular and intracellular water). The obtained material was statistically processed using the SPSS 22.0 application package to describe the results. The results used were the mean value (M), the error of the mean deviation of the value (m), the standard deviation ( ), the minimum and maximum. The significance of intergroup differences was carried out using the Mann–Whitney U test. Differences were considered statistically significant at $p<0,05$.

Results of the study and discussion. The results of an anthropometric study of athletes involved in freestyle wrestling and boxing are presented in Table 1.

Analysis of the obtained indicators revealed that with reliably indistinguishable body length parameters, freestyle athletes had significantly higher body weight ($p=0,049$), BMI ($p<0,001$), hip circumference ($p=0,018$) and chest circumference ($p=0,0110$). The identified anthropometric characteristics of wrestlers are related to the fact that wrestling requires wider dimensions of the shoulders, chest, hips and buttocks for grips, throws and for stability and maneuverability during the fight. Frequency analysis of BMI determined the predominance of persons with normal body weight in 63.9% of wrestlers (n=23) and 92,3% of boxers (n=12). Among the wrestlers there were athletes with overweight (30,6%, n=11) and obesity (5,5%, n=2). Among boxers, there were no overweight or obese individuals based on BMI. The OT/BP index in 94,4% of wrestlers and 100,0% of boxers was within normal values; an increased OT/BP index was determined only in two wrestlers (5,6%). The bioelectrical parameters of the body of the examined wrestlers and boxers are presented in table 2.

Analysis of bioelectrical indicators of active (R5, R50) and reactive (Xc5, Xc50) resistances measured at frequencies of 5 and 50 kHz revealed significantly higher indicators in boxers ($p <0,001$), which is explained by the lower hydration of their body, since the conduction of electrical current is influenced by the amount of fluid in the body, which has an ionic conduction mechanism [3]. The total body fluid of the wrestlers was 44,37±1,05 kg, of the boxers – 40,0±0,71 kg, which had significant differences ($p=0,030$). The difference is due to the higher content of intracellular water in wrestlers compared to boxers (26,29±0,67 kg and 23,72±0,53 kg, respectively). The average value of extracellular water was 18,09±0,48 kg in wrestlers and 16,27±0,54 kg in boxers. The absolute and relative values of the body components of the examined groups of athletes involved in freestyle wrestling and boxing are presented in Table 3.

Analysis of the average values of body components revealed significant differences in only two components: the absolute amount of SMM and LM, which were higher in athletes involved in freestyle wrestling ($p = 0,006$ and $p = 0,026$).

Table 1. Anthropometric parameters of athletes involved in freestyle wrestling and boxing

Parameters	Freestyle wrestling (n=36)			Boxing (n=13)		
	Min – Max	M±m	δ	Min – Max	M±m	δ
Body length, cm	159,0-197,0	171,19±1,30	7,85	161,0-184,0	174,30±1,58	5,71
Body weight, kg	57,0-125,0	73,0±2,60	15,65	53,0-72,0	63,76±1,72	6,21
BMI, kg/m^2	21,4-40,8	24,74±0,64	3,86	17,6-22,9	20,94±0,34	1,22
Waist circumference, cm	65,0-106,0	74,83±1,56	9,36	58,0-78,0	71,53±1,34	4,85
Hip circumference, cm	83,0-120,0	94,0±1,37	8,25	84,0-94,0	88,23±0,85	3,06
OT/OB	0,72-1,39	0,81±0,01	0,11	0,69-0,85	0,80±0,01	0,04
Chest circumference, cm	83,5-121,0	94,82±1,49	8,98	77,0-94,0	88,31±1,29	4,67

Table 2. Bioelectrical parameters of the body of athletes involved in freestyle wrestling and boxing

Parameters	Freestyle wrestling (n=36)			Boxing (n=13)		
	Min – Max	M±m	δ	Min – Max	M±m	δ
R50, Om	316,0-552,0	456,69±8,22	49,35	495,0-579,0	535,41±7,51	27,08
R5, Om	372,0-657,0	514,47±12,63	75,78	419,0-685,0	593,61±23,31	84,06
Xc50, Om	41,0-77,0	58,59±1,23	7,39	62,9-78,20	70,03±1,20	4,34
Xc5, Om	20,1-373,0	74,52±17,68	106,09	31,7-371,0	131,58±48,13	152,20

Table 3. Body composition of athletes involved in freestyle wrestling and boxing

Parameters	Freestyle wrestling (n=36)			Boxing (n=13)		
	Min – Max	M±m	δ	Min – Max	M±m	δ
FM, kg	5,40-36,70	12,36±1,31	7,90	3,00-13,20	9,13±0,89	3,22
FM, %	8,85-30,00	15,89±1,02	6,14	5,56-18,33	14,01±1,14	4,12
ACM, kg	29,30-53,00	36,17±0,91	5,46	28,10-37,60	32,93±0,77	2,78
ACM, %	41,02-54,56	50,11±0,61	3,68	47,34-57,68	51,77±0,79	2,87
SMM, kg	26,70-46,20	33,55±0,71	4,29	26,50-32,70	30,11±0,49	1,79
SMM, %	36,45-56,56	46,75±0,83	5,01	44,31-53,15	47,44±0,80	2,89
LM, kg	51,00-88,30	60,63±1,44	8,66	48,00-59,20	54,63±0,97	3,51
LM, %	70,00-91,15	84,10±1,02	6,14	81,67-94,44	85,98±1,14	4,12

Conclusions. A scientific study showed that with reliably indistinguishable body length parameters, freestyle athletes had significantly higher body weight, BMI, hip circumference and chest circumference. Frequency analysis of BMI determined the presence of overweight and obese individuals among the wrestlers. Among boxers, there were no overweight or obese individuals based on BMI. According to the bioimpedance study, significantly higher rates of active and reactive resistance were established in boxers. The difference is due to the higher content of total and intracellular water in wrestlers compared to boxers. Athletes involved in freestyle wrestling showed large values of the absolute amount of skeletal muscle and lean mass. The resulting anthropometric and bioimpedance metrics provide valuable scientific data that can be used to improve the effectiveness and individualization of training, weight management and improve the overall performance of athletes involved in freestyle wrestling and boxing.

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Features of comprehensive control in the preparation of basketball players

UDC 796.32(045)

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Abstract

Objective of the study was to expert assessment of complex control over the training of basketball players at the stage of improving sportsmanship.

Methods and structure of the study. The method of expert assessment of 81 basketball coaches was used. The respondents had extensive practical work experience and high qualifications. The questionnaire contained questions regarding the content and organization of comprehensive control during the training of basketball players.

Results and conclusions. As a result of the method of interviewing highly qualified experts, problematic aspects of complex control over the level of preparedness of players in modern basketball were identified. It was revealed that the assessment of important sections of basketball players' preparedness (hand speed, jumping speed, special agility, etc.) requires the development of new ones and clarification, taking into account the modern realities of basketball, of existing methods, indicators and criteria of preparedness. It has been established that the system of comprehensive control over the level of preparedness of basketball players has not yet been fully formed. Additional research is required on the scientific substantiation of the content, methods, tests (control exercises) for assessing the level of preparedness of basketball players. The greatest difficulties for trainers are in carrying out operational control.

Keywords: *comprehensive control, expert opinion, basketball players preparedness, modern basketball.*

Introduction. Successful performance of basketball players at important responsible competitions is currently impossible without carefully planned team preparation. The effectiveness of the training process largely depends on well-thought-out and competently organized comprehensive control, which includes informative criteria for assessing the level of special preparedness of basketball players.

P.M. Tsetlin and K.I. Travin recommend using control standards, which represent various throws and movements, and monitoring the players performance indicators [4-6]. In the mid-sixties of the last century, S.G. Bashkin points to the need to exercise medical control over the training process of basketball players [1]. In 1967, a textbook on basketball for physical education universities was published, in which a separate section is entirely devoted to the pedagogical control of players [3]. The beginning of the 70s of the last century was marked by the appearance of manuals and recommendations for conducting scientifically based monitoring of the level of preparedness of basketball players of various qualifications [2].

The process of selecting informative control indicators is quite complex, since the success of actions in basketball depends on many factors. In practice, there are thousands of control indicators, but their true value and the need for application are not always scientifically substantiated, and therefore expedient. Many of them duplicate each other and are not informative enough. Therefore, an important task when developing an effective control system is the selection of a relatively limited number of scientifically based indicators that would provide a fairly complete description of the preparedness of basketball players. It should be

noted that the development of various components of complex control in basketball is not the same. Methods for monitoring the functional capabilities of basketball players appear in a more advantageous position, but they characterize only the foundation of the players sportsmanship, but not the skill itself. Many motor tests presented in the specialized literature, for the most part, are not scientifically substantiated. The influence of indicators obtained with their help on the effectiveness of competitive activity has not been established, and there are often no specific quantitative criteria characterizing the skill of players.

Particularly difficult is the assessment of both individual playing techniques and the calculation of integral indicators that characterize the effectiveness of the game of individual basketball players and the team as a whole.

Objective of the study was to expert assessment of complex control over the training of basketball players at the stage of improving sportsmanship.

Methods and structure of the study. The study used a survey in the form of a questionnaire. The experts were qualified basketball coaches with extensive practical experience.

Information characterizing the level of professional competence of experts is given in Table 1.

Table 1. Characteristics of the composition of experts – basketball coaches (n=81)

Expert data	Composition percentage
Honored Trainers of Russia (HTR)	13
Trainers of the highest category	48
Trainers of the first category	36
Trainers of the 2nd category	3
Coaching experience less than 5 years	13
Coaching experience 5-10 years	20
Coaching experience 10-20 years	31
Coaching experience over 20 years	36

The presented data indicate that more than 65% of respondents had more than 10 years of coaching experience and 97% of basketball coaches had the title of HTR, or the highest and first coaching category. The majority of coaches surveyed (96%) consider complex monitoring at the SCM stage to be an important necessary part of the training of basketball players.

Results of the study and discussion. Experts were asked to rate on a five-point scale the degree of importance of assessing various types of training of basketball players when conducting stage-by-stage control at the SSM stage. According to experts, the level of physical, functional, tactical-technical and competitive preparedness of players is considered a priority (Fig. 1).

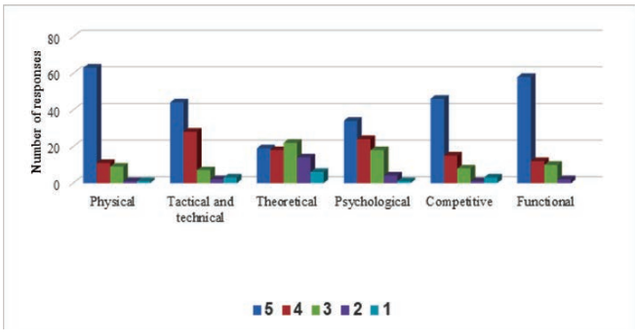

Fig. 1. Expert opinion on the priority of types of training that need to be assessed in the process of stage-by-stage control of basketball players

The majority of trainers believe that in the process of stage control, tests (control exercises) should be presented that assess the levels of special dexterity and coordination abilities (79% of respondents), speed endurance (65% of respondents), hand speed (49% of respondents), maximum jump speed (42% of respondents). Analysis of expert opinions (Table 2) shows that tests and control exercises presented in program documents regulating the training of basketball players do not always perform a control function, since they do not allow adequate assessment of the level of development of important special physical qualities necessary for successful gaming activity in basketball.

Difficulties arise when assessing the hand speed of basketball players - 25% of respondents believe that the presented tests solve this problem, jump speed

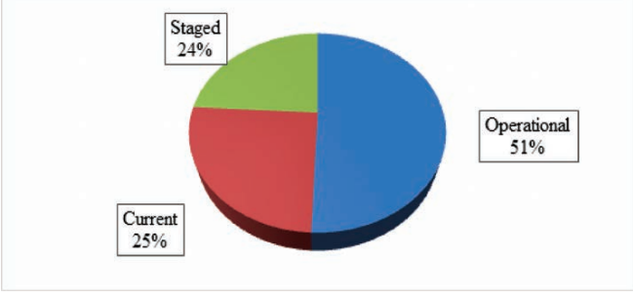

Fig. 2. Opinion of experts (basketball coaches (n=81) on the priority of difficulties that arise when carrying out various types of control in their practical activities

Table 2. Expert opinion (n=81) on the performance of tests (control exercises) presented in the Federal Standard of Sports Training and corresponding programs at the stage of improving sportsmanship, their control function when assessing the special physical qualities of basketball players

Sections of special physical training	Answer options (%)		
	Yes	No	I find it difficult to answer
Tests to assess the general endurance of basketball players	59	21	20
Tests for assessing speed endurance of basketball players	68	20	12
Tests to evaluate the jumping endurance of basketball players	33	38	29
Tests to evaluate the maximum jump height of basketball players	57	16	27
Tests to evaluate the jumping speed of basketball players	29	45	26
Tests to evaluate specialized agility of basketball players	29	44	27
Tests to assess the speed of movement of basketball players	68	13	19
Tests to evaluate the hand speed of basketball players	25	49	26
Tests to evaluate the strength of basketball players	47	18	35

and special dexterity - 29% each. The majority of respondents were unable to assess the correspondence of tests and control exercises, this indicates unresolved problems in the content of various aspects of complex control of basketball players.

When analyzing the difficulties of various types of complex control of basketball players, 51% of experts noted that they were experiencing (Fig. 2). This is explained by the fact that for an objective assessment of operational control indicators it is necessary to use instrumental techniques. 81% of surveyed experts consider it important to use instrumental techniques when conducting comprehensive control.

Conclusions. Analysis of the opinions of highly qualified trainers on various aspects of complex control revealed:

1. A system of comprehensive control over the level of preparedness of basketball players has not yet been fully developed. Additional research is required on the scientific substantiation of the content, methods, tests (control exercises) for assessing the level of preparedness of basketball players.

2. Assessing the sections of basketball players' preparedness requires the development of new methods, indicators, preparedness criteria and clarification of existing ones, taking into account the modern realities of basketball.

3. The greatest difficulties for basketball coaches are in carrying out operational control. It is necessary to introduce new digital technologies into the practice of training basketball players and teach new methods to coaches as part of the professional development system.

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Distinctive features of technical training of football players of leading european clubs

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Abstract

Objective of the study was to conduct a comparative analysis of the main aspects of the technical training of football players from leading European clubs.

Methods and structure of the study. In the process of studying and analyzing the training process of two famous European clubs, FC Barcelona and FC Liverpool, the experience of technical training of football players, implemented in the structure of advanced sports technologies, was analyzed.

Results and conclusions. The use of advanced sports technologies by European clubs, the structure of which provides for a special section of training work, focused on the constant and targeted improvement of the technical readiness of players, taking into account their individual characteristics, allows, ultimately, to educate outstanding football players who occupy leading positions in European and world football.

Keywords: *technical training of football players, European clubs, sports technologies, training process, individual characteristics of players, advanced positions in football.*

Introduction. In modern football, the technical training of players is aimed at achieving a high level of performance of fast and unexpected technical techniques, skill in handling the ball, speed of movement, effective interactions with teammates and conducting single combats with opponents on the field, quick thinking in decision making, etc. . These qualities become determining factors in the success of a football team [1].

Objective of the study was to conduct a comparative analysis of the main aspects of the technical training of football players from leading European clubs.

Methods and structure of the study. The experience of technical training of football players in two famous European clubs FC Barcelona and FC Liverpool is analyzed. The research materials will allow us to evaluate the importance of technical training in football and apply it in practice.

Results of the study and discussion. Technical training in football plays an important role in the formation of playing skills, which includes a set of training sessions, control games, various types of testing, which will improve the quality of technical elements, such as individual actions with the ball, the accuracy of short and long passes to a partner and indirectly increase the effectiveness of the team's tactical decisions in game situations in general [2]. High technical preparedness of football players determines the success of the team's game, and also increases the effectiveness of individual and collective actions of the players and the team as a whole.

As the analysis shows, the technical preparedness of FC Barcelona football players differs from players of other teams in their unique style of play, based on high technical performance and positional attacking play, since the technical training of players in FC Barcelona is based on the principles:

• positional ball handling: technical training includes improving the technical execution of passes and the ability to create a positional advantage through highly technical ball handling. On the field,

football players learn to act coherently, which corresponds to the team's philosophy, where every movement and pass is aimed at creating playing opportunities for partners;

• dribbling and individual skill: FC Barcelona pays great attention to improving the individual technical skills of each player, such as dribbling, beating the opponent and finding innovative and effective solutions in different game situations that contribute to increasing skill and creativity in the game;

• development of strategic thinking: in addition to technical aspects, FC Barcelona pays attention to improving tactical thinking in game situations that require making the only correct decision among possible options [2].

The English football club is focused on the constant introduction of modern technologies into the training process that help improve the technical preparedness of football players. The most important areas used in the practical activities of Liverpool FC include:

• analysis of statistical data to study and develop the individual strengths of players, through the development and implementation of personalized training programs for football players in the training process;

• active use of information technologies, through which the results of virtual analysis of game situations are introduced into the training process, providing players with the opportunity to make highly effective decisions;

• individual approach to training and improvement: each player pays great attention to the development of his technical skills in accordance with his playing role - this helps to maximize his individual potential, and in total ensures a high level of performance and technical readiness of athletes to effectively perform their playing functions [2].

FC Barcelona and FC Liverpool use a variety of exercises in the training process to develop the technical skills of players, which are included in the training programs:

1. «Ronaldinho» exercise – dribbling the ball through a series of obstacles (for example, cones), while maintaining constant control of the ball. Main goal: improving the technique of dribbling the ball, coordination of movements and the speed of making adequate decisions depending on game situations that arise on the field.

2. Exercise «Messi with a partner» is a combined attacking training, during which the players, alternately performing a series of passes to each other, complete the attack with a shot at the goal. The main goal of the exercise is to improve the accuracy of passes, correctly comprehend game situations and effectively complete attacks.

Liverpool FC, more often than others, use team ball control training (3 on 3 under pressure) - players move in a limited space, control the ball and make accurate passes in the face of constant opposition from the opponent. The main goal of the exercise is to improve the technique of dribbling the ball, dribbling the opponent, passing accuracy, making effective decisions to continue the attack under pressure from the opponent.

3. Exercise «Shooting for accuracy» During its implementation, football players improve the technique of delivering accurate and strong shots on goal, after combining passes and movements in the end-of-game zone.

The main purpose of the exercise is to train the accuracy and power of strikes when completing attacks.

The examples of exercises given above are just a small part of them, used in the training process of football clubs in Spain and England to improve technical skills [2].

Conclusions. Over the past few decades, European and world football in general has changed quite a lot. This happened largely thanks to serious work aimed at improving the technique of ball handling, taking into account the individual characteristics of the players, since the high level of technical preparedness of the players is decisive in achieving success. Football clubs in Spain and England pay serious attention to this aspect of the training process, who are constantly working to improve the individual skills of football players, paying close attention to replenishing their technical arsenal with new elements that allow them to occupy leading positions in European football for several decades.

Thus, the use by European clubs of advanced sports technologies, the structure of which provides for a special section of training work, focused on the constant and targeted improvement of the technical readiness of players, taking into account their individual characteristics, allows, ultimately, to educate outstanding football players who occupy leading positions in the European and world football.

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Phase portrait of control movements – one of the criteria of technical skill of an athlete

UDC 796.012+ UDC 796.015

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Abstract

Objective of the study was to develop an integral criterion of an athlete's technical skill and a computer application for constructing a phase portrait of sports exercises.

Methods and structure of the study. The research instrumental base is video materials of gymnastic exercises, computer tools for processing research results using the MatLab software environment. Performer: A. Bergovin, Master of Sports in artistic gymnastics, Republic of Belarus. Two revolutions were performed in a row, which were compared with each other based on phase portraits.

Results and conclusions. It was revealed that the deformation of the kinematic control structure is most significant in changing the area of the phase portrait and varies within 15-30% of the area of the original image, which, however, does not lead to a significant restructuring of the technical basis of the motor action and makes it possible to implement the target setting of the exercise. Amplitude changes in executive function are less significant in solving a motor task than the rate of change in the joint angle. A comprehensive «Kinematic Control» functionality has been developed, which allows for an integral assessment of the athletes technical skill.

Keywords: *trajectory of the biomechanical system, phase portrait, gymnastic exercises.*

Introduction. In the field of biomechanics of physical exercises, there are a few studies in which attempts have been made to assess the technical skill of an athlete on the basis of an integral indicator that comprehensively characterizes the quality of mastering a motor skill in the form of a phase portrait that determines the kinematic state of control of the biomechanical system [2, 4, 5]. In this regard, a hypothesis has been defined that the assessment of the athlete's biomechanical state, based on the analysis of the phase portrait of control movements at the kinematic level, will make it possible to give an integral assessment of the athlete's level of technical skill.

Objective of the study was to develop an integral criterion of an athlete's technical skill and a computer application for constructing a phase portrait of sports exercises.

Methods and structure of the study. Computer methods for constructing and comparing images and video recording of sports exercises were used. Technical actions in the hip and shoulder joints of a gymnast in a large back rotation on the crossbar were analyzed. Performer A. Bergovin, master of sports in artistic gymnastics, Republic of Belarus. Two revolutions were performed in a row, which were compared with each other based on phase portraits. In the first revolution, a motor task was set: to perform the exercise while achieving the maximum linear speed of the general center of mass of the athlete's body in its upper part. In the second revolution, the motor task of achieving maximum speed was not set for the athlete.

Results of the study and discussion. The main results of the study were: developed computer technology for constructing a phase portrait of sports exercises in the MatLab software environment, visualization of a phase portrait of an athlete's control movements, computer methods of comparison based

on the similarities and differences of «standard»-«performer» phase portraits.

Computer technology for constructing a phase portrait of sports exercises. The «input» block of the computer program receives information about the trajectory positions of the links of the biomechanical system in the form of a two-dimensional array of generalized coordinates – Q (n, m), where n is the number of video frames of the exercise, m is the number of model links. Calculations and construction of phase portraits «Kinematic control» are performed in the MatLab software environment, developed by a computer program.

Visualization of a phase portrait of an athlete's control movements. Along the Ox axis of the Cartesian coordinate system (DCS), the value of the control function is plotted, presented in the «degree» dimension and calculated as the difference in the generalized coordinates of the biosystem, where i varies from 1 to n, and j – from 1 to m. Along the ordinate axis DSC is the speed value of the control function in the dimension «rad/s». The resulting points are the vertices of the polygon, characterizing the state of kinematic control in the competitive exercise at the points of the j-phase portrait. In Fig. Figure 1 shows options for computer construction of phase portraits for visual analysis of images using the 'FaceAlpha' function (Fig. 1.1-1.4) and computer comparison based on a binary image (Fig. 1.5-1.6).

The numerical value of similarities and differences in the athlete's technical actions was assessed using computer methods in the MatLab software environment.

Computer methods for assessing image characteristics. In line with the thematic focus of the study, we paid priority attention to two basic categories of information indicators of similarity and difference between images: the geometric shape of the objects being compared and comparison criteria.

The geometric shape of the compared objects was characterized by visual and numerical assessment of the parameters of the main spatial characteristics of the phase portrait using the corresponding functions [1, 3] of the MatLab software environment: image contour (markerless - Fig. 2.1; marker - Fig. 2.2), area (in the dimension of the original data – Fig. 2.3; in pixels – Fig. 2.4), perimeter, center of the figure (Fig. 2.5), maximum and minimum control and speed limits (bounding rectangle – Fig. 2.6), orientation of the major axis (Fig. 2.7), ellipsoid (Fig. 2.8).

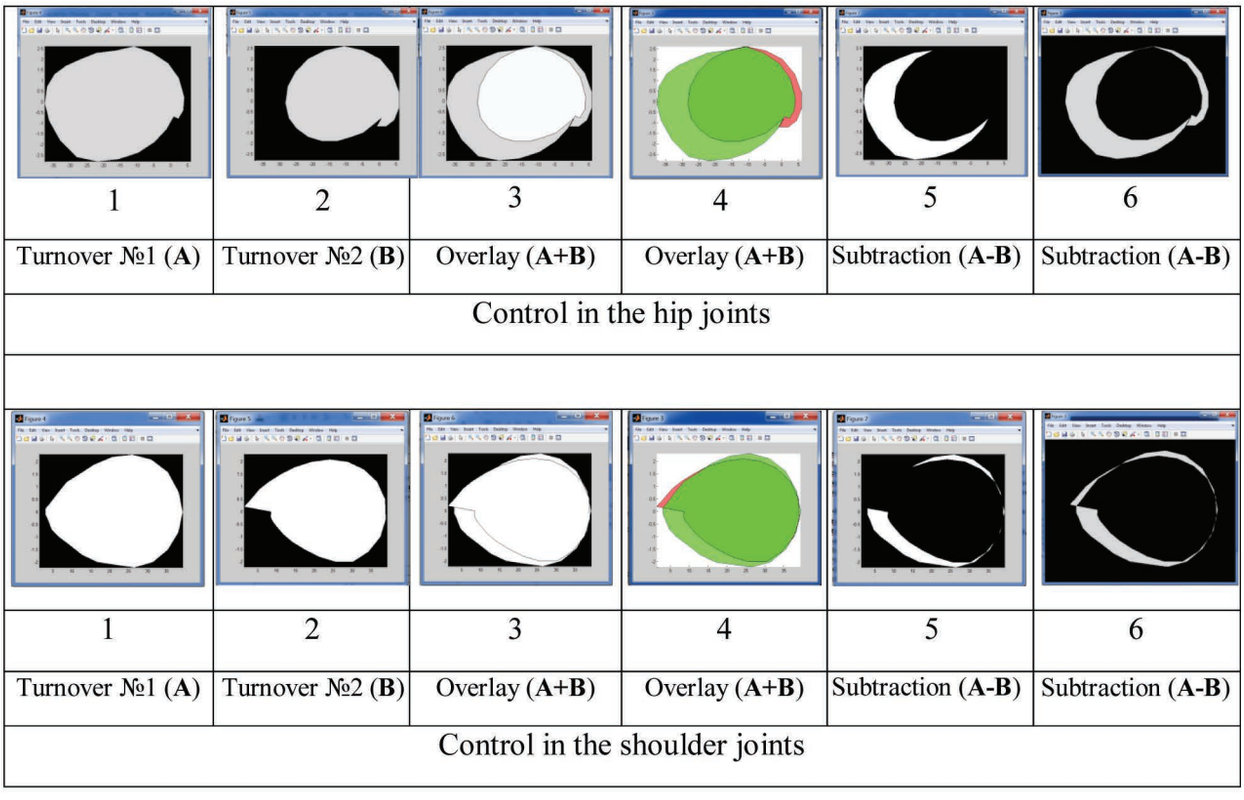

Fig. 1. *Phase portrait – control in the hip and shoulder joints in the first (A) and second (B) large revolutions back on the crossbar*

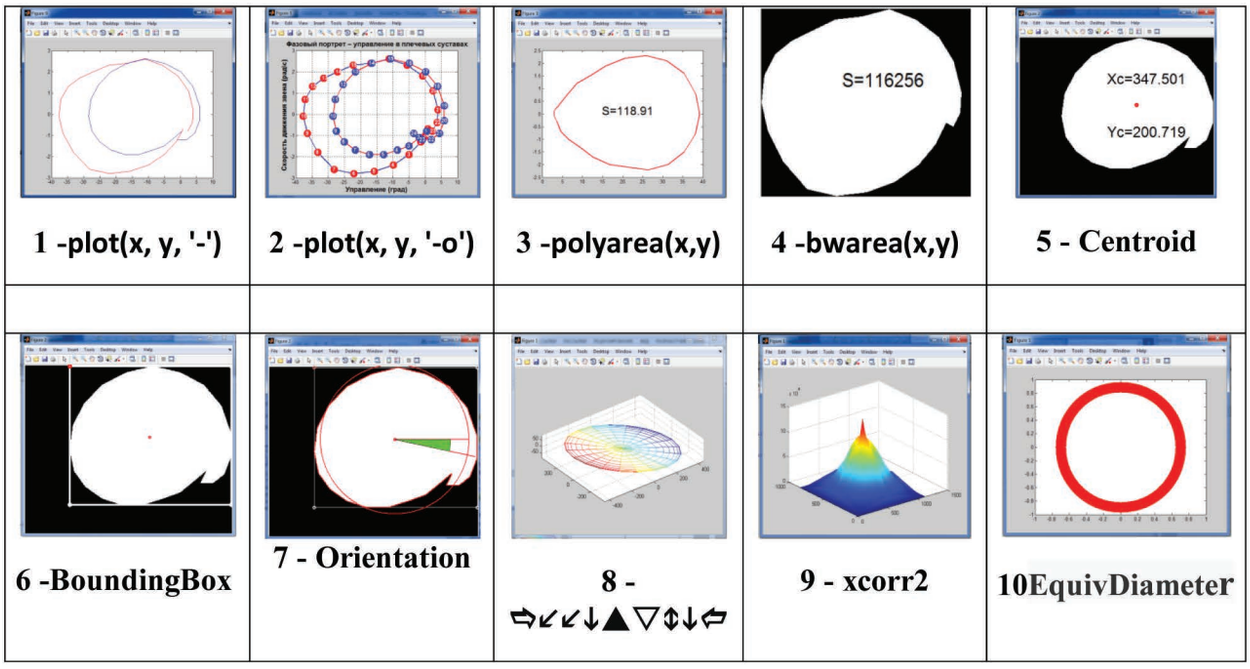

Fig. 2. *Elements of the geometric shape of phase portraits of a biosystem and the functions of their representation by the MatLab software environment*

Elements of the phase portrait of the kinematic control of the biosystem were visualized and assessed using functions and commands of the MatLab software environment, designated:

x, y – vectors defining the vertices of the polygon in the 2D area;

plot (x,y,'-') – function of plotting a polygon without a marker outline;

plot (x,y,'-o') – function for constructing the marker contour of a polygon;

polyarea (x,y) – a function that calculates the area of a polygon based on given vertices in the dimension of the DSC axes;

bwarea (BW) – estimates the area of objects in a binary BW image in pixel dimension;

Parameters of deformation of the phase portrait «Kinematic control» in large revolutions back on the crossbar

Element	Turnover 1				Turnover 2				The relationship between turnovers			
	Management (U)				Management (U)							
	1		2		1		2					
1	2		3		4		5		6		7	8
Square	S_1	118,9	S_2	167,7	S_3	102,5	S_4	117,9	S_3/S_1	0,862	Management 1	Management 2
									S_4/S_2	0,703		
Perimeter	P_1	277,7	P_2	311,8	P_3	264,4	P_4	253,5	P_3/P_1	0,95		
									P_4/P_2	0.81		
Radius equivalent	Rs_1	205	Rs_2	243	Rs_3	190	Rs_4	204	Rs_3/Rs_1 0,927	Rs_4/Rs_2 0,840		
Limits on horizontal	X_{1min}	2,9	X_{2min}	-37,8	X_{3min}	1,4	X_{4min}	-28,5	$X_{3,4min}$-$X_{1,2min}$		1,5	9,3
	X_1y_{mn}	26,4	X_2y_{mn}	-22,1	X_3y_{mn}	30,2	X_4y_{mn}	-17,3	$X_{3,4}y_{mn}$ - $X_{1,2}y_{mn}$		3,8	4,8
	X_1y_{mx}	25,9	X_2y_{mx}	-11,1	X_3y_{mx}	24,1	X_4y_{mx}	-10,7	$X_{3,4}y_{mx}$ - X_1y_{mx}		-1,8	0,4
	X_{1max}	39,2	X_{2max}	4,0	X_{3max}	38,9	X_{4max}	5,9	$X_{3,4max}$-$X_{1,2max}$		-0.3	1,9
Amplitude	L_1	36,3	L_2	41,8	L_3	37,5	L_4	34,4	$L_{3,4}$- $L_{1,2}$		1.2	-7,4
Limits on verticals	Y_{1min}	-2,2	Y_{2min}	-2,8	Y_{3min}	-2,0	Y_{4min}	-1,9	$Y_{3,4min}$-$Y_{1,2min}$		0,2	0,9
	Y_{1max}	2,3	Y_{2max}	2,6	Y_{3max}	2,1	Y_{4max}	2,6	$Y_{3,4min}$-$Y_{1,2min}$		-0,2	0,0
Amplitude	H_1	4,5	H_2	5,4	H_3	4,1	H_4	4,5	$H_{3,4}$- $H_{1,2}$		-0.4	-0,9

graindata (2) – characterizes the image and coordinates of the center along the Ox and Oy axes of the DSC with the options: graindata (2). Centroid(1), graindata(2).Centroid(2);

graindata(2). BoundingBox (1-4) – image boundaries are extracted.*Comparison criteria* by which the similarities and differences of phase portraits were assessed:

1. The ratio of the image areas of the standard and the performer.

2. Amplitude of limit changes.

3. The criterion for two-dimensional comparison is the coefficient xcorr 2 (Fig. 2.9).

4. Radius of a circle equivalent to the image area.

The main numerical solutions for a gymnast's implementation of various motor tasks in a large backward rotation on the crossbar are given in the table.

The dimension of the indicators corresponds to the input data (the Ox DSC axis is degrees, the Oy DSC axis is rad/s).

Characteristics of shape deformation of phase portraits. Deformation of the shape of phase portraits in the DSC metric can be carried out both along the numerical axis Ox (control of kinematic changes in the angle in the joint) and along the Oy axis (velocity of kinematic control in the joint).

The discrepancy between the characteristics of the phase portrait in the first (S1, P1, L1, H1) and second (S2, P2, L2, H2) exercises is (Table 1): area (S1÷S2) – 14%-30%, perimeter (P1÷P2)–5%-20%, control amplitude (L1÷L2) – 2,2%-17,7%, control speed amplitude (H1÷H2) – 8,9%-16,7%. Consequently, the functional, which comprehensively characterizes the magnitude of the deviation of the biomechanical characteristics of movement from the "ideal model", can

$$F = abs(S_1 - S_2) + abs(P_1 - P_2) + abs(L_1 - L_2) + abs(H_1 - H_2).$$

be represented in the form.

The functionality (F) is complex and includes the following elements: S – area, P – perimeter, L – maximum and minimum control limits, H – control speed limits. Digital indices correspond to objects: 1 – standard, 2 – performer. The more the functionality is minimized and approaches zero, the less differences in the exercise technique of the compared athletes.

C**onclusions.** It was revealed that the deformation of the kinematic control structure is most significant in changing the area of the phase portrait and varies within 15-30% of the area of the original image, which, however, does not lead to a significant restructuring of the technical basis of the motor action and makes it possible to implement the target setting of the exercise. Amplitude changes in executive function are less significant in solving a motor task than the rate of change in the joint angle. A comprehensive «Kinematic Control» functionality has been developed, which allows for an integral assessment of the athlete's technical skill.

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The effect of a multidirectional functional load by means of OFP on the indicators of systemic hemodynamics and vegetative support of qualified boxers

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Abstract

Objective of the study was to influence of multidirectional functional load by means of general physical training on the indicators of systemic hemodynamics and autonomic support of qualified boxers.

Methods and structure of the study. Two equal groups of 1st category boxers from 18 to 20 years old, 15 people in each group, were formed: experimental group (EG) and control group (CG). All athletes were represented in the weight category up to 71 kg.

Results and conclusions. Multidirectional means of functional training for indicators of systemic hemodynamics and autonomic support of the body of qualified boxers have been identified. During testing, the fact was recorded that the use of general physical training tools, which largely involve the muscles of the lower extremities in the activity, contributes to the adequate development of optimal functional training in boxing, which is qualitatively reflected in the indicators of systemic hemodynamics and autonomic support of the athletes body in response to the work performed.

Keywords: *indicators of systemic hemodynamics and autonomic support of the body, multidirectional functional training, general physical training tools, ultrasound examination of the heart.*

Introduction. Analysis of a number of scientific studies allows us to make the assumption that the striking movements of boxers who use different tactics in a fight require multidirectional functional and motor training to increase their functional capabilities [8]. The process of improving the speed-power characteristics of strikes is built taking into account the intermuscular interaction used by boxers in different tactical manners of fighting [5]. The authors testify that boxers who use a playful manner in a fight begin the striking movement by powerfully involving the muscles of the lower extremities in the activity. At the final phase of the movement, the muscles of the torso and shoulder are involved in the work, and the blow itself develops from the leg muscles by transferring inertial activity to the following kinematic chains. Researchers note that impacts of this type of intermuscular interaction are usually called ballistic [8]. Boxers of a different tactical style of fighting - knockouts - prefer to achieve victory by delivering an accented blow, focusing on the final phase of the striking movement with more pronounced activity of the muscles of the upper extremities [5, 8].

Based on the above, a number of researchers make the assumption that the use of various fighting styles requires adequate means of developing functional capabilities when using general physical training in the training process of qualified boxers [5, 6, 8].

Objective of the study was to analysis of identifying multidirectional functional load by means of general physical training on indicators of systemic hemodynamics and autonomic support of qualified boxers.

Methods and structure of the study. Two equal groups were formed of 1st category boxers from 18 to 20 years old, 15 people in each group: experimental group (EG) and control group (CG). All athletes were represented in the weight category up to 71 kg.

Qualified athletes were given the task of improving functional training, based on the tactical features of fighting. Boxers-players used general physical train-

ing tools aimed at developing the muscles of the lower extremities (EG). Athletes who use a strong blow to achieve victory in a fight (knockout boxers) used exercises that largely developed the muscles of the upper limb girdle (CG).

During the study, testing was carried out to assess the functions of systemic hemodynamics and autonomic support of the body of athletes for multidirectional motor activity. Athletes from the EG performed squats at maximum speed for 30 s. With a similar time period, athletes from the CG performed push-ups from the floor while lying down, at a maximum pace.

The following analysis methods were used: echocardiography (ultrasound) of the heart [4]. During the testing, a comprehensive transthoracic echocardiography of the heart was performed in two-dimensional (2D) B-mode. Systemic hemodynamic parameters were obtained using the En Visor C HD Philips ultrasound system. Scientific work was carried out in parasternal and apical standard positions. During testing, indicators obtained at rest and in the first minute of recovery after physical activity were recorded: heart rate (HR, beats/min), minute volume of blood flow (MVR, l/min), cardiac index (CI, l/min/ m2), left ventricular stroke volume (LV SV, ml), blood pressure indicators (systolic - BP and diastolic - BPd, mm Hg) and central venous pressure (CVP, mm Hg) [2, 4]. Pulse pressure (PAP, mm Hg) is calculated as the difference between systolic and diastolic blood pressure: PAP=BPs–APd. Mean arterial hemodynamic pressure (MAP, mmHg) was calculated using the formula: MAP=ADd+ADp/3 [3, 7]. We calculated the values of total peripheral vascular resistance (TPVR, dyn/s/cm-5): TPVR=80 (BPmean-CVP)/IVR [1]. The indexing of the BPSS indicator was carried out by calculating using the formula (IPSS, dyn/s/cm-5/m2): IPSS=(BPsr–CVD)/SI [1]. Echocardiography results were assessed according to the recommendations of the American and European Associations of Echocardiography.

To determine the values of vegetative support due to multidirectional motor activity, we used the double product index (Robinson index), determined by the formula: DP=HR BPs/100, (arbitrary units) [6]. The calculation of the myocardial tension index (MIS, arbitrary units) was defined as: MSI=BPs HR/1000 [5]. During the study, the circulatory efficiency coefficient (CEC, arbitrary units) was calculated: CEC=BPp HR [6, 7]. The obtained data were processed using the statistical analysis program Statistica 10.0. To assess significance, the nonparametric Mann–Whitney test was used.

Results of the study and discussion. When analyzing the results of systemic hemodynamics on the nature of intermuscular interaction, it was recorded that the values of CVP, LV SV, ABP and ABP were not marked by statistical significance of differences at all stages of testing (p>0,05; Table 1). Comparing the data of other indicators of systemic hemodynamics, we noted the following values: the values of OPSS observed after exercise in the EG were 20,7% lower compared to the results of the CG and decreased by 31,5% when compared with the data recorded at rest (p<0,05). In the CG, similar values became lower by 29,5% (p<0,05). IPSS data recorded after exercise in the EG were not noted by us as statistically significant differences relative to the

Table 1. Indicators of systemic hemodynamics in qualified athletes with multidirectional load by means of general physical training, X±m

Boxers of the 1st category				
Indicators	**Control group**		**Experimental group**	
	Peace	**Load**	**Peace**	**Load**
OPSS (din/s/cm-5)	1507,9±102,7	1063,5±69,5#	1300,5±98,4	843,8±57,6*#
IPSS (din/s/cm-5/m^2)	2440,4±131,2	1981,4±99,5	2183,4±109,8	1609,1±89,6#
BPs (mm Hg)	118,6±4,3	137±7,2	119,2±4,6	155,8±10,7#
ADP (mm Hg)	40,2±2,9	55,4±6,2#	39,8±3,2	73,8±6,4*#
SI (l/min/m^2)	2,9±0,1	4±0,3#	3,3±0,2	5,1±0,5*#
MOK (l/min)	4,7±0,4	7,4±0,5#	5,4±0,6	9,8±1,1*#
Heart rate (bpm)	64±4,6	92,6±5,3#	70,8±5,1	122,6±6,7*#

** – reliability of differences between the data from the EG and the CG, p<0,05; # – reliability of the load data relative to the resting level, p<0,05.*

control results (p>0,05); they became 26,3% lower relative to the values observed at rest (p<0,05). In the CG, similar results became lower, but we did not note that the differences were significantly significant (p>0,05). Based on the obtained values, it was noted that more significant muscle involvement during general physical fitness exercises is characterized by a low level of the indicator, determined by more significant post-load effects in the EG, which is most important for ensuring delayed recovery processes in the body of athletes.

The blood pressure values in the EG, recorded after testing, were not marked by statistical significance of differences relative to the control level (p>0,05); they became 30,7% higher relative to the results observed at rest (p<0,05). In the CG, similar results became higher, but were not marked by significant differences (p>0,05). The ADP values noted after the load in the EG were 33,2% higher than the control values, increasing by 85,4% relative to the results recorded at rest (p<0,05). In the CG, similar results became higher by 37,8% (p<0,05). This fact greatly contributes to the optimization of adaptation to exercises performed by more energy-intensive work of a global nature involving large muscle groups in the activity.

The IOC values observed after testing in the EG were 32,4% higher than the similar results in the CG, becoming 81,5% higher relative to the data recorded at rest (p<0,05). In the CG, a similar predominance was 57,4% (p<0,05). The SI data observed after the load in the EG were 27,5% greater than the similar results in the CG, increasing by 54,5% relative to the results recorded at rest (p<0,05). In the CG, similar values became higher by 37,9% (p<0,05; Table 1). When analyzing heart rate values, we noted that the results of the EG recorded after the load were 32,4% higher than the data of the CG (p<0,05). When comparing these values with the results observed at rest, we noted the fact that in the EG they became higher by 73,2%, and in the CG they increased by 44,7% (p<0,05). This fact allows us to make an assumption about the adequate response of the athletes body to the load performed by involving various muscle groups in the activity while improving striking actions (see Table 1).

Analyzing the indicators of vegetative support of qualified athletes, we noted that at rest the data of DP indicators in the EG and CG were assessed as good when the working reserves of the heart correspond to the norm. After completing the testing task, the values of DP in athletes from the EG were 50,6% higher than the control level, having increased by 126,3% relative to the results observed at rest (p<0,05; Table 2). In boxers from the CG, the values of DP after performing striking movements increased by 67,1% (p<0,05). This fact allows us to indicate greater productivity of the heart muscle as a result of performing exercises of a global nature of muscle involvement, which implies a more significant adaptation of the body to the needs of the work performed compared to the group performing exercises of a regional nature of muscle activity. In the IMI values after completing the testing task, we recorded a predominance of values in the EG by 52,8% relative to the level of the CG (p<0,05). When comparing the values observed after testing with the data recorded at rest, we noted that in the EG the values became higher by 127,4%, and in the CG – by 64,5% (p<0,05). Analyzing these results, we made the assumption that the implementation of general physical training exercises that involve the muscles of the lower extremities in activity contributes to the development of adequate adaptive capabilities in athletes who use a playful style of fighting.

Table 2. Indicators of the influence of multidirectional functional load by means of general physical training on the vegetative support of the body of qualified athletes, X±m

Boxers of the 1st category				
Indicators	Control		Experiment	
	Peace	Load	Peace	Load
DP (conventional units)	75,9±4,2	126,8±8,2#	84,4±4,6	191±10,3*#
OSI (conventional units)	7,6±1,02	12,5±1,9#	8,4±1,3	19,1±2,2*#
CEC (conventional units)	2773,6±63,4	6598±82,1#	2817,6±71,2	9041,4±97,5*#

** – Comparison of the obtained data with the corresponding values in the CG athletes, p<0,05; # – Comparison of the obtained load data relative to the resting level, p<0,05.*

When analyzing the EEC values after performing the testing load, we noted that the results of the EG were 37% higher than the control data ($p<0,05$). The values observed in the EG athletes after exercise were 220,9% higher than the values observed at rest, and in the control group – by 137,9% (see Table 2). This fact indicates better performance of boxers from the EG, characterized by the body's expenditure on the movement of blood in the vascular bed. Taking into account the fact that the CEC values increased more significantly in the EG, we made an assumption about the significant cost-effectiveness of spending CVS reserves when using general physical training tools, which to a greater extent involve the muscles of the lower extremities in the activity of the global nature of the activity of muscle work.

Conclusions. The results of the study allow us to state that multidirectional means of general physical training, involving various muscle groups in activity, have an adequate effect on the indicators of systemic hemodynamics and autonomic support of the body in qualified boxers. Performing general physical fitness exercises with a more significant involvement in the activity of the leg muscles contributes to a more significant functioning of the hemodynamics and autonomic support of the body in the process of muscle work, which contributes to the emergence of adequate adaptive capabilities during the training process.

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Electrical stimulation of c2c12 cell culture as a model of human physical activity

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Abstract

Objective of the study was to using a physical exercise model, evaluate the effect of electrical stimulation on the glucose transport mechanism of the C2C12 cell culture.

Methods and structure of the study. For the study, the cells were randomly divided into 4 groups: 2 control groups and 2 experimental groups (with insulin resistance). Insulin resistance was formed using a high-glucose medium (25 mM). In each group, half of the cells were exposed to electrical stimulation, the other half remained intact. Half of the cells in each subgroup were treated with insulin to trigger the glucose transport mechanism. The content of the phosphorylated form of the Akt protein (pAkt) in the cells served as a marker for the operation of this mechanism.

Results and conclusions. It was found that in cells with insulin resistance, pAkt was lower compared to the control group. The addition of insulin increased pAkt content, but its level in the experimental group remained reduced. Electrical stimulation increased the concentration of pAkt in all groups, bringing the level of this protein in the experimental groups to values comparable to the control group. Physical activity is one of the methods for treating various diseases and improving both the psychological and functional state of the body. It has been proven that physical activity has a positive effect on the body with insulin resistance. Modeling physical activity on cell cultures using electrical stimulation makes it possible to elucidate the mechanisms of such positive effects.

Keywords: *electrical stimulation, exercise model, insulin resistance, cell culture.*

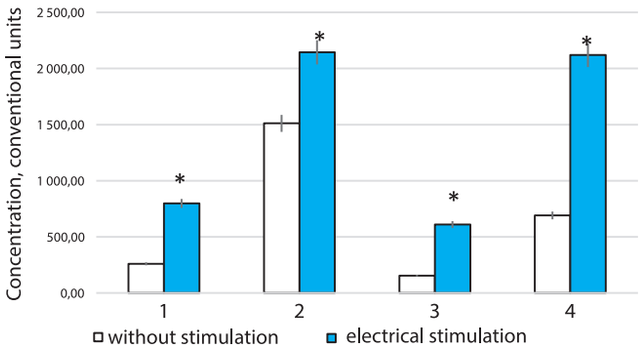
Introduction. To achieve the goals of scientific research, the most popular research method is the modeling of certain conditions, processes and systems. For example, running loads are used to study the effect of physical activity on a metabolic disorder such as insulin resistance. Aerobic exercise is considered a core component of any regimen for the prevention/treatment of insulin resistance [2]. Experiments were conducted on mice to determine the effect of running loads during the formation of insulin resistance on the content of protein markers in insulin-sensitive tissues: muscles, liver, brown and white fat [1, 4, 5]. Exercise has been found to have a positive effect on the physical condition of laboratory animals. However, the mechanism associated with the glucose transport system is difficult to trace in the whole organism. Cell culture experiments are suitable for this purpose. Imitation of physical activity is carried out using the method of electrical stimulation on muscle cells. In this case, either muscle cultures from cell banks or primary cultures of myoblasts isolated from animal muscle tissue are used. This approach allows us to minimize the influence of unaccounted factors and study individual mechanisms. The key factor in the implementation of the glucose transporting function of the cell is the Akt protein, the phosphorylated form of which (pAkt) indicates the activation of this pathway.

Objective of the study was to using a physical exercise model, evaluate the effect of electrical stimulation on the glucose transport mechanism of the C2C12 cell culture.

Methods and structure of the study. The study was carried out on a cell culture of mouse myoblasts C2C12 (collection of cell cultures of the Institute of Cytology of the Russian Academy of Sciences, St. Petersburg). Cells were seeded at a density of 3 10 cells/well in 8 six-well plates containing DMEM supplemented with 5 mM glucose, 10% heat-inactivated fetal bovine serum (FBS), 100 units/ml penicillin, and 100 µg/ml streptomycin. Cells were stored in a CO2 incubator at 37°C in a humidified atmosphere. Five days after seeding, cells were differentiated in DMEM containing 5 mM glucose, antibiotics, 2% calf serum, and 1 nM insulin. Cell morphology was assessed using phase-contrast microscopy at 400 magnification without prior fixation.

Next, two groups were formed - experimental (EG, 24 wells) and control (CG, 24 wells). In the EG plates, the differentiation medium with 5.5 mM glucose was replaced with a medium containing 25 mM glucose. Insulin resistance developed in these cells. In CG plates, mannitol was added to the medium with 5.5 mM glucose to equalize osmolarity. The cells were placed in a CO2 incubator for two days. Next, the cells were subjected to the serumstarvation procedure - serum starvation to bring them to a state of basal activity [3]. To do this, the cells were placed in a serum-free medium for 1 hour, after which the medium was replaced with serum.

The next stage was electrical stimulation (in two tablets from the EG and in two tablets from the CG) for 6 hours. Electrical stimulation was performed using a C-Pace pulse generator (C-Pace EP, IonOptix, USA) with a voltage of 40 V, a stimulus duration of 10 ms, and a frequency of 1 Hz. At the same time, from each group CG and EG, two tablets remained intact (were not subjected to electrical stimulation).



Content of pAkt in myocyte samples during electrical stimulation (1 – CG without the addition of insulin, 2 – CG with the addition of insulin, 3 – EC without the addition of insulin, 4 – EG with the addition of insulin)

After electrical stimulation, 10 nM insulin was added to half the wells of each subgroup, and the corresponding amount of serum was added to the second half of the wells; the plates were placed in an incubator for 30 minutes. The cells were then washed with PBS and frozen in liquid nitrogen. Next, samples were prepared in which the protein concentration was determined by the Lowry method. Electrophoresis was carried out in SDS-polyacrylamide gel in accordance with the Laemmli method. Proteins were transferred from the gel to a nitrocellulose membrane (BioRad, USA). Incubation with HRP-conjugated secondary antibodies was carried out for 1 h at room temperature in 5% dry milk in PBST. Visualization of antigen-antibody complexes was carried out using the ECL kit and ChemiDoc XRS + Molecular Imager (BioRad, USA).

Statistical processing of data was carried out using the statistical analysis package STATISTICA 12.0. The Mann–Whitney U test was used to perform statistical analysis.

Results of the study and discussion. The phosphorylated form of the Akt protein was detected in all samples studied. The concentration of pAkt in samples that were placed in a medium with increased glucose content was lower than in the control group, indicating partially formed insulin resistance in the experimental group. When insulin was added, the pAkt content increased; this increase was higher in the control group (see figure).

The figure shows that electrical stimulation led to an increase in the phosphorylated form of Akt in all groups. Moreover, its content in the experimental group was almost the same as in the control group when exposed to electrical stimulation.

Conclusions. Electrical stimulation of cell culture as a model of human physical activity causes positive changes at the cellular level, affecting, in particular, the glucose transport system of the cell. An increase in the level of the phosphorylated form of the Akt protein after stimulation indicates that physical activity during a metabolic disorder such as insulin resistance increases the cell's availability for glucose, improving the state of carbohydrate metabolism in the body as a whole.

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Changes in regional blood flow of the lower limb during the period of early recovery after physical activity

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Abstract

Objective of the study was to study the response of regional blood flow of the lower extremities in healthy men during the period of early recovery after physical exercise when the whole body is immersed in water.

Methods and structure of the study. 20 conditionally healthy volunteers of the first mature age (all men) took part in the scientific work. In addition to gender and age criteria, the following conditions for inclusion in the observation group were identified: height 170–180 cm, body mass index 20–24 kg/m2, average level of physical activity (3,000–4,000 MET-min/week). Exclusion criteria were chronic respiratory diseases, a history of acute illness within the last three months, smoking, regular water hardening (including winter swimming). Rheovasographic examination of the lower extremities was carried out using the Valenta hardware and software complex (Neo Company LLC, Russia).

Results and conclusions. The article presents the results of a study of the reaction of regional blood flow of the lower extremities in healthy men during the period of early recovery after physical activity when the whole body is immersed in water. It has been shown that being in comfortable conditions of an aquatic environment leads to a prolonged vascular response. At the stage of early recovery in both groups, the efficiency of the heart and vascular reactivity increase. Moreover, in the TWI group, a comfortable water environment significantly contributes to longer-lasting vasodilation. Thus, the use of complete immersion in a comfortable aquatic environment for passive recovery after intense physical activity is promising.

Keywords: *rheovasography, healthy volunteers, comfortable temperature, fatigue, recovery.*

Introduction. Fatigue always accompanies the training process, and insufficient recovery or an improperly organized recovery period after long and intense training can negatively affect the results of subsequent training or competitions [3, 5]. During early recovery, hydrotherapeutic methods [2], such as cold water immersion [4], are widely used. However, research examining the effectiveness of using neutral or warm water after exercise remains limited. In particular, according to our own meta-analysis (2023), it was shown that the use of water of different temperatures has similar restorative effects [6].

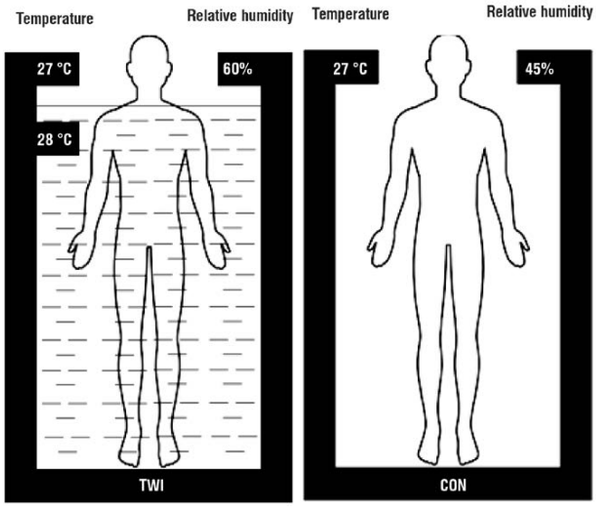
Objective of the study was to study the response of regional blood flow of the lower extremities in healthy men during the period of early recovery after physical exercise when the whole body is immersed in water.

Methods and structure of the study. 20 apparently healthy volunteers of the first adulthood (all men) took part in the scientific work; all participants were divided into 2 groups – CON and TWI. In addition to gender and age criteria, the following conditions for inclusion in the observation group were identified: height 170–180 cm, body mass index 20–24 kg/m2, average level of physical activity (3,000–4,000 MET-min/week). Exclusion criteria were chronic respiratory diseases, a history of acute illness within the last three months, smoking, regular water hardening (including winter swimming). Rheovasographic examination of the lower extremities was carried out using the Valenta hardware and software complex (Neo Company LLC, Russia). Registration of indicators was carried out in a state of relative rest, immediately after physi-

cal activity and after recovery for 15 minutes. Exercise included running with a high hip lift for 20 seconds, followed by a double countermovement jump (CMJ) and a 30-second rest period between repetitions. The criterion for achieving fatigue was a decrease in jump height by more than 40% from the initial level. After this, volunteers either immersed themselves in water (TWI group) or remained in standard conditions (CON group) for 15 minutes (see figure). During the first week of the study, all volunteers were assigned to the CON group. After a week of rest, all volunteers were transferred to the TWI group. SPSS 21.0 was used for statistical data processing. Differences were considered statistically significant at p≤0,05.

Results of the study and discussion. The results of rheovasography are divided into indicators of blood filling, blood inflow and outflow, as well as their ratio [1]. For further analysis and interpretation, we used the data obtained in the «right thigh» section (all volunteers had the leading leg on the right) (see table).

Blood supply indicators. In both CON and TWI groups, an increase in blood volume was observed after exercise. Relative volume pulse (Pr) increased significantly in all observation groups, indicating an increase in cardiac efficiency and vascular reactivity. In the recovery phase, the Pr value in both groups showed a tendency to decrease by 12%. The rheographic index (RI) and the maximum arterial component (A) increased significantly after exercise (p≤0,05), indicating an increase in blood flow due to a local increase in temperature and vasodilation. In the CON group, after 15 minutes of passive recovery, there was a significant decrease in RI and A (p≤0,05). While in the TWI group, RI and A values increased by 5%, indicating that a comfortable water environment contributed to maintaining hyperemia and improving hemodynamics. After physical exercise, the amplitude-frequency index (AFI) increased in both groups, reflecting the physiological response of the heart to intense exercise. At the recovery stage, blood volume indicators in the TWI group were significantly higher than those in the CON group (p≤0,05).



The position of a person during passive recovery
Note – on the left – full immersion in water (TWI), on the right – being in a room (CON)

Blood flow indicators. After physical exercise in both groups, the value of the elastic modulus (MU) was significantly higher than the same parameter in a state of relative rest (p≤0,05). This indicates that the vessels temporarily increased their stiffness, preventing them from dilating excessively, in response to increased cardiac output. After recovery in both groups, the MU value decreased significantly (p≤0,05), which is associated with a weakening of the tone of the vascular wall and restoration of the natural elasticity of the vessels. However, no differences were observed between the CON and TWI groups (p≤0,05). In all observed groups, the average rapid filling rate (Vb) decreased after exercise, which reflects the effect of the exercise on the efficiency of the myocardium (in particular, diastolic blood filling). In addition, the redistribution of blood during exercise reduced the volume of blood returning to the heart, which further slowed the rate of its blood filling. After sufficient rest, normal diastolic cardiac function is gradually restored. The volume of blood returning to the heart increases, which gradually leads to an increase in Vb. In the recovery phase, hydrostatic water pressure accelerates the return of blood to the heart, which is presumably the main reason for the significant increase in Vb in the TWI experimental group compared to the CON control group (p≤0,05).

Indicators of blood outflow. In both groups, venous outflow (VO) indicators in the fatigue state showed a tendency to decrease, and in the recovery phase, to increase. Thus, intense loads contributed to the obstruction of blood outflow, and during the recovery period, on the contrary, easier conditions for outflow were observed.

The ratio of blood inflow and outflow. Dicrotic index (DCI) and diastolic index (DI) are important rheological indicators that assess the efficiency of the heart pump and the state of vascular elasticity. In both groups, after physical exercise, the values of DCI and DSI increased, and after 15 minutes of passive rest they decreased.

Indicators of regional blood flow at the level of the "right hip" segment

Indicator	The Monitoring Group					
	CON			TWI		
	Baseline	Fatigue	Recovery	Baseline	Fatigue	Recovery
Pr	0,43±0,13	0,77±0,211	0,68±0,07	0,66±0,12	1,06±0,371	0,93±0,143
RI	1,15±0,18	1,55±0,331	1,25±0,212	1,19±0,31	1,54±0,271	1,62±0,213
AFP	1,18±0,41	1,41±0,59	1,51±0,29	1,42±0,31	2,00±0,791	2,00±0,363
A	114,64±17,84	154,92±33,201	125,58±20,552	118,40±31,39	154,30±26,991	161,23±21,493
MU	11,00±3,74	21,80±3,561	18,80±2,952	14,50±3,93	25,38±4,631	20,38±2,392
Vb	1,21±0,31	0,89±0,26	0,97±0,11	1,36±0,30	0,95±0,211	1,19±0,223
VO	14,52±6,78	6,32±4,88	11,78±13,67	25,30±26,89	15,15±8,19	27,40±26,68
DCI	0,27±0,23	0,39±0,15	0,14±0,072	0,27±0,16	0,32±0,25	0,30±0,20
DSI	0,53±0,39	0,96±0,79	0,65±0,45	0,57±0,31	1,90±1,63	0,36±0,132

Note – Pr is the relative volumetric pulse (in %), RI - rheographic index (in units), AFP is the amplitude–frequency index (in c–1), A is the maximum arterial component (in Ohms), MU is the modulus of elasticity (in %), Vb is the average rate of rapid filling (in Ohms/s), VO - venous outflow (in %), DCI – dicrotic index (in units), DSI – diastolic index (in units); CON – passive recovery when in a room under standard conditions, TWI – passive recovery when fully immersed in water at a comfortable temperature; Baseline – measurement results at relative rest before loading, Fatigue – measurement results immediately after loading, Recovery – measurement results after 15 minutes of passive recovery; 1 – statistically significant differences (p≤0.05) when comparing Baseline and Fatigue, 2 – statistically significant differences (p≤0.05) when comparing Fatigue and Recovery, 3 – statistically significant differences (p≤0.05) when comparing CON and TWI.

Conclusions. Promising is the use of complete immersion in a comfortable aquatic environment for passive recovery after intense physical activity. The TWI group shows a prolonged vascular response compared with the CON group. At the stage of early recovery in both groups, the efficiency of the heart and vascular reactivity increase. Moreover, in the TWI group, a comfortable aquatic environment significantly promotes longer-lasting vasodilation. There is also a more pronounced rapid recovery of cardiac and vascular functions in the TWI group - a decrease in MU and an increase in Vb. The results obtained reflect the potential benefits of using a comfortable aquatic environment to passively stimulate blood circulation and accelerate the recovery of cardiac function.

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Improving scientific and methodological support for training in paralympic sports

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Abstract

Objective of the study was to formation of directions for improving the scientific and methodological support of Paralympic sports in the system of sports training.

Methods and structure of the study. Currently, scientific and methodological support for Russian sports teams is carried out using modern technologies for collecting and analyzing data on the functional state and level of preparedness of athletes, which make it possible to remotely analyze the measured parameters and provide data to coaches in a fairly short time.

Results and conclusions. The article discusses approaches to improving scientific and methodological support for the training of Paralympic sports athletes based on the experience of implementing this system at the St. Petersburg Research Institute of Physical Culture. As the main areas of improvement, the requirements for programs, calendar plan, programs of specific events, means and methods are analyzed, taking into account the differences in sports disciplines and nosological characteristics of Paralympic athletes: sports of persons with musculoskeletal disorders (MSD), sports of the blind, sports of persons with disabilities intellectual disabilities (ID).

Keywords: *Paralympic sports, scientific and methodological support, athletes level of preparedness, sports training system.*

Introduction. At the present stage of development of the sports training system for highly qualified Paralympic athletes, one of the key sections is scientific and methodological support (SMS). At the same time, the most important element of SMS is comprehensive control of various aspects of preparedness.

Many years of experience in the scientific and methodological support system of the FSBI «St. Petersburg Research Institute of Physical Culture» (FSBI SPbNIIFK) is widely used to improve the system of sports training for Paralympic sports using the developed model characteristics of the level of preparedness in various sports.

It is important to note that FSBI SPbNIIFK provides scientific and methodological support to Russian national sports teams and is the only scientific organization that, on an ongoing basis, works with Russian national teams in Paralympic sports. The scientific and methodological support programs developed and implemented into the practice of sports training made it possible to increase the performance of athletes from national teams of the Russian Federation. The results of the implementation of the scientific and methodological support system implemented at the Federal State Budgetary Institution SPbNIIFK are included in the Preparation Strategy for the Paralympic Games of 2024 and 2026, and the institute's employees are members of the Committee on Science and Education of the Russian Paralympic Committee.

Currently, the Federal State Budgetary Institution SPbNIIFK organizes research at various Paralympic sports events (sports for the blind, sports for people with intellectual disabilities, sports for people with musculoskeletal disorders). At the same time, innovative systems for assessing the level of athletes' preparedness have been improved.

Objective of the study was to formation of directions for improving the scientific and methodological support of Paralympic sports in the system of sports training.

Methods and structure of the study. Currently, scientific and methodological support for Russian sports teams is carried out using modern technologies for collecting and analyzing data on the functional state and level of preparedness of athletes, which make it possible to remotely analyze the measured parameters and provide data to coaches in a fairly short time.

To determine approaches to improving the scientific and methodological support of training in Paralympic sports, it is necessary to determine the characteristics and tasks at various stages of sports training, solved taking into account the nosological characteristics of athletes. Specialists directly involved in the organization of SMS found that the basic principles, methods, criteria and indicators of scientific and methodological support for Olympians and Paralympians are similar.

Differences in the organization of pedagogical control are due to the characteristics of Paralympic athletes and consist in the choice of individual parameters of success; determining test indicators in accordance with the loss of certain functions; selection of specific equipment and procedures in accordance with the anatomical or functional characteristics of Paralympic athletes; relying on individual characteristics and model indicators, taking into account nosological features and limitations.

The main tasks of scientific and methodological support in the system of sports training for Paralympic athletes should be highlighted as follows: conducting stage-by-stage and ongoing examinations; selection of modern testing methods; assessment of competitive activity; making operational adjustments to the educational and training process; formation of methodological recommendations to increase the effectiveness of the training process and the effectiveness of competitive activity; development and implementation of software to improve the performance and adaptation of athletes.

The principles and approaches developed at the Federal State Budgetary Institution SPbNIIFK were tested during many years of work on the implementation of a system of scientific and methodological support and are applied directly in the educational and training process and competitive activities of national teams in various sports [1, 2].

One of the promising areas in the system of sports training for Paralympic sports is the formation of requirements for the organization of a system of scientific and methodological support, in particular, for programs; calendar plan, programs of individual events; means and methods of SMS, as well as mandatory consideration of the characteristics of the sports discipline and consideration of nosological characteristics of Paralympic athletes.

When forming general requirements for SMS programs, it is necessary to ensure systematic, comprehensive and timely presentation of research results and the development of scientific and methodological recommendations. This section should include information about modern research techniques and scientific equipment. The use of modern diagnostic complexes makes it possible to organize a system of scientific and methodological support for assessing the athlete's health status, the level of various aspects of preparedness, as well as factors leading to psychophysiological breakdowns and injuries [3].

Mandatory accounting of changes in the calendar plan should be aimed at constantly updating SMS programs, indicating the timing and location of examinations depending on the type of training or competitive event. The SMS calendar plan should begin with the preparatory period and contain the tasks of a phased comprehensive examination (PCE), ongoing examination (OE) or competitive activity assessment (CAA).

The types of scientific and methodological support for Paralympic sports correspond to those of Olympic sports and include SCE, OE and OSD. However, programs for each of these types must additionally contain requirements for implementation under conditions of physical limitations when testing Paralympic athletes.

An analysis of the modern development of Paralympic sports made it possible to highlight the following proposals for improving scientific and methodological support:

1. Taking into account the specifics of sports training and nosological characteristics of athletes, it is proposed, in accordance with the training calendar plan, to conduct such types of examination as a staged comprehensive examination (SCE), a current examination (CO), an assessment of competitive activity (ACA), which together implement the paradigm of a comprehensive control of sports training.

2. In accordance with the developed model characteristics and changes in the sports-functional clas-

sification, it is proposed to expand the range of application of testing complexes and clarify the selection of individual methods that are most effective in terms of accessibility, mobility, for use in a specific examination (field or laboratory).

3. To increase the prognostic potential of the chosen type of examination, it is necessary to use not only different, but also identical indicators characterizing both the training and competitive activities of the athlete in order to obtain a certain set of values for assessing the magnitude of the dynamics of indicators for a specific criterion or area of sports training, in particular , during the transition from one period of sports training to another (taking into account macro- and mesocycles).

4. In the practice of scientific and methodological support in Paralympic swimming, it is necessary to conduct an examination of the hydrodynamic readiness of para swimmers as an additional type of control, because only this type of control is aimed at assessing the special hydrodynamic training and level of preparedness of Paralympic athletes.

When determining the requirements for SMS tools and methods, it is important to reflect the following characteristics: taking into account the characteristics of nosological groups; individualization; mobility; complexity; possibility of remote use.

In this case, the choice of methods should be carried out depending on the nosological characteristics of Paralympic athletes (persons with damage to the musculoskeletal system, people with intellectual disabilities, people with visual impairments).

To effectively organize SMS, the universality of the diagnostic systems used is necessary. This will make it possible to organize scientific and methodological support for several sports teams at the same time when they are at a training event at the same sports training base, for example, in Paralympic athletics. Technological support should be based on modern innovative and information diagnostic systems that allow minimizing the time of examinations.

The study identified the following directions for improving scientific and methodological support for Paralympic sports:

- mandatory individualization of testing methods and evaluation of results;

- mobility and accessibility of diagnostic complexes;

- analysis of the dynamics of individual indicators based on the developed model characteristics of the level of preparedness;

- formation of databases of research results;

- improvement of the personnel training system.

Analysis of the content of scientific and methodological support programs determined that for high productivity of training impact, constant monitoring of completed tasks, analysis of means and methods, as well as monitoring the ratio of planned and completed loads are necessary.

Conclusions. An analysis of the scientific and methodological support system in Paralympic sports determined the organizational features of the examination of athletes, taking into account the individual characteristics and nosological characteristics of Paralympic athletes. Scientific and methodological support should include the following main activities: systematic analysis of the dynamics and structure of training loads, examinations of competitive activity, stage-by-stage comprehensive and ongoing examinations. It was noted that the improvement of scientific and methodological support based on the developed model characteristics of the level of preparedness will make it possible to quickly assess the level of preparedness of athletes with the issuance of recommendations for adjusting the sports training system. At the same time, modern technologies for assessing the functional state of a Paralympic athlete and his level of preparedness will make it possible to remotely analyze the measured parameters and provide data to the coaching staff. When using diagnostic techniques, it is necessary to provide an individual approach to Paralympic athletes within the framework of the implementation of scientific and methodological support, depending on the specifics of the disability, as well as the personal level of sports and psychological preparedness.

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Implementation of vfsk gto among disabled people and persons with limited health capabilities

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Abstract

Objective of the study was to analysis of the implementation of the regulatory testing part of the state requirements of the All-Russian physical culture and sports complex «Ready for Labor and Defense» (GTO) for disabled people and persons with disabilities in the constituent entities of the Russian Federation with a population from 6 to 70 years and older, taking into account the characteristics and severity of damage to functions and systems of their body.

Methods and structure of the study. An analysis was carried out of the results of the implementation of the All-Russian physical culture and sports complex «Ready for Labor and Defense» (GTO) for people with disabilities and people with disabilities over five years from 2019 to 2023. according to statistical reporting from the ANO «Directorate of Sports and Social Projects», Federal operator of the All-Russian physical culture and sports complex «Ready for Labor and Defense» (GTO).

Results and conclusions. The data obtained indicate a steady increase in interested persons with disabilities and disabilities in fulfilling the standards of tests (tests) of the VFSK GTO; males are more actively involved in this process. The smallest nosological groups involved in the complex are people with short stature and total blindness. This is due to the fact that, according to statistics, in the Russian Federation there are a small number of people with these health conditions. The need to improve the VFSK GTO for disabled people and persons with disabilities has been confirmed, including expanding the number of test standards (tests) and categories of persons with disabilities and disabilities, taking into account the characteristics and severity of damage to the functions and systems of their body, for an objective assessment of the level of their physical preparedness, as well as the development of alternative requirements for assigning them insignia.

Keywords: *VFSK GTO, people with disabilities, people with intellectual disabilities, hearing, vision, and musculoskeletal disorders.*

Introduction. The study was carried out within the framework of the state task of the Ministry of Sports of Russia for scientific and methodological support on the topic: «Improving the sections of the All-Russian Sports and Physical Culture GTO for disabled people and persons with limited health capabilities based on taking into account modern requirements for the sports-functional classification of persons participating in the implementation of test standards, as well as expert -analytical analysis of the results of the implementation of this complex». The All-Russian physical culture and sports complex «Ready for Labor and Defense» (GTO) for disabled people and persons with disabilities (hereinafter referred to as VFSK GTO for disabled people and people with disabilities) has been operating since 2019. During this period of time, 45744 people took part in fulfilling the testing standards for the complex. Of these, more than 32324 people received insignia. But at the same time, 13420 people were unable to complete the testing and fulfill the testing standards (tests) for any of their insignia.

Thus, there is a need to attract a larger number of potential participants in the physical culture and sports complex for people with disabilities and people with disabilities, as well as to increase the

number of people who could fulfill test standards (tests) and receive insignia, which is directly related to increasing motivation among contingent to systematic physical education and sports, as well as participation in competitions to fulfill the standards of tests (tests) of the All-Russian Physical Sports Complex GTO for disabled people and persons with disabilities.

Objective of the study was to analysis of the implementation of the regulatory testing part of the state requirements of the All-Russian Federal Sports Complex GTO for disabled people and persons with disabilities in the constituent entities of the Russian Federation with a population from 6 to 70 years and older, taking into account the characteristics and severity of damage to the functions and systems of their body.

Methods and structure of the study. To carry out the work at this stage, the working group summarized the results of participation in the fulfillment of the standards of tests (tests) of the All-Russian Federal Sports Complex GTO for disabled people and persons with disabilities of various gender and age groups with hearing impairment, vision impairment, intellectual disabilities and damage to the musculoskeletal system based on the results of statistical reporting from the ANO «Directorate of Sports and Social Projects», Federal Operator of the All-Russian Physical Culture and Sports Complex «Ready for Labor and Defense» (GTO).

Results of the study and discussion. Based on statistics received from the Federal operator of the All-Russian Sports Complex GTO for the period from the beginning of the implementation of the physical culture and sports complex for the disabled and persons with disabilities (from 2019) and to 2023, in accordance with the Orders of the Ministry of Sports of the Russian Federation «On approval of the state requirements of the All-Russian Physical Education sports complex «Ready for Labor and Defense» (GTO)» No. 90 dated 02.12.2019 and No. 117 dated 02.22.2023 [1, 2], an analysis of data on the participation in the All-Russian Sports Complex GTO of persons with hearing impairments, vision impairments, intellectual disabilities and damage to the musculoskeletal system. In figure 1 shows the total number of representatives of various gender, age and nosological groups who took part in fulfilling the standards of testing (tests) of the VFSK GTO for 5 years (from 2019 to 2023).

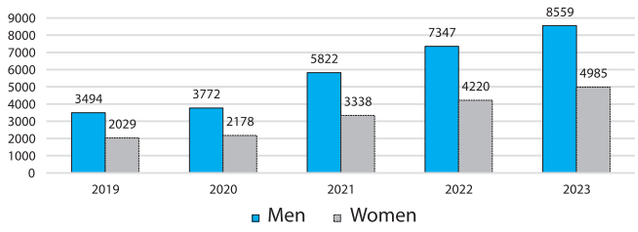


Fig. 1. The number of female and male persons (from 6 to 70 years and older) who took part in fulfilling the standards of tests (tests) of the VFSK GTO for disabled people and persons with disabilities for 5 years (from 2019 to 2023)

The data obtained indicate a steady increase in the participation of interested persons with disabilities and special needs in participation in the All-Russian Sports Society of the TRP. Moreover, males are more actively involved in the process of fulfilling the standards of testing (tests) of the physical education and sports complex (Fig. 1). The number of males who took part in the testing was 28994 people, females - 16750 people. Considering the results of the performance of standards (tests) for insignia by persons with disabilities and with disabilities (from 6 years to 70 years and older) (Fig. 2), we can state the fact that more gold badges were received (and specifically by male persons) than silver and bronze. At the same time, a large percentage of participants in the physical culture and sports complex were recorded who were unable to fulfill the standards (also males), this is especially evident in older age groups (from 60 years to 70 years and older) [3].

According to the results of the study, out of 45744 people, 5574 women and 10672 men met the standards for the gold badge, 2582 women and 4563 men achieved the silver badge, 3391 women and 5529 men achieved the bronze badge.

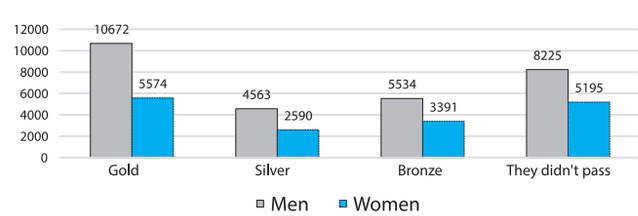
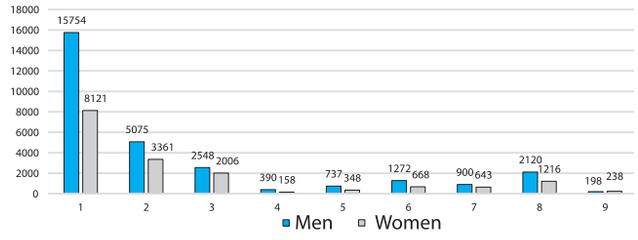


Fig. 2. The total number of disabled people and persons with disabilities (from 6 to 70 years of age and older) who have completed the testing standards (tests) of the All-Russian Federal Sports Society for Religious Defense for insignia for 5 years (from 2019 to 2023)

If we compare the total number of participants in the physical culture and sports complex for the disabled over the past 5 years of various nosological groups, it is obvious that the smallest nosological groups involved in participating in the implementation of the standards (tests) of the All-Russian Physical Culture and Sports Complex GTO are people with short stature and total blindness (Fig.3). According to statistics, there are a small number of people in Russia with these health conditions. This may also indicate the need to develop additional measures to cover and involve representatives of these nosological groups in participation in the All-Russian Physical Culture and Physical Culture GTO for disabled people and persons with disabilities.

The most numerous groups of participants in the complex are people with hearing impairment and intellectual disabilities. Analyzing the data obtained, presented in Figure 3, it is clear that the most active participation in the implementation of the VFSK GTO complex, relative to nosological groups, was demonstrated by persons with intellectual disabilities, the number of which was 23875 people (52,2% of the total number of participants).



Note: – persons with intellectual disabilities; – persons with hearing impairment; – persons with residual vision; – persons are totally blind; – persons with unilateral or bilateral amputation or other lesions of the upper extremities; – persons with unilateral or bilateral amputation or other lesions of the lower extremities; – persons with spinal injuries and spinal cord lesions; – persons with cerebral palsy; – persons of short stature.

Fig. 3. The number of disabled people and persons with disabilities (from 6 to 70 years of age and older) by nosological groups involved in performing tests (tests) of the All-Russian Physical Fitness Test for GTO for 5 years (from 2019 to 2023)

However, it should be noted that, despite the large number of representatives of the group of people with intellectual disabilities, participants of the VFSK GTO complex fulfill standards in accordance with uniform requirements for all types of disorders within this nosological group. Therefore, it is necessary to develop additional testing standards (tests) for people with Down syndrome and autism spectrum disorder, which will allow for the involvement of even more participants in the GTO complex for people with disabilities and people with disabilities.

Conclusions. The analyzed data on the participation of disabled people and persons with disabilities of various gender, age and nosological groups in the VFSK GTO from 2019-2023 indicate a positive dynamics of growth in the number of participants with disabilities in the complex, which, in our opinion, is caused by the increasing interest in the VFSK GTO in these population groups Russia.

It is necessary to develop additional measures to involve an even larger number of potential participants in the complex, as well as expand the number of testing standards (tests) to objectively assess the level of physical fitness of categories of persons with disabilities and disabilities, and propose alternative requirements for assigning them insignia.

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The use of floorball in adaptive physical education of schoolchildren with intellectual disabilities

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Abstract

The purpose of the study. To determine the composition of the funds and establish a rational sequence of teaching basic technical elements of floorball to children with intellectual disabilities (IN).

Methodology and organization of the study. The means and a specific procedure for teaching the basic elements of the floorball technique to children with intellectual disabilities are proposed. An experimental approbation was carried out with the participation of four groups of schoolchildren who studied using different methods.

The results of the study and conclusions. The effectiveness of the author's approach in teaching basic techniques in floorball to students with intellectual disabilities is scientifically substantiated.

Keywords: *adaptive physical education (AFV), floorball, children with intellectual disabilities, learning sequence.*

Introduction. The introduction of sports technologies into the process of adaptive physical education should provide a corrective and developmental effect on the psychophysical and social characteristics of schoolchildren with intellectual disabilities [6]. Floorball potentially has many properties of a complex effect on the body and personality of those involved, which is due to the team nature of the game, emotionality, frequent change of game situations, a large arsenal of coordination and technical and tactical means [1, 2]. The expediency of the accentuated use of floorball products in the AFV of schoolchildren with intellectual disabilities is determined by the following factors:

- a public order for the popularization and development of floorball included in the program of the Special Olympics [4];

- the material and technical accessibility and attractiveness of the sport;

- the need for an alternative replacement of the "hockey on the floor" section of the school Physical education curriculum for students with mental retardation (intellectual disabilities);

- the need to take into account the interests and leading motives of physical education and sports activities of schoolchildren with IN, ensuring the continuity of basic and additional education, regular and extracurricular forms of the physical education process [2, 3, 5, 6].

To date, in the theory and practice of adaptive physical education, there is no method of using floorball in people with IN [2, 5].

The purpose of the study. To determine the composition of the funds and establish a rational sequence of teaching basic technical elements of floorball to children with intellectual disabilities.

Methodology and organization of the study. The biomechanical structure of motor actions in floorball is characterized by complexity and diversity. For the effective application of techniques and methods of the game, it is necessary to adapt them taking into account the psychophysical characteristics of persons with intellectual disabilities [2]. We have identified those elements of the technique that are most applicable and necessary in the gam-

Table 1 – Composition of floorball products for teaching students with intellectual disabilities

Goal attack (throw/ short stroke)	Keeping the ball	Passing the ball	Receiving and stopping the ball	Hitting the ball
– a sweeping throw with eyeliner – long throw – short wrist throw – a throw from the spot – throw from different angles – roll over throw – a throw from the wrong side – a throw in motion – short stroke	–holding the club with one (two) hands – moving face forward, running – with a change in direction of movement –short jerks in a straight line with acceleration, – running backwards with different turns – sideways – «snake» – in an arc	– with a push – by throwing – putting the stick in one touch – overboard – "with a broom" – from a U-turn – a foundling	– by stopping the stick with the inside or outside of the hook – stopping the ball with the shin – stopping a flying ball with the sole – receiving a flying ball on a hook «in the grip» – stopping the ball with your chest	– «convenient» strokes with the open side of the stick (sweeping, pressing, kick-click, hooking). – «uncomfortable» strokes with the closed side of the stick (click-kick, click-kick with summer pressure, touch-up)

ing activities of people with IN (goal attack (throw/ short stroke), keeping the ball, passing the ball, receiving and stopping the ball, hitting the ball). Table 1 systematizes the types and methods of technical techniques that are most accessible for mastering this contingent of children (Table 1).

At the same time, we found that the authors' recommendations on the sequence of mastering the basic elements of floorball are fundamentally different and there is no consensus. The author's methodology has been developed, the key idea of which is that it is necessary to start training with the technical technique "gate attack", performed in order to hit the opponents' gates. This approach helps to initially create in children an idea of the essence and result of the game.

We compared four versions of the training to determine the most optimal option for people with intellectual disabilities, taking into account their psychophysical and functional characteristics:

– classic: *passing, receiving and stopping, throwing, hitting, keeping the ball;*

– according to A.V. Bykov: *keeping the ball, throwing, passing, receiving and stopping, hitting*

– proposed by Special Olympics International (SOI): *reception and transmission, impact, stroke;*

– author's: *goal attack (throw/ short stroke), keeping the ball, passing the ball, receiving and stopping the ball, hitting the ball.*

Each of the four equally numbered groups of schoolchildren (n-21) was engaged in different methods during 9 months of the academic year.

The results of the study. The success of mastering the floorball technique was determined by 5 tests *(driving the ball with a stick, passing the ball, throwing the ball for accuracy, throwing the ball at the goal, protecting the goal*). The results were recorded every three months (Figures 1-5).

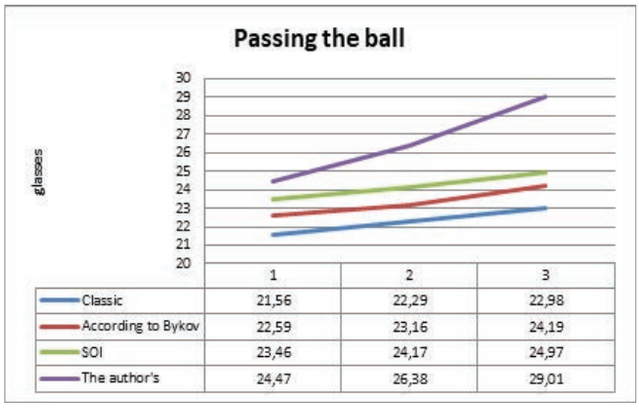


Figure 1

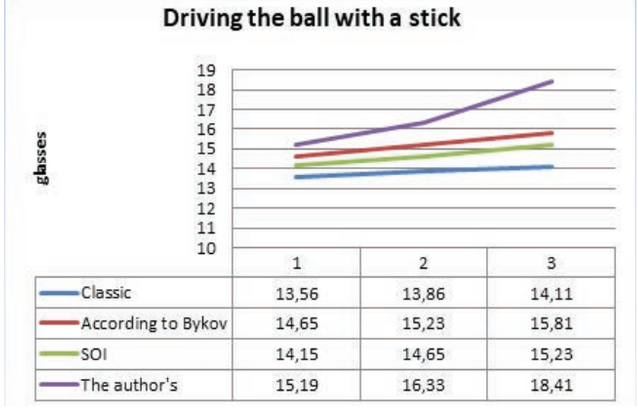
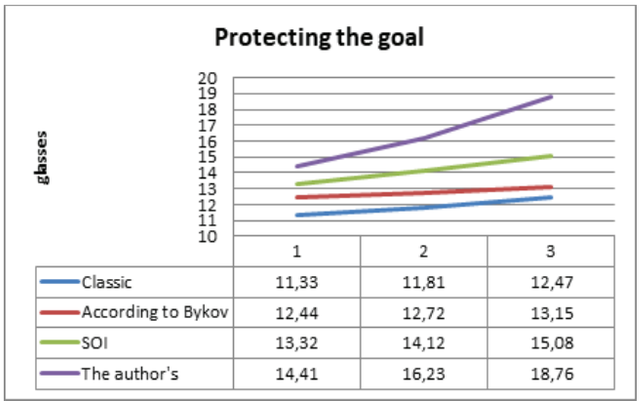
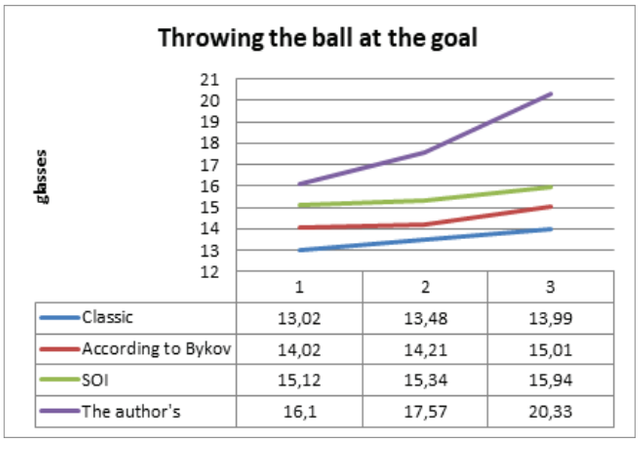


Figure 2



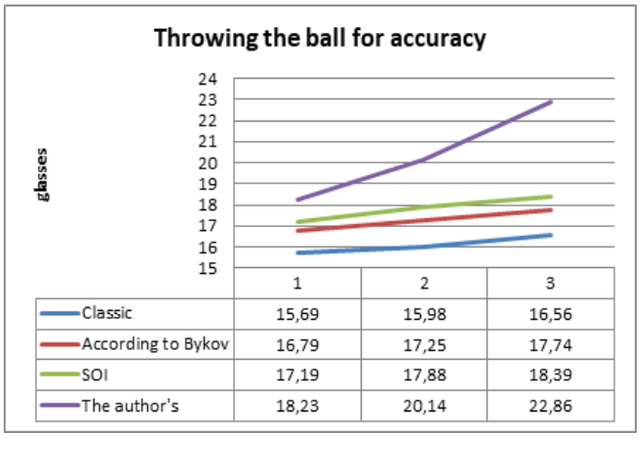
	1	2	3
Classic	11,33	11,81	12,47
According to Bykov	12,44	12,72	13,15
SOI	13,32	14,12	15,08
The author's	14,41	16,23	18,76

Figure 3



	1	2	3
Classic	13,02	13,48	13,99
According to Bykov	14,02	14,21	15,01
SOI	15,12	15,34	15,94
The author's	16,1	17,57	20,33

Figure 4



	1	2	3
Classic	15,69	15,98	16,56
According to Bykov	16,79	17,25	17,74
SOI	17,19	17,88	18,39
The author's	18,23	20,14	22,86

Figure 5

The figures show that the author's approach is the most effective, since it differs in the most significant reliable dynamics (growth rate according to S. Brody) of all the studied indicators.

Conclusions. The sequence of teaching the basic elements of the floorball technique developed by us is the most optimal for children with intellectual disabilities, since it is based on accounting:

– the peculiarities of the course of mental processes *(low attention span, rapid distraction, distraction and the inability to concentrate for a long time, a significant violation of spatial perception, orientation in space, narrow thinking, inability to quickly assess the situation and make a rational decision, etc.)*;

– difficulties and opportunities for mastering complex coordination motor actions, which are widely represented in floorball.

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Figital festival as a new format for promotion of traditional spiritual and moral values in youth environment

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Abstract

Objective of the study was to theoretically substantiate the development of a digital assessment system and a mechanism for developing the skills of traditional spiritual and moral values of students.

Methods and structure of the study. More than 3 500 students from educational institutions in St. Petersburg and the Leningrad region took part in the experiment. The research protocol included: purpose, objectives, methods (theoretical analysis and synthesis of scientific and methodological literature and documentary sources, monitoring the expression of traditional spiritual and moral values of students using the multifunctional online platform «Fakultetus», pedagogical observations.

Results and conclusions. As part of the pilot study, a Festival was held, the purpose of which was to popularize sports and promote a healthy lifestyle among students in St. Petersburg and the Leningrad region. The analysis and generalization of the results showed that, despite a fairly strong interest in socialization, the overwhelming majority of students who took part in the monitoring do not classify the category «spiritual and moral values» as highly significant. The prerequisites for assessing the skills of traditional spiritual and moral values and identifying the mechanisms for their formation in students through the use of a developed unique digital platform have been determined.

Keywords: *spiritual and moral values, physical education and sports activities, figital.*

Introduction. The problem of the formation of traditional spiritual and moral values has always been important, and today it is extremely relevant. This is constantly drawn to our attention by the Head of State V.V. Putin, who on January 16, 2024, at an official meeting with the heads of municipalities of the constituent entities, said: "Traditional values remain the moral foundation of Russian statehood, and the authorities intend to continue to strengthen them, 2024 is no coincidence declared the «Year of the Family». This is a national event aimed at strengthening our traditional values, on which, as a foundation, we are trying to build and are building the edifice of the entire Russian statehood" [6]. This is necessary to solve demographic problems, increase the population, and preserve the Russian people as the moral foundation of statehood. The choice of topic is due to the importance of developing and scaling the ideas of Doctor of Pedagogical Sciences, Professor Irina Aleksandrovna Viner and approaches to the formation of spiritual and moral values, embodied by her over many years of coaching and teaching activities.

Objective of the study was to theoretically substantiate the development of a digital assessment system and mechanisms for developing the skills of traditional spiritual and moral values of students.

Methods and structure of the study. As part of the execution of the instructions of the President of the Russian Federation dated May 25, 2022 No. Pr-1049 GS (subparagraph 2 a), aimed at popularizing

traditional family values, as well as the execution of the Decree of the President of the Russian Federation dated November 9, 2022 No. 809 «On approval of the Fundamentals of State Policy for Conservation and strengthening traditional Russian spiritual and moral values», on the basis of Lesgaft University, from the beginning of 2023, within the framework of scientific, methodological and resource support for the education system, research was carried out to identify prerequisites for the development of a project on the topic: «Comprehensive analysis and development of a digital assessment system for the model of traditional competencies spiritual and moral values of students in educational institutions of higher education and their further support» [5, 7]. More than 3500 students from educational organizations in St. Petersburg and the Leningrad region took part in it. A theoretical analysis and generalization of scientific and methodological literature and documentary sources was carried out, monitoring of the expression of traditional spiritual and moral values of students using the multifunctional online platform «Fakultetus», and pedagogical observations.

Results of the study and discussion. As a result of theoretical analysis and generalization of research on the problems of determining modern approaches to the educational process among athletes, identifying the life-meaning orientations of students in sports educational institutions, determining approaches to the education of spiritual and moral values, as a prevention of risk factors for the use of psychoactive substances among student athletes, clarifying modern challenges to the system of educating athletes based on the traditional values of the Olympic movement, a conclusion was made about finding ways to counter value wars in the sphere of cultural, informational and psychological space, which involve the destruction and/or distortion of worldview, moral and cultural attitudes, especially in the field of youth education, using the example of analysis models of health and development skills [1-4].

More than 30 events were held, including qualifying and final tournaments in the following types: individual program: Just Dance; team program (3x3): floorball + interactive hockey (NHL); team program (3x3): basketball + interactive basketball (NBA 2K); team program (3x3): football + interactive football (FIFA); team program (5x5): volleyball + dota 2; individual program: rhythm game Beat saber; team program (2x2): darts + counter-strike: global offensive (16+); individual program: Fruit ninja VR; team program (3x3): World of Tanks.

The main objectives of the Festival were: education of patriotism, formation of an active life position and desire for sports victories in the younger generation; preservation and enhancement of sports and patriotic traditions of the Russian Federation; development of interpersonal contacts between students, formation of skills in organizing and conducting sports events; development of traditional spiritual and moral values among Festival participants. The structure of the events included mechanisms for the formation of the values of patriotism, friendship, mutual assistance and mutual respect, creative work, the unity of the peoples of Russia, goodness and justice.

The applied format for involving students in the study was chosen taking into account the preferences of modern youth in the use of digital tools, and was distinguished by its originality: a large-scale patriotic event in fidget sports, using unique tools and mechanisms for educating traditional spiritual and moral values of participants; innovation and uniqueness: the formation of an active patriotic position in accordance with traditional Russian spiritual and moral values, by combining physical education and sports activities in real and virtual space using innovative approaches: 1) a gaming approach that allows motivating students to physical activity and social interaction; 2) social component: formation of a sports and patriotic community; conducting patriotic online lessons, patriotic events: master classes on drone racing, assembly/disassembly of the AK-74; 3) technological solutions: the use of virtual reality (VR) and augmented reality (AR) - technologies integrated into competitive activities, attracting the attention of students and motivating them to physical activity; 4) educational component: inclusion of educational materials and information about the importance of a balance between activity in real and virtual spaces, teaching skills in effective time management, healthy lifestyle and rational use of technology; 5) cooperation with parents, allowing to create a general strategy for motivating their children to physical activity and social interaction, cooperation with educational organizations - allowing to introduce the program into the educational process and create a system of support and monitoring progress.

The analysis and generalization of the results of monitoring the expression of traditional spiritual and moral values of students using the multifunctional online platform «Fakultetus"», as well as pedagogical

observations of physical culture and sports activities at festival events showed that with a sufficiently large interest in socialization, the overwhelming majority of students who took participation in monitoring does not classify the category «spiritual and moral values» as highly significant, which in itself is a problem, since this creates a risk that the own development of these children and their future families will overload psychological and social stability, are susceptible to rapid emotional and professional burnout, it is difficult to keep their future families in the space of traditional spiritual and moral values.

Pedagogical observations of the activities of festival participants also revealed their greater involvement in joint activities using end-to-end technologies and digital tools, compared to traditional methods of interaction. This confirmed the assumption of the need for further research on ways to form a sustainable model of competencies of traditional spiritual and moral values of students in educational organizations using a digital platform for assessing the model of traditional spiritual and moral values of students based on their individual digital profile, and subsequent support to help them maintain a sustainable model values.

Conclusions. The prerequisites for assessing the skills of traditional spiritual and moral values and identifying the mechanisms for their formation in students of educational organizations through the use of a developed unique digital platform have been determined. The result of intellectual activity will be a digital platform that allows, based on unique assessment mechanisms, not only to identify, but, most importantly, to form the necessary skills of traditional spiritual and moral values. The project is in demand by society and is necessary for students, teachers and parents.

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Structure of an elective course in physical education «winter football» using figital technologies

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Abstract

Objective of the study was to justify the pedagogical technology of teaching students of specialized groups in winter football.

Methods and structure of the study. The basis of the study was the analysis of educational, training and competitive gaming activities.

Results and conclusions. It is shown that the pedagogical technology for teaching students of specialized winter football groups should be a set of pre-designed effective and interconnected components of the educational process. It is advisable to include elements of phygital technologies in up to 20% of training time; they can be aimed primarily at developing coordination abilities, reaction time and team interactions.

Keywords: *winter football, training, phygital, students.*

Introduction. The system of physical education at a university should develop according to the principles of an individual approach to the individual, taking into account the needs, interests, motives of each student, developing physical qualities and motor abilities. Currently, classes in specialized groups in team sports are becoming increasingly popular among university students [5]. Considering the active participation of students in winter football competitions, as well as their enormous interest and desire to engage in this sport, instilling interest and creating a need for physical education and sports among students is possible by introducing the «Winter Football» specialization [2, 3]. This is especially true in the conditions of the Siberian region, when playing regular football is impossible due to climatic conditions [4]. The use of digital technologies, their introduction into the educational process, including in the direction of physical education, seems to us the most promising trajectory for the future of higher education [1].

Objective of the study was to justify the pedagogical technology of teaching students of specialized winter football groups.

Methods and structure of the study. The basis of the study was the analysis of educational, training and competitive gaming activities, which included: selection into specialized winter football groups, taking into account the wishes of the student himself, health and physical fitness; training program for specialized student groups on winter football; teaching methodology based on the use of principles and methods of sports training, ensuring intensification and higher efficiency of the educational and training process; a system of winter football competitions, including interfaculty tournaments, a mass regional championship league and a major league; comprehensive pedagogical control.

Results of the study and discussion. When developing pedagogical technology, the following principles were observed: gradualism, consistency, activity, accessibility, consciousness.

Goals and objectives of pedagogical technology for teaching students in specialized winter football groups:

1 course.

- mastering the necessary theoretical knowledge about winter football, including safety rules;
- studying the techniques and tactics of playing winter football;
- developing the ability to apply technical and tactical elements in a two-way game during training sessions;
- development of general physical qualities, including through activities in other types of physical culture and sports.

At this stage, physical elements make up 10–15% of the training time and are aimed at mastering technologies and developing primary skills, including balance, coordination and reaction speed. For this, VR technologies and stabilization platforms can be used.

2nd and 3rd courses:

- further mastery of theoretical knowledge about winter football;
- further study and improvement of techniques and tactics of playing winter football;
- development of speed-strength endurance, speed, agility;
- developing the ability to use technical and tactical individual and team actions in various competitions.

At this stage, phygital elements make up 20–25% of the training time and are aimed at developing important skills, including balance, coordination and reaction speed, as well as game interaction in the virtual space. For this purpose, VR technologies, computer simulators, stabilization platforms and team computer simulators of team sports can be used.

The sequence of mastering educational material.

1 course:

Stage 1 (September – October) – testing the level of development of physical qualities and functional state of students (registration of a health passport), questionnaires, formation of specialization groups; studying the theory of physical education and sports, winter football; general physical fitness; athletics, development of general endurance and coordination;

Stage 2 (October – December) – parallel lessons in skiing and specialization «Winter Football», implementation of the tasks of the 1st course;

Stage 3 (February – March) – classes in the «Winter Football» specialization, implementation of the tasks of the 1st year in accordance with the training program;

Stage 4 (March – April) – general physical training, outdoor and sports games;

Stage 5 (April – June) – athletics, sports games, development of general endurance and coordination, testing the level of development of physical qualities and functional state of students (health passport).

2nd course:

Stage 1 (September) – testing the level of development of physical qualities and functional state (health passport), questionnaires, studying the theory of winter football, general physical training, athletics, development of general endurance and coordination;

Stage 2 (October) – classes in the «Winter Football» specialization, preparation, formation, development of skills in playing football (on the court), including preparation for winter football, classes on sand, gravel, outdoor games with elements of football, speed development -strength endurance;

Stage 3 (November – December) – classes in the «Winter Football» specialization in accordance with the 2nd year training program, preparation and participation in competitions;

Stage 4 (February - March) - parallel skiing and winter football specialization, development of general endurance, development of speed-strength endurance, participation in competitions;

Stage 5 (March – April) – classes in the «Winter Football» specialization, practicing winter football playing skills, testing practical skills in winter football;

Stage 6 (April – June) – athletics, sports games, testing the level of development of physical qualities and the functional state of the students' body (health passport), a test in the theory of physical education and sports, including winter football.

3rd course:

Stage 1 (September – November) – testing the level of development of physical qualities and functional state (health passport), questionnaires, studying the theory of winter football, classes in the «Winter Football» specialization, development of speed-strength endurance, speed, agility, development of playing skills football on the court, gravel, sand. Preparation for winter football competitions;

Stage 2 (November – December) – methodological and practical classes in the «Winter Football» specialization, practicing the technique and tactics of the game, testing the level of preparedness for winter

football competitions, participation in sports competitions of various levels in winter football, taking into account the level of training;

Stage 3 (February – March) – methodological and practical classes in the «Winter Football» specialization, analysis and development of playing techniques and tactics, participation in sports competitions of various levels in winter football, taking into account the level of training, analysis of the results of participation in competitions and their evaluation according to rating scale, testing practical skills of playing winter football;

Stage 4 (March – June) – classes in the «Winter Football» specialization, introduction to various types of football: mini-football, classic football (on grass), beach football, testing on the theory and methodology of winter football, testing the level of development of physical qualities and functional state of students (health passport).

Conclusions. Thus, the pedagogical technology for teaching students of specialized winter football groups should be a set of pre-designed effective and interconnected components of the educational process, built on a modern scientific basis and aimed at transforming the compulsory educational process into the process of physical education. It is advisable to include elements of phygital technologies in up to 20% of training time; they can be aimed primarily at developing coordination abilities, reaction time and team interactions.

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Attitude of junior schoolchildren and parents to the recommended volume of weekly motor activity

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Abstract

Objective of the study was to analysis of the attitude of primary school children and their parents to the recommended volumes of weekly physical activity.

Methods and structure of the study. A survey was conducted of 309 school-age children studying in 10 schools in St. Petersburg and the Leningrad region. Of these, 143 respondents were children of primary school age (6-9 years old).

Results and conclusions. It was revealed that a significant proportion of children of primary school age and their parents tend to believe that the amount of physical activity in the range of 180-360 minutes per week is sufficient for schoolchildren in this group. This range combines the necessary amount of physical activity to prevent the onset of symptoms of physical inactivity, ensure the process of physical development, and also save time for free leisure. A group of children whose volume of physical activity exceeds 360 minutes per week is considered insufficient. Parents of this group of children, whose volume of physical activity exceeds 360 minutes per week, and in exceptional cases reaches 900 and 1020 minutes per week, also tend to consider it insufficient.

Thus, the question of the upper limit of the volume of physical activity of school-age children, both daily and weekly, remains relevant for study. It is necessary to establish a threshold that has sufficient developmental potential, ensures an improvement in the health of children and contributes to their harmonious development.

Keywords: *motor activity, volume, children, primary school age.*

Introduction. Creating conditions for maintaining and improving the quality of life and, in particular, the health of citizens is one of the priorities of any state, since not only the satisfaction with the life of an individual and a group of people, but also the stability of the socio-economic state of the country depends on the degree of its solution. There is no doubt about the historically proven thesis that one of the most significant social determinants for human health is the adoption of healthy lifestyle values. Organizing your lifestyle and forming a life style based on these values requires adherence to a number of principles. Compliance with certain volumes of physical activity and rational organization of their implementation is one of the leading principles of a healthy lifestyle [2].

Motor activity, as defined by V.K. Balsevich, this is: a person's purposeful implementation of motor actions aimed at improving various indicators of his physical potential. In a broad sense, physical activity is the sum of all movements performed by a person in the process of life [1].

An analysis of scientific research on the influence of physical activity on the level of health and the determination of optimal norms of physical activity allows us to conclude that in view of the inevitability of changes in all spheres of human life under the influence of various global social and environmental trends, the issue

of systematic review and adjustment does not lose its relevance. only existing norms of physical activity, but also methodological approaches to their determination.

Objective of the study was to analysis of the attitude of primary school children and their parents to the recommended volumes of weekly physical activity.

Methods and structure of the study. The study was carried out by the team of the Institute of Adaptive Physical Culture of NSU named after P.F. Lesgafta, St. Petersburg, within the framework of the state assignment to carry out research work on the topic: «Development of scientifically based norms of weekly physical activity in children, including those with disabilities and children with disabilities, creating conditions for the health-improving and developmental effect of classes physical culture and sports». The results of a study on the attitude of primary schoolchildren and parents of children 6-10 years old to the weekly volume of physical activity are presented. The sociological survey involved 309 school-age children - 143 respondents were schoolchildren (6-9 years old) studying in 10 schools in St. Petersburg and the Leningrad region.

Results of the study and discussion. When filling out a specially designed questionnaire, schoolchildren must answer whether they attend a physical education lesson. At the same time, the questionnaire specified how the child participates in the educational session. 100% of respondents answered that they take an active part in the physical education lesson.

Currently, WHO recommends that children aged 5-17 years follow a physical activity regimen that involves performing 60 minutes of moderate to vigorous intensity physical activity per day, at least 3 times a week. Accordingly, the minimum amount of physical activity that ensures the prevention of diseases associated with physical inactivity is 60 minutes per day or 180 minutes of moderate and high intensity physical activity per week. A decrease in the volume of physical activity of less than 180 minutes can provoke the development of somatic diseases, the appearance of excess body weight, and a deterioration in the physical development of schoolchildren.

Comparing these recommendations with the respondents answers, we can assume that almost all survey participants perform a minimum amount of physical activity. This assumption is confirmed by the fact that in the schools where the survey took place, physical education lessons are taught 3 times a week, which guarantees students 135 minutes of organized and regular physical activity per week. The lesson, which lasts 45 minutes, involves a load of medium and high intensity, and children make up for the remaining 15 minutes by playing during breaks or moving to school and back, background and household physical activity. The share of such children was 22%.

The diagrams below indicate the upper threshold of the minimum amount of physical activity - 360 minutes per week, which is the sum of the time spent in physical education lessons and three additional classes, medium and high intensity. The range from 180 minutes to 360 minutes of weekly motor volume is accepted by us as a conditionally optimal range that ensures the prevention of somatic diseases, has a beneficial effect on the physical development of the child, but at the same time allows us to organize the weekly regime in such a way that children can attend additional classes of interest and have free time for leisure. It is important to note that 360 minutes per week is not the upper limit for the amount of physical activity, i.e. there is no data regarding the possible negative effect on children's health if it is exceeded. The WHO recommended volume of physical activity included both respondents who receive moderate and high intensity physical activity exclusively through physical education lessons, and those who, in addition to lessons, attend various additional classes: in the sports and physical education sections of their educational institution, children's and youth sports schools and other organizations. The proportion of such children in the study was 50%; in the diagram they are indicated by the number 2 (Fig. 1).

It should be noted that among all the younger schoolchildren surveyed, there were those whose weekly physical activity exceeded 360 minutes, the share of which was 27,3%. As a rule, such children, in addition to the physical education lesson, have at least three additional classes of 120 minutes each during the week.

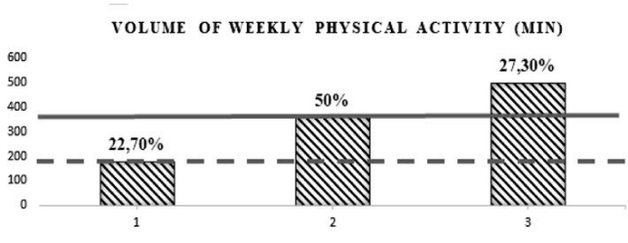

Fig. 1. Volume of weekly physical activity in children of primary school age

Despite the fact that all children overcome the lower threshold of recommendations, 31% of the respondents are not satisfied with their weekly volume of physical activity. The wording of the question assumes the interpretation of dissatisfaction in the volume of physical activity from the position of its insufficiency.

It is worth noting that 96% of children have free time for leisure on weekends, which they use for various types of physical activities: cycling, walking, roller skating, etc. For different children, this time ranges from 1 to 4 hours on every day off, but its intensity and duration are not regulated.

The study also included a survey of parents of children of primary school age. 334 parents raising a child attending primary school took part in the survey. All respondents noted that their child attends a physical education lesson and takes an active part in it - performs the same exercises as all children or does individual work.

Of the 334 parents surveyed, only 22.3% have children who attend only physical education classes. Taking into account that schools maintain 3 physical education lessons per week, these children perform the minimum amount of physical activity per week recommended by WHO, which is 180 minutes of moderate to vigorous intensity physical activity. At the same time, 42.3% of parents determine the amount of organized physical activity of their children in the range of 180-360 minutes per week, which also fits into WHO recommendations; 35.4% of respondents determined the weekly amount of physical activity for their children to be over 360 minutes. The highest indicators were 900 and 1020 minutes of training per week (Fig. 2).

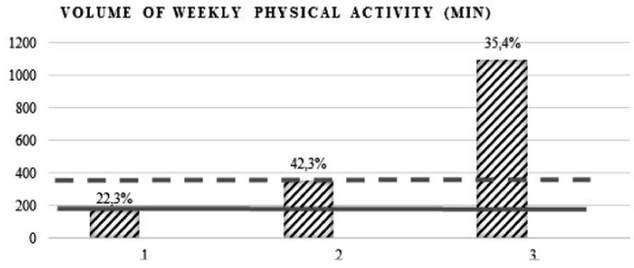

Fig. 2. The volume of weekly physical activity (according to parents) in children of primary school age

22% of respondents answered that their children's organized physical activity consists only of physical education lessons. Of these, the proportion of parents who consider the daily and weekly volume of physical activity of their children to be sufficient was 38% and 62%, respectively, and 48,6% and 51,4% of parents consider the daily and weekly volume of physical activity of their children to be insufficient.

Among all parents participating in the survey, 64,4% and 69,5%, respectively, consider the amount of daily and weekly physical activity sufficient. 35,6% and 30,5%, respectively, are not satisfied with the level of physical activity of their children during the day and week. It is also worth noting that among the group of parents where the weekly volume of children's physical activity exceeded 360 minutes, 3%. responded that they considered the volume of physical activity of their children insufficient.

Conclusions. Based on the results of the study, it was determined that a significant proportion of children of primary school age and parents of children of primary school age tend to believe that the amount of physical activity in the range of 180-360 minutes per week is sufficient for schoolchildren in this group. This range combines the necessary amount of physical activity to prevent the onset of symptoms of physical inactivity, ensure the process of physical development, and also save time for free leisure.

At the same time, children who perform more than 360 minutes of physical activity per week consider it insufficient. It is worth noting that in that group of parents of primary schoolchildren, whose volume of physical activity exceeds 360 minutes per week, and in exceptional cases reaches 900 and 1020 minutes per week, they tend to consider it insufficient for their children. Moreover, in these cases, children have no or very little time left for free leisure and personal time. Despite the positive attitude of both groups of respondents to the recommended volumes of weekly physical activity, the question of the upper limit of the volume of physical activity, both daily and weekly, remains relevant for study.

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Social and pedagogical conditions for increasing the role of the family in increasing the physical activity of school-age children

UDC 37.062.5

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Abstract

Objective of the study was to identify the socio-pedagogical components of family influence on the level of physical activity of school-age children.

Methods and structure of the study. A survey was conducted of 2555 schoolchildren aged 11-16 years (1287 boys and 1268 girls), during which schoolchildren answered questions related to their physical activity and characteristics of family life.

Results and conclusions. The survey results showed that in families where its members engage in physical exercise and sports, there are relationships of cooperation, mutual assistance and support, family members spend a lot of time communicating and interacting together, children grow up with a conscious attitude towards physical activity, they are involved in physical activities culture and sports, they feel protected.

Keywords: *physical activity, school-age children, high and low levels of physical activity, family influence on the physical activity of schoolchildren.*

Introduction. Sociological studies of the physical activity of school-age children, which have been conducted by the St. Petersburg Research Institute of Physical Culture since 1990, show that the level of involvement of schoolchildren in physical education and sports is largely influenced by socio-pedagogical factors, and in particular , family [1-3]. Despite the growing trends in liberal discourse about the weakening role of the family and the state in the development of society, which prevails in Western countries, in Russia, on the contrary, processes associated with strengthening the family as the most important unit of society are intensifying.

Objective of the study was to identify the socio-pedagogical components of family influence on the level of physical activity of school-age children.

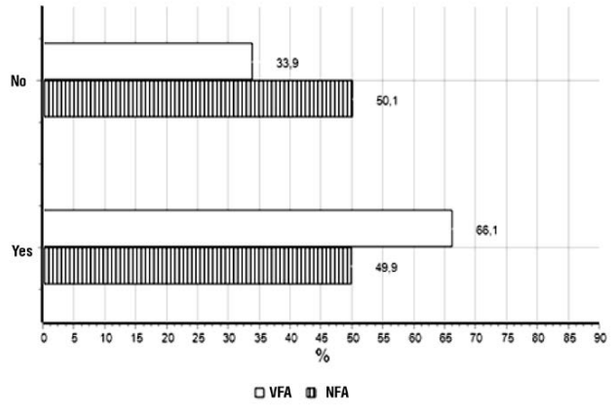
Methods and structure of the study. A survey was conducted of 2555 schoolchildren aged 11-16 years (1287 boys and 1268 girls), during which schoolchildren answered questions related to their physical activity and questions regarding the characteristics of family life [4]. Based on the results of answers to questions on physical activity, all respondents were divided into two groups - with a high level of physical activity (HPA) and a low level of physical activity (LPA). The criteria for dividing into these groups were the respondents answers to the following questions. The HPA group included respondents who reported that: 1) they had been physically active for at least an hour on 5 to 7 days during the past week; 2) outside of school, in their free time, they usually engage in intense physical exercise 4-7 days a week; 3) those who reported that they take part in organized activities in team or individual sports. The second group (LPA) included the remaining respondents who did not meet these criteria.

Thus, two samples of HPA (n=1817) and LPA (n=738) were formed. Next, a comparative analysis

was conducted of how respondents in these samples answered questions regarding intrafamily interaction; the significance of differences in answers in groups was assessed using the nonparametric chi-square test at p<0,05 or p<0,01.

Results of the study and discussion. To control the conscious attitude towards physical education, a comparative analysis of the answers of respondents from two groups to the question of how they assess their knowledge in the field of physical education was carried out. 83,6% in the HPA group and 61,8% in the LPA group know a lot or enough. This result indicates a conscious attitude towards physical education in both groups, but in the HPA group it is significantly (p<0,01) higher.

To assess whether the family is physically active, an analysis was carried out of respondents answers to the question of whether any family members do exercises (running, gymnastic exercises, etc.). In the HPA group, a positive response was given in 66,1% of cases, in the LPA group - in 49,9% of cases (see figure). The differences are significant (p<0,01).



Results of responses of respondents from the VFA and NFA groups to the question of whether any family members do exercises (running, gymnastic exercises, etc.) (%)

Differences in answers to this question between boys and girls were also analyzed. Boys answered this question positively in the HPA group in 63,3% of cases, and in the LPA group in 44,8% of cases. The differences are significant (p<0,01). Girls answered this question positively in the HPA group in 69,4% of cases, and in the LPA group in 53,2% of cases. The differences are significant (p<0,01).

Respondents answers to the question of whether family members play outdoor games were analyzed. And again it was revealed that in the HPA group the family is more physically active than in the group of LPA schoolchildren. These are 62,6% and 42,7%, respectively (differences are significant, p<0,01). For boys, this figure was 61,5% and 37,3%, respectively. The differences are significant (p<0.01). For girls in the HPA and LPA groups, this figure was 64,0% and 46,1%, respectively. The differences are significant (p<0,01).

To assess the level of family cohesion, a number of questions were analyzed, the answers to which are given in Table 1-4. In all cases, families of schoolchildren from the HPA group show a significantly higher level of cohesion, mutual understanding, interaction and mutual assistance than in the LPA group.

Table 1. *Important family relationships*

Question	Completely agree		Significance of differences
In family…	HPA	LPA	
Important issues are discussed	48,6%	34,8%	p<0,01
When I speak, they listen to me	47,3%	34,7%	p<0,01
We ask questions when we don't understand each other	45,4%	33,0%	p<0,01
When there is any misunderstanding, we discuss it until the situation becomes clear	42,5%	27,4%	p<0,01

Table 2. *Joint activities in the family*

Joint action	Daily or almost daily		Significance of differences
	HPA	LPA	
Food intake	77,8%	68,1%	p<0,01
Walks	38,2%	18,2%	p<0,01
Attending events	38,8%	19,1%	p<0,01
Sports activities	24,6%	6,5%	p<0,01

Table 3. *Ease of communication with dad (very easy or easy to communicate on important topics)*

Gender	HPA	LPA	Significance of differences
Both genders	62,5%	44,0%	p<0,01
Boys	70,8%	51,4%	p<0,01
Girls	53,0%	39,5%	p<0,01

Table 4. *Ease of communication with mom (very easy or easy to communicate on important topics)*

Gender	HPA	LPA	Significance of differences
Both genders	78,6%	71,1%	p<0,01
Boys	81,3%	70,4%	p<0,01
Girls	75,4%	71,6%	p<0,01

Additionally, the self-assessment of quality of life was analyzed using an 11-point scale («Cantril's Ladder»), where 10 points means the best possible life, and 0 points means the worst. This indicator at the level of 7-10 points in the VFA group was 63,3%, and in the NFA group – 47,7%.

Conclusions. Thus, the study showed that in families where its members engage in physical exercise and sports, there are relationships of cooperation, mutual assistance and support, family members spend a lot of time communicating and interacting together, children grow up with a conscious attitude towards physical activity, they are involved in physical education and sports, they feel protected.

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Pedagogical technology of the use of physical and recreational tools in the conditions of acquisition by students of the elective course

UDC 37.013

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Abstract

Objective of the study was to reveal the effectiveness of the use of physical and recreational tools in the conditions of students acquisition of the elective course.

Methods and structure of the study. The experiment was conducted on the basis of Tomsk State University with the participation of students of the basic and preparatory medical groups who chose the elective course «Ushu». The training methodology includes the study of basic techniques, mastering the tao complexes «18 Forms of Changquan» and «32 Forms of Changquan». Sociological methods were used in the study: questionnaires and testing of functional and psychological tests for monitoring the functional state of students (coefficient of endurance, level of physical condition, Ruffier-Dixon test, etc.).

Results and conclusions. This activity based on the developed pedagogical technology allowed students to get acquainted with a new type of physical activity, to increase the level of physical health. The results of the study confirm the effectiveness of this application in the system of physical education of students in the university as an elective discipline, contribute not only to the improvement of physical training, but also to the development of important personal qualities, the formation of a healthy lifestyle and the improvement of the general quality of life of student youth. The revealed main motive for choosing this occupation is interest in Chinese culture, desire to improve physical form, self-defense skills, desire for self-development and harmonization of personality.

Keywords: *students, this at the university, eastern martial arts, student health, healthy lifestyle, physical culture.*

Introduction. Modern society is characterized by a high level of intellectual stress, especially among students. The educational process, sessions, exams, scientific activities require significant expenditure of energy and concentration, which leads to a deterioration in the physical and psycho-emotional state of students. Physical inactivity, stress, sleep disturbances, decreased immunity are just some of the consequences of insufficient physical activity, which have been noted by a number of authors over the past decade [2, 3, 4, 7].

Currently, there is a clearly expressed need to find new, more attractive forms of physical activity that will be interesting to students and help them join a healthy lifestyle. One of these options can be considered the Chinese martial art of wushu, as an alternative form of physical activity that helps improve the physical and psycho-emotional state of students [5]. Wushu develops not only physical qualities - strength, flexibility, endurance and coordination, but also concentration, attention, memory, discipline, moral and volitional qualities [1]. After analyzing the scientific and methodological literature, we discovered a gap in the study of the influence of wushu on the health of students studying at a university. There are only a few such works, and they are mainly devoted to sectional classes with students [6, 8].

Objective of the study was to identify the effectiveness of the use of sports and recreational means in the conditions of students mastering an elective course in wushu.

Methods and structure of the study. The experiment was conducted from October 2022 to April 2024 at Tomsk State University, which involved 89 students of basic and preparatory medical health groups aged 17-22 years, who chose the elective course «Wushu». During the study, a pedagogical technology for physical education of students using wushu was developed, aimed at improving the physical and mental health of students. During the experiment, a number of functional tests were carried out to study the physical condition of the subjects.

The work of the cardiovascular system was studied using the endurance coefficient, the level of physical condition, the Ruffier-Dixon test, and the Kerdo test. The experiment showed that wushu classes have a positive effect on the functioning of the cardiovascular system. The endurance coefficient (EF) is used to assess the degree of fitness of the cardiovascular system to perform physical activity.

Results of the study and discussion. At the beginning of the experiment, the CV value in the group of subjects was 17,73; at the end of the experiment, positive changes occurred – 14,84, which is an indicator of the norm and training of the participants. A test for «Level of Physical Condition» (LPC) was carried out. The level of physical condition was determined according to the system of E.A. Pirogova. At the beginning of the pedagogical experiment in the group of subjects, the following results were obtained: a «low» level of LPC was detected in 6 people, this is 8% of the total number of participants in the experiment, «below average» - in 20% (15 people), an «average» level of physical condition - in 46,7% (35 people), «above average» in 25,3% of subjects (19 people). In the final test, the level of physical fitness of all participants improved. A «low» level at the end of the experiment was established in 6 subjects (8%), in 12% of the subjects (9 people) the level was «below average», «average» – 29,3% (22 people), «above average» was recorded in 50,7% of the students studied (38 people). From this test we can conclude that wushu classes increase the level of physical condition of those involved. The Ruffier-Dixon test was used to assess cardiac performance during physical activity. Test results: 16 subjects – 21,3% of the total number of participants in the experiment at the beginning of the study received high scores, 33,3% (25 people) scored this parameter as «good». The average score was 29,3% (22 people), 5,3% (4 people) had a satisfactory result, 10,8% (8 people) had a bad score. After the experiment, performance increased significantly. The values of this test were recorded: 30,7% (23 people) showed a high performance rating, 38,7% (29 people) - good, 26,6% (20 people) - average rating for this test, satisfactory - 4% (3 people). The state of blood circulation, assessment of health, resistance to stress, as well as assessment of the activity of the autonomic nervous system (ANS) were carried out using the Kerdo index. It was revealed that the students who took part in the study both before and after the pedagogical experiment observed an increase in the balance of the sympathetic and parasympathetic influences of the nervous system (see table).

To find out the reasons for choosing the «Wushu» specialization, a survey was conducted of 89 students who decided to engage in this sport at the university. As the survey showed, only a few of the respondents (5 respondents) had previously practiced wushu; the rest of the students were not familiar with this type of physical activity. Most students cited the reasons for

Results of the dynamics of functional tests among students studying in the Wushu specialization at TSU (Tomsk)

Test name	n	Result	$X \pm m_x$	t	p
Endurance coefficient	75	Before	17,73 ±0,39	5,04	<0,05
	75	After	14,84 ±0,42		
Physical condition level	75	Before	0,6 ±0,02	2,12	<0,05
	75	After	0,66 ±0,02		
Ruffier-Dixon	75	Before	8,44 ±1,06	2,85	<0,05
	75	After	5,29 ±0,31		
Kerdo	75	Before	17,06 ±2,59	3,21	<0,05
	75	After	4,91 ±2,76		

choosing this specialization: the desire to engage in a new discipline, to become more flexible and coordinated. Many survey participants are attracted to wushu: belonging to Asian martial arts, self-defense, training of strength and endurance.

The students named the purpose of wushu classes as improving the physical qualities of the body, flexibility and stretching, the opportunity to become stronger, remove stiffness and tightness in the body, increase the level of endurance, maintain good physical shape and a healthy lifestyle. Two respondents honestly admitted that they attend classes to receive credit in the discipline «Physical Education». When asked whether Wushu specialization is needed at a university, all students answered positively, noting that this is «an interesting variety in basic specializations», «a good alternative to simple physical exercises», «an opportunity to broaden one's horizons and strengthen the body», and the choice is also based on learning the Chinese language as a means of expanding knowledge of Chinese culture.

Conclusions. Wushu classes using the developed pedagogical technology contributed to improving the level of physical health of students. The main motives for choosing wushu classes have been identified: interest in oriental culture, development of physical and mental abilities, the possibility of self-defense, stress relief and improvement of psycho-emotional state.

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Assessment of the level of physical fitness of youth of student age in the format of GTO standards

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Abstract

Objective of the study was to assess the level of physical fitness of youth of student age 18-19 years old according to the GTO standards.

Methods and structure of the study. Boys and girls aged 18-19 years who are not athletes took part in the scientific work. Testing included an assessment according to GTO standards. The All-Russian physical culture and sports complex GTO includes a comprehensive assessment and is the basis for monitoring the physical fitness of the population of various age groups.

Results and conclusions. The problem of physical fitness of student-age youth does not lose its relevance from year to year, the obtained testing data according to the GTO standards only confirm this: low level of endurance - 100% of young men will not pass this standard; Of the girls, only 50% will be able to pass the standard; the level of strength abilities of young men according to the standard «pull-ups from hanging on a high bar» is assessed as low - only one of the subjects will be able to pass it; among girls, only 20 people will be able to pass the standard «flexion and extension of the arms while lying on the floor»; according to the standard assessing the level of flexibility, among young men only 2 people were able to fulfill the standard; among girls, 70% were able to pass this standard, but the average value for the group is only 8,8 ± 3,4 cm, which corresponds only to the bronze badge; according to the standing long jump standard among boys, only 30% received a positive result; among girls, 80% have a positive result, however, the average value of 169,5 ± 17,5 cm indicates that they received only a bronze badge.

Keywords: *VFSK GTO, youth of student age, physical education and sports, physical fitness.*

Introduction. Particular importance in solving the problem of improving the health of the country's population at the state level is given to increasing physical fitness by attracting more people to regular and systematic physical education and sports. Today, not only the material and technical conditions for physical education and sports are created, but programs and projects are supported and developed that provide for monitoring and testing the level of physical fitness of those involved, and its improvement [1, 3]. One of the largest government projects is the VFSK GTO, within the framework of which, for almost ten years, citizens of Russia, ranging from children of primary school age to the elderly, have been tested for compliance with the requirements for the level of physical fitness. In his message, the President of the Russian Federation also noted that our achievement today is to increase the number of citizens who regularly engage in sports. «To encourage, starting next 2025, a tax deduction will be provided for those who successfully pass the GTO standards».

The President announced the launch of a new national project «Youth of Russia». This project is designed to support young people and consolidate the positive experience of the already existing youth policy. It is noteworthy that the national project should affect all aspects of the lives of young people - from infrastructure, careers to volunteering, science, and health. An analysis of scientific and methodological literature has shown that there are a number of unre-

solved problems related specifically to physical fitness as the basis for the health and development of human potential of student-age youth [5, 6]. One of the approaches to solving the current situation with low motivation and lack of a conscious attitude towards physical education is to popularize among students the preparation and passing of GTO standards.

Objective of the study was to assess the level of physical fitness of youth of student age 18-19 years old according to the GTO standards.

Methods and structure of the study. 40 boys and 43 girls, aged 18-19 years, who were not athletes, took part in the scientific work. The study was carried out over several days, which made it possible to create conditions for the highest possible results. Testing was carried out in the manner established by the order of the Ministry of Sports of the Russian Federation [4]

Results of the study and discussion. The study involved assessing physical fitness for all basic physical qualities and included the following standards [2]:

Test 1 – 3 km run (boys) / 2 km run (girls) (min);

Test 2 – lifting the body from a supine position (number of times);

Test 3 – standing long jump (cm);

Test 4 – flexion and extension of the arms while lying on the floor (girls)/pull-ups from hanging on a high bar (boys) (number of times);

Test 5 – bend forward from a standing position with straight legs (cm).

The following results were obtained during the study (Fig. 1, 2):

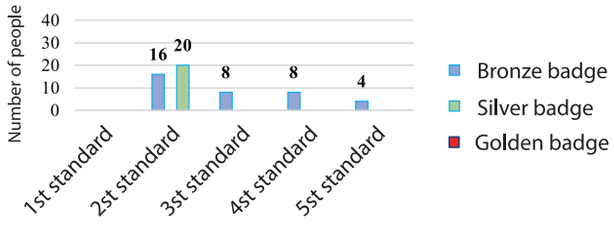

Fig. 1. Results of GTO standards - boys

As can be seen in Fig. 1, in the first test exercise, the young men of the study group showed low results, the values were in the range from 16 minutes 30 s to 15 minutes 45 s, according to the regulatory framework of the GTO, not one of the young men would be able to pass the mandatory standards, since the time for the bronze badge is -15 min 20 s, for girls the range of values was 9 min 40 s – 12 min 50 s. According to the indicators of the GTO regulatory framework, only 55% of girls could pass this standard for the «bronze badge» (32%) and the «silver badge» (23%). The result of only one girl corresponds to the «gold badge» level (Figure 2).

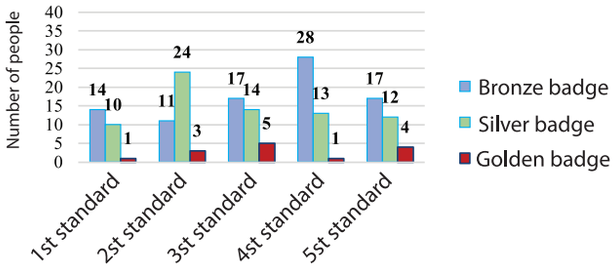

Fig. 2. Results of GTO standards – girls

According to the results of the second test task: for young men, the values of this indicator range from 32 to 48 times per minute. It can be stated: 16 people fulfilled the «bronze sign» standard, 20 people – «silver sign», 4 – the results did not correspond to any of the standard values (Fig. 1). As for girls, the range of values obtained is from 28 to 45 times per minute: 25% is the result of the «bronze sign», 55% is the result of the «silver sign», 7% is the result of the «gold sign» (Fig. 2).

In the third test task it was revealed (Fig. 1): for young men the range of values was from 160 to 220 cm, only 8 people from the group could pass this standard for the «bronze badge». In girls (Fig. 2), as a result of this test, it was established that the range of indicators was from 153 to 210 cm. 80% of the girls showed a fairly high result and could pass this standard.

In the fourth test task: the girls (Fig. 2) showed results ranging from 4 to 18 times, so 20 girls from the group (87%) will be able to pass the GTO standard, having passed the bronze and silver badge standards. The interval of results obtained in boys is from 2 to 8 times. It is worth noting that only 4 young men could pass the GTO standard in this discipline (Figure 1).

When completing the fifth test task, only 8 young men would be able to pass this standard within the framework of the GTO. For girls, the values for this test are in the range from 5 to 17 cm; only 13 girls could not fulfill this standard (Fig. 1, 2).

Conclusions. VFSK GTO is a complete regulatory framework for monitoring the physical fitness of the population. As was said earlier, the problem

of physical fitness of student-age youth does not lose its relevance from year to year, the test data obtained according to the GTO standards only confirm this:

- low level of endurance – 100% of young men will not pass this standard; Of the girls, only 50% will be able to pass the standard;

- the level of strength abilities of young men according to the standard «pull-ups from hanging on a high bar» is assessed as low - only one of the subjects will be able to pass it (average value 3,6 ± 2,0 times); among girls, only 20 people will be able to pass the standard «flexion and extension of the arms while lying on the floor» (12,9±2,9 times);

- according to the standard assessing the level of flexibility, among young men only 2 people were able to fulfill the standard (average value 2,4±2,4 cm); among girls, 70% were able to pass this standard, but the average value for the group is only 8,8 ± 3,4 cm, which corresponds only to the bronze badge;

- according to the standing long jump standard among boys, only 30% received a positive result; among girls, 80% have a positive result, however, the average value of 169,5 ± 17,5 cm indicates that they received only a bronze badge.

Thus, the data indicate a low level of physical fitness of young people aged 18-19, which does not meet the requirements imposed on them by the state. In our opinion, one of the leading directions for solving this problem is the development of mass student sports, as well as the development of uniform forms and means of encouraging young people of this age for having a high level of physical fitness and health in general.

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Features of the educational process of training coaches and teachers at the university of physical education

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Abstract

Objective of the study was to theoretical justification of the educational process in the preparation of trainers-teachers in the conditions of integration of educational, scientific and sports activities in universities of physical education.

Methods and structure of the study. Based on a synthesis of curriculum monitoring data over 35 years, curricula, educational process schedules and class schedules were analyzed.

Results and conclusions. The ratio of educational and sports activities in the process of their integration should take into account the specifics of training in the chosen sport: the age characteristics of the stages of training, the dynamics of the formation of sports skills and the achievement of its peak, the features of the periodization of the training process and planning of the training load. The integration process assumes that the development and implementation of both educational and sports programs takes into account the need for the associated formation of competencies that correspond to the Federal State Educational Standard of Higher Education 49.03.04 Sports and the labor functions of the professional standard «Coach-teacher».

Keywords: *physical education universities, coaching and teaching activities, educational process, students, competencies, sports training.*

Introduction. The integration of education into the scientific and sports activities of students is ensured, both horizontally and vertically, by the content of professional training, focused on the multifunctional activities of the future sports teacher [1, 3]. An analysis of the multicomponent composition of a sports teacher's professional activity as a «descriptive and technological characteristic of his professional activity» shows that preparation for coaching determines a wide range of professional training tasks to be solved with immersion in each of them. Each implemented stage of sports training depends on the sports qualifications of the contingent, as well as on the experience of the teacher in sports and coaching. It is necessary to take into account that specialists who carry out sports training of future trainers and teachers must, in their own way, previously existing level of sports qualifications, exceed the level of students by at least one level. The variety of tasks to be solved and professional functions performed at the same time (organizer, communicator, diplomat, analyst, methodologist, etc.), characteristic simultaneously for educational, scientific and sports activities, allows them to be successfully combined, forming the professional competence of students.

The curriculum, the schedule of the educational process and the schedule of classes should provide not only the possibility of implementing the training process and competitive activity of students, taking into account the stage of sports training, but also the implementation of research activities, which are, as a condition for the formation of pedagogical creativity skills. This requires harmonization of

programs both separately for each discipline of the profile, and, in general, for all disciplines of the main professional educational program in accordance with federal standards of sports training for sports. It is necessary to take into account the possibilities of combining training sessions within the curriculum with a full-fledged training process [4].

Results of the study and discussion. An analysis of the features of curriculum transformation over the past 35 years has shown that sports improvement classes played a key role in the training of coaches even before the introduction of state educational standards. In the 1988 curriculum, 864 academic hours were allocated for the discipline «Sports and Pedagogical Improvement». At NSU named P.F. Lesgaft in those years there was a structural unit «School of Higher Sports Excellence» - an analogue of the TsSP. At the same time, independent teaching activities of students began only in senior years. Thus, the ratio of activities in the process of their integration should take into account the specifics of training in the chosen sport: the age characteristics of the stages of training, the dynamics of the formation of sportsmanship and the achievement of its peak, the features of the periodization of the training process and planning of the training load [5].

The number of hours and the content of the curriculum disciplines is determined taking into account the requirements of the FSSP for the sport and the requirements of the professional standard «Coach-teacher», approved by the Ministry of Labor of Russia dated December 24, 2020 No. 952n. [2]. Thus, the curriculum is drawn up in accordance with Appendix No. 2 to the FSSP for the type of sport «Requirements for the volume of the training process», which makes it possible to specify the indicators of the training load in sports-pedagogical disciplines mastered at a physical education university. As part of training activities in their chosen sport, students, using specific means and methods, prepare to solve the problems of pedagogical activity in accordance with the professional standard «Coach-teacher». At the same time, it is necessary to take into account that in the process of sports training, pedagogical influences allow, within the framework of integration, to form not only professional competencies of the disciplines of the educational program in the direction 49.03.04 - Sports, but also universal competencies (Table 1).

The qualifications of teachers of disciplines aimed at solving the problems of sports training must not only meet the professional standard «Trainer-teacher», but also ensure the improvement of competencies developed as part of the development of the BOP, and the conduct of empirical research as part of the qualification work (Table 2).

The formation of professional competence «is able to improve one's individual sports skills and maintain a level of preparedness that ensures solving the problems of professional activity» involves not just mastering the content of a sports training program at a specific stage, but also analytical ac-

Table 1. Universal competencies of the main professional educational program 49.03.04, formed in students in the process of mastering the sports training program at the stages of improving sportsmanship and higher sportsmanship

Code	Name of the graduate's universal competence
UC-1	Able to search, critically analyze and synthesize information, apply a systematic approach to solve assigned problems
UC-2	Able to determine the range of tasks within the framework of the set goal and choose the best ways to solve them, based on current legal norms, available resources and limitations
UC-3	Able to carry out social interaction and realize his role in a team
UC-4	Able to carry out business communication in oral and written forms in the state language of the Russian Federation and foreign language(s)
UC-5	Able to perceive the intercultural diversity of society in socio-historical, ethical and philosophical contexts
UC-6	Able to manage his time, build and implement a trajectory of self-development based on the principles of lifelong education
UC-7	Able to maintain the proper level of physical fitness to ensure full social and professional activities
UC-8	Able to create and maintain safe living conditions in everyday life and professional activities to preserve the natural environment, ensure sustainable development of society, including in the event of the threat and occurrence of emergencies and military conflicts
UC-11	Able to form an intolerant attitude towards manifestations of extremism, terrorism, corrupt behavior and counteract them in professional activities

Table 2. Correlation of general professional competencies formed in the educational program "Sport" and generalized labor functions of the professional standard "Coach-teacher"

Name of the category of general professional competencies	Code and name of competencies
Planning	GPC-1 Able to plan the content of physical education and sports within the scope of sports training, education, taking into account the provisions of the theory and methodology of physical culture, the theory of sports, anatomical, morphological, physiological and mental characteristics of those involved in different genders and ages
Sports selection	GPC-2 Able to use methods of sports orientation and selection of athletes and students taking into account their age, psychophysical and individual characteristics in the field of sports training and education
Types of athlete training, training, education, development	GPC-3 Able to conduct physical education and sports classes in the field of sports training and education
	GPC-4 Capable of developing physical qualities and increasing the functional capabilities of athletes and students in accordance with the specifics of the sport, providing psychological and pedagogical support in the field of sports training and education
	GPC-5 Able to organize and conduct training, ensure the participation of athletes and students of various qualifications in sports and physical education events
Management of competitive activities	GPC–8 Capable of providing and implementing information, technical and psychological support for competitive activities
	GPC-9 Able to analyze competitive activity to adjust the pedagogical impact on athletes and students
Ensuring security	GPC-10 Able to ensure compliance with safety regulations and injury prevention
Control and analysis	GPC-12 Capable of monitoring the technical, physical, tactical, psychological, intellectual and integral preparedness of athletes, the physical development of athletes and students, including using measurement and evaluation techniques
	GPC-13 Able to use the results of pedagogical, psychological and medical-biological control to correct the training process in a chosen sport, monitor the formation of a general culture, and cultivate personal qualities in individuals involved in physical culture and sports
Scientific research	GPC-15 Capable of conducting scientific research to determine the effectiveness of the means and methods used in the field of sports training and education
Organizational and methodological support	GPC-17 Able to organize and referee sports competitions
	GPC-18 Able to provide methodological support and control in the field of sports training and education
Information and communication technologies for professional activities	GPC-20 Able to understand the operating principles of modern information technologies and use them to solve professional problems

tivity to assess one's capabilities, choose an individual trajectory of motor and theoretical development, adequate to the tasks of sports and pedagogical activities.

The integration process assumes that the development and implementation of both educational and sports programs takes into account the need for the associated formation of competencies that correspond to the Federal State Educational Standard VO 49.03.04 - Sports and the labor functions of the professional standard.

The occupancy and volume of workload in groups of students must comply with the regulatory requirements of the federal standard of sports training for the chosen sport. At the same time, at the stage of improving sportsmanship and higher sportsman-

ship, it is possible to unite highly qualified athletes into one group, regardless of the course.

For the convenience of planning associated educational and training activities, it is possible to combine sports into larger subgroups based on the presence of common signs of motor activity: for example, cyclic sports, complex coordination sports, team sports, martial arts, etc. As a result of the associated development of programs, the formation of universal competencies in athletes can be carried out more intensively, confirming the possibility and necessity of integrating educational, scientific and sports activities.

Conclusions. A comparison of the general professional competencies formed within the framework of the main professional educational program «Sport» and the generalized labor functions of the professional standard «Coach-teacher» confirmed that achieving the effectiveness of the process of professional pedagogical training is impossible without combining educational, scientific and physical culture-sports activities, allowing systematically and comprehensively solve professional problems. Considering that all teachers of sports pedagogical departments of universities have the required level of basic professional education (not lower than a specialty), in accordance with the professional standard, they can perform the labor functions of a sports coach at various stages of training.

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The attitude of future teachers in the field of physical education to education as a key professional task

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Abstract

Objective of the study was to identify the main characteristics of the attitude of future teachers in the field of physical education to education as a professional task of pedagogical activity and to determine ways to improve their professional training for organizing the education of the younger generation. The study was based on the concept of «Competency-based approach in teacher education» [1, 7].

Results and conclusions. Based on the analysis, generalization and systematization of the obtained research data, the article presents the characteristics of the attitude of future teachers in the field of physical education to education as a professional task of pedagogical activity. These characteristics are revealed through a number of indicators: the importance of education for future teachers; priorities of students in educational tasks, the most important in modern conditions and the most difficult to solve; priorities of students in educational methods that are the most productive in modern conditions and most often used in educational practice; priorities of students in the forms of educational work that are the most productive in modern conditions and most often used in educational practice.

Keywords: *professional pedagogical activity, education, tasks, methods and forms of education, attitude of future teachers in the field of physical education to education.*

Introduction. The relevance of the study is due to a number of reasons. Firstly, the need of educational practice for teachers who are capable of solving a modern class of educational problems at a professional level [5, 6]. Secondly, insufficient attention in the professional training of future teachers to the issues of organizing education in new conditions. Thirdly, the need of pedagogical science for knowledge about the main trends that characterize the attitude of future teachers to education as the task of their professional activity [2, 3, 4].

Objective of the study was to identify the main characteristics of the attitude of future teachers in the field of physical education to education as a professional task of pedagogical activity and to determine ways to improve their professional training for organizing the education of the younger generation. The study was based on the concept of «Competency-based approach in teacher education» [1, 7].

Methods and structure of the study. The study was conducted on the basis of the Institute of Physical Culture and Sports of the Russian State Pedagogical University named after A. I. Herzen in 2024. It included undergraduate (1-4 year) and master's students (165 people in total). To collect the necessary information, a questionnaire was developed that included 4 groups of questions. The first group included questions that revealed the importance of education for future teachers. The second includes questions that identify students' priorities in educational tasks, the most important in modern conditions and the most difficult to solve. The third is the priorities of students in educational methods that are the most productive in modern conditions and most often used in educational prac-

tice. The fourth includes questions that identify students priorities in the forms of educational work that are most productive in modern conditions and most often used in educational practice.

Results of the study and discussion.

First group of results. The study found that the vast majority of respondents (100% in the 1st-3rd years of bachelor's degree and 100% in master's degree) believe that education is a significant task of professional pedagogical activity. The exception was 4th year undergraduate students, among whom 96.3% shared this position.

Second group of results. The study showed that, in the opinion of students, the most important tasks of educational activity in modern conditions are: «instilling responsibility» and «instilling independence». At the same time, these tasks are highlighted as a priority in all undergraduate and graduate courses. «Education of responsibility» was noted in the courses by 79,2%, 65,1%, 77,4%, 66,7% in undergraduate courses, respectively, and 72,2% in master's programs, and «education of independence» - 62,5%, 48,5%, 67,9%, 59,3% for undergraduate courses, respectively, and 50% for graduate courses. In third place among students in the 1st and 2nd years of a bachelor's degree was «cultivating self-demandingness» (41,7% and 53,5%, respectively); in 3rd and 4th years – «cultivating a friendly attitude towards people» (49,5%, respectively). 1% and 59,3%), and in the master's program – «cultivating a caring attitude towards people» (44,4%). To a lesser extent, respondents focused on «cultivating love for the fatherland and serving it» (37,5%, 20,9%, 26,4%, 33,3% in bachelor's and 33,3% in master's); «nurturing social activity» (33,3%, 41,9%, 32,1%, 33,3% in undergraduate and 38.9% in master's programs).

During the study, it was found that future teachers in the field of physical education believe that in modern conditions the most difficult tasks to solve are: «cultivating a caring attitude towards people» (1st place), «cultivating responsibility» (2nd place), «education independence» (3-4th place) and «cultivating love for the homeland and serving it» (3-4th place).

Correlating the importance for respondents of the tasks of education in modern conditions and the difficulty of solving them made it possible to record a certain disproportion between them: important tasks are not always considered as difficult to solve, and difficult to solve as important. Thus, first-year students consider the most difficult tasks to solve to be «cultivating a caring attitude towards people» (58,3% of the total number of participants) and «cultivating love for the fatherland and service to it» (54,2%). At the same time, these tasks are considered important for themselves by 25% and 37,5% of respondents, respectively. In the 4th year, «cultivating a caring attitude towards people» is difficult to solve for 44,4% of respondents, but it turns out to be significant for 22,2%. For 3rd year students, «cultivating responsibility» is a priority task for 77,4%, and 35,8% of respondents consider it difficult to solve.

Third group of results. The study revealed that future teachers in the field of physical education consider productive methods of education in modern conditions, first of all: «example» (in undergraduate courses, respectively, 91,7%, 95,3%, 92,5%, 81,5%; in master's programs – 83,3%), «dialogue» (in bachelor's courses, respectively, 83,3%, 81,4%, 62,3%, 77,8% and in master's programs – 72,2%%); «encouragement» (in bachelor's courses, 50%, 44,2%, 50,9%, 40,7%, respectively, and in master's courses – 44.4%). At the same time, the example method consistently retains first place in all undergraduate and graduate courses, although the number of respondents who indicated this method decreases from the first year to the fourth.

Less productive, according to respondents, are methods such as: «exercise» (respectively, for courses 37,5%, 39,5, 41,5%, 44,4% in undergraduate and graduate courses – 66,7%), although from course to course it is highlighted by an increasing number of respondents; «training» (respectively, in courses 33,3%, 18,6%, 28,3%, 25,9% in undergraduate and 22.2% in master's degrees), «persuasion» (respectively in courses 12,5%, 9,3%, 20,8%, 18,5% in bachelor's and master's degrees – 16,1%) and «public opinion» (according to courses 8,3%, 11,6%, 9,4%, 7,4% in bachelor's and master's degrees – 5,6%). Respondents turned out to be quite unanimous in relation to the «blame» method (respectively, for courses 4,2%, 0%, 0%, 3,7% in undergraduate and 11,1% in master's programs). Noteworthy is the fact that «blame» as a productive method is more clearly detected in master's programs, in which students already have quite a wealth of experience in professional teaching activities.

The study showed that both undergraduate and graduate students are faced with different methods of education in educational practice. First of all, these are the methods of «example» (1st place), «exercise» (2nd place) and «persuasion» (3rd place), less often

– the methods of «dialogue» (4th place), «encouragement» (5th place), and even less often – methods of «training» (6th place), «censure» (7th place) and «public opinion» (8th place).

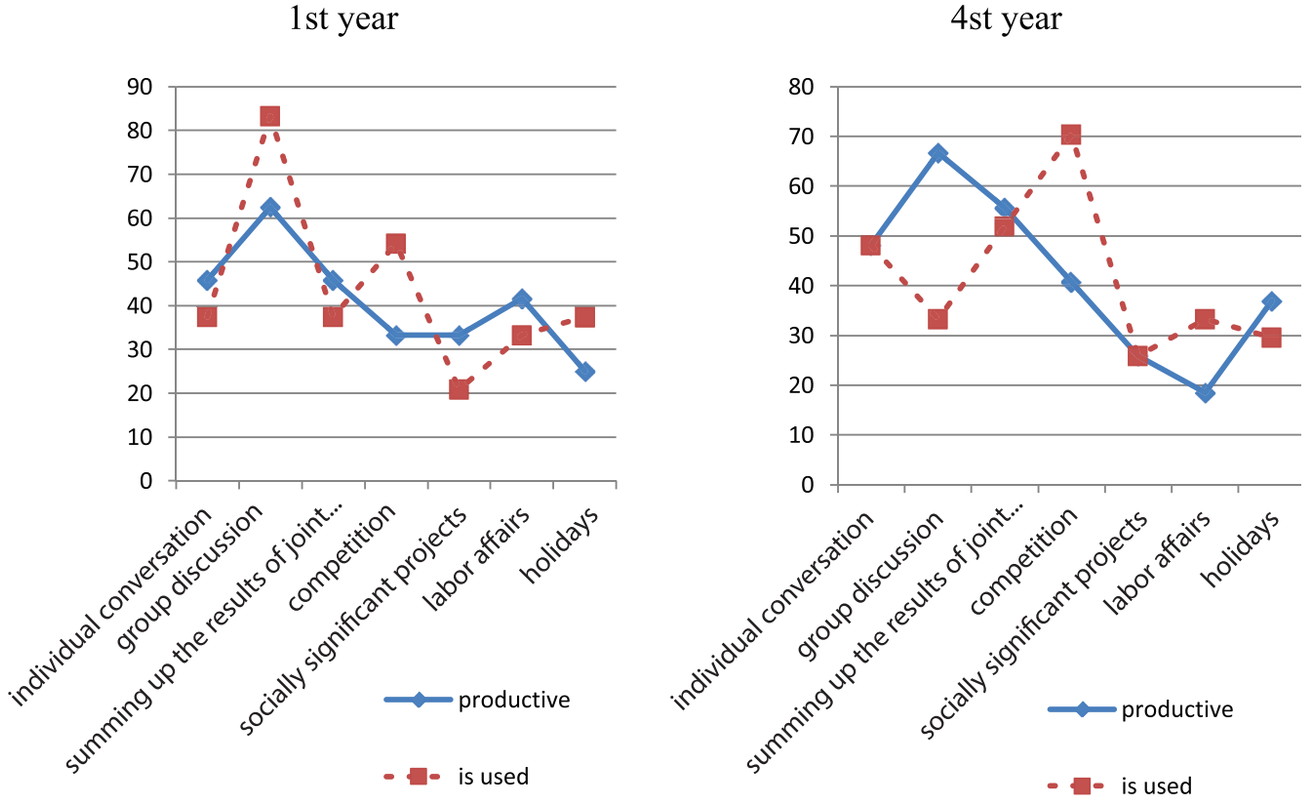
Correlating educational methods, which, according to respondents, are productive in modern conditions, with the methods that future teachers in the field of physical education encounter in educational practice, made it possible to document certain disproportions.

Thus, it turned out that the «example», which students consider the most productive method of education, is used in practice, in their opinion, 1,5-2 times less often.

A similar situation emerged with the «dialogue» method and the «encouragement» method. The methods of «persuasion» and «public opinion», which respondents do not consider the most productive, are used in educational practice, in their opinion, much more often by 2-5 times.

The study revealed that respondents consider productive forms of educational work, first of all: «individual conversation» (for undergraduate courses 45,8%, 60,5%, 58,5%, 55,6% and 55,6%, respectively) in master's degree); «group discussion» (respectively, in undergraduate courses 62,5%, 51,2%, 56,6%, 66,7% and 72,2% in master's courses); «summarizing the results of joint activities» (45,8%, 60,5%, 58,5%, 55,6% and 55,6% in master's courses for undergraduate courses, respectively). Less productive included «competitions» (33.,3%, 34,9%, 58,5%, 40,7% and 44,4% in master's courses, respectively), «socially significant projects» (respectively, undergraduate courses 33,3%, 23,3%, 30,2%, 25,8% and 38,9% in master's programs), «labor affairs» (according to undergraduate courses 41,7%, 14%, 35,8 %, 18,5% and 38,9% in the master's degree) and «holidays» (respectively for undergraduate courses 25%, 30,2%, 18,9%, 37% and 16,7% in the master's degree). It turned out that future teachers in the field of physical education, regardless of the course, consider verbal forms of educational work (discussions, conversations, summing up the results of joint activities) to be the most productive. Much less often they give preference to practical forms (socially significant projects, competitions, work matters, holidays).

The study showed that respondents encounter various forms of educational work in educational practice.Most often - with «competitions» (1st place), with «group discussions» (2nd place), with «individual conversations (3rd place) and with «summarizing the results of joint activities» (4th place). Much less often, according to students, they encounter such forms of



The relationship between the frequency of use of forms of educational work encountered in educational practice by 1st and 4th year undergraduate students and their productivity

educational work as: «socially significant project», «holiday», «labor affairs». It turned out that there are certain disproportions between the frequency of use of forms that undergraduate students encounter in educational practice and their productivity (see figure).

Thus, first-year students quite often encounter «group discussions» (83,3% of respondents), but they are productive only for 62,5% of students. 54,2% of students encounter «competitions», and only 33.3% consider them productive forms of education. It's the same with «holidays» – 37,5% of respondents encounter them, but only 25% consider them productive. It turned out that 37,5% encounter «individual conversations», and 58,5% consider them productive. Every third respondent encounters «work matters», and for 41,7% they are a productive form of education.

A similar picture is found in the 4th year. Only every third person encounters a «group discussion», and 66,7% of respondents consider it a productive form of education. 70,4% encounter «competition», and only 40,7% of respondents consider it a productive form of education.

Conclusions.

• The attitude of future teachers in the field of physical education to education as a task of professional activity has a pronounced positive character, which is manifested in: understanding the meaning of educational activities, striving to determine its current tasks, focusing on the dialogical nature of interaction with students, and the ability to indicate one's value position in choosing priority forms and methods of education. This attitude of students provides grounds for productive further work.

• The attitude of future teachers to education is quite contradictory: recognition of the importance of education as an important task of professional activity is combined with a misunderstanding of its social essence, its focus on solving pressing modern problems; orientation towards example as the leading method of education is combined with a certain orientation towards the spontaneity of its implementation; the focus on nurturing a person's business qualities is combined with the choice of verbal methods and forms as a priority. Resolving these contradictions requires some work to update programs for preparing future teachers in the field of physical education for educating the younger generation, which, in turn, will require, first of all, updating the basis for teaching practice as a shining example of the organization of educational activities.

• The attitude of future teachers in the field of physical education to education is differentiated by courses, which must be taken into account in educational practice.

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Criteria for selection of students for the elective course in the specialization «sports orienting»

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Abstract

Objective of the study was to determination of criteria for the initial selection of students for an elective course in the specialization «Orienteering».

Methods and structure of the study. The experiment was attended by NI TSU students aged from 18 to 21 years, 36 females and 25 males, specializing in «General Physical Training». Testing of cognitive abilities, physical fitness, as well as completion of a distance in the «cross-choice» discipline was carried out.

Results and conclusions. The factors that determine the criteria for the initial selection of students to specialize in orienteering at the university have been identified. For men, this is the level of development of spatial thinking and working memory, the level of development of spatial thinking and short-term memory, the relationship between the development of short-term memory and the distribution and volume of attention and the performance of physical activity in an aerobic mode, endurance when performing specific work. For women, the determining factors were the level of development of spatial thinking and short-term memory, endurance when performing specific work, and the level of development of operational thinking. We recommend using the obtained data when selecting students for orienteering sports sections.

Keywords: *orienteering, cognitive abilities, physical training, student sports, sports selection.*

Introduction. Orienteering is a complex sport where the training process of athletes should include not only physical training, but also technical, tactical and intellectual. Today, this sport is spreading significantly in universities [5, 6]. And in connection with the popularization of orienteering among students at different levels of competition, the problem of training highly qualified athletes arises. Often, athletes with such qualifications enter universities with a sports focus and rarely choose universities where the profile is not «physical culture and sports». Thus, coaches of «non-core» universities are faced with a shortage of qualified athletes in university teams.

Objective of the study was to determination of criteria for the initial selection of students for an elective course in the specialization «Orienteering».

Methods and structure of the study. Two types of preparation were identified as criteria: intellectual and physical, because athletes at a distance are in a working mode at the level of PANO, and sometimes higher, and at the same time use cognitive abilities to work with a sports card [1]. The following cognitive abilities were taken as indicators of intellectual preparation: spatial perception of direction, operational thinking, visual-figurative memory, working memory, distribution and volume of attention. Speed and endurance were chosen as the criteria for physical fitness, because... in the federal standard of sports training for the sport «orienteering», it is these qualities that have a significant impact on the result [8, 10].

The study was conducted at the National Research Tomsk State University in September 2023. The study involved NI TSU students aged 18 to 21 years, 36 females and 25 males, studying in the «General Physical Training» specialization weekly, 2 times a week for up to 80 minutes. Physical fitness indicators were tested, mental processes were diagnosed, and orienteering distance was covered in a forested area.

Physical fitness testing included standards from the All-Russian Sports Society GTO tests, 100 m run; 2000 for women and 3000 m for men. To diagnose cognitive mental processes, the following were used: a test using the «Compass» method; «structures of intelligence» – for diagnosing spatial thinking [2, 7]; short-term memory test for images; «Remember and dot the dots» – diagnostics of short-term memory [2, 3]. «Random Memory» – diagnostics of RAM [4]. Test for speed of thinking – diagnostics of operational thinking [9]. «Red-black tables» – diagnostics of the distribution and volume of attention [2].

As the third indicator, the «cross-choice» orienteering distance was chosen, planned for ±2 km with 8 control points (CP), where students must collect all the CP in any order in the shortest time. The results were processed by factor analysis, which solved the problem of reducing the number of variables and determining the relationships between them. The statistical program STATISTICA 64 was used.

Results of the study and discussion. At the first stage of the study, the magnitude and degree of influence of each factor on the total variance of the sample was determined, where the number of variables selected for this study (physical fitness testing, diagnostics of cognitive mental processes, orienteering distance completion) was taken as 10 factors. Thus, out of 10 factors, 4 are key for the men's group, and 3 for the women's group, because their own numbers are greater than 1. To identify the factor structure of students completing the orienteering distance, the matrix of factor loadings was rotated using the Varimax criterion for two groups (Tables 1, 2).

Analysis of the matrix of factor loadings after rotation in a group of male students allows us to identify four factors that are decisive for sports selection:

– factor: high values indicate the results of passing the «compass» and «random access memory» tests. The first factor can be defined as «the level of development of spatial thinking and working memory»;

– factor: high values show the results of passing the 2structure of intelligence» and «memory for images», which determines the «level of development of spatial thinking and short-term memory»;

– factor: factor loadings of students results in the following tests have high values: «remember and dot the dots», «red-black tables» and «100 m run». The third factor can be defined as «the relationship between the development of short-term memory and the distribution and volume of attention and the performance of physical activity in an aerobic mode»;

– factor: the results of completing the orienteering distance and running 3000 m are of high im-

Table 1. Results of factor analysis after the procedure of rotating the results in the male group

Variables	Factor 1	Factor 2	Factor 3	Factor 4
«Compass»	0,748507*	-0,226997	0,332561	-0,046062
«Structures of intelligence»	0,091224	0,879920*	0,170894	0,122339
Memory for images	-0,016953	0,903960*	-0,023741	0,043092
«Remember and dot the dots»	0,291186	0,101942	0,750869*	-0,011177
«Main memory»	0,849477*	0,197951	0,115853	0,039152
Speed of thinking test	-0,482414	-0,228317	0,351493	-0,526293
«Red and black tables»	0,392406	0,027579	0,796714*	0,052620
100 m run	-0,109196	0,073624	0,735254*	0,352995
3000 m run	-0,125171	0,226147	0,137922	0,886832*
Completing the orienteering course	0,332386	-0,229170	0,140756	0,737129*

**– significance of results, p≤0,05.*

portance. It can be determined that the 4th factor characterizes «endurance when performing specific work».

Analysis of the matrix of factor loadings after rotation in a group of female students allows us to identify three factors that are decisive for sports selection:

– factor: high values indicate the results of passing the tests «structures of intelligence», «memory for images», «remember and dot the dots». It can be determined that the first factor characterizes «the level of development of spatial thinking and short-term memory»;

– factor: the results of completing the orienteering distance and the results of the 2000 m run have high values. It can be determined that factor 2 characterizes «endurance when performing specific work»;

– factor, the results of passing the test for speed of thinking have high values, which characterizes the «level of development of operational thinking».

Conclusions. Based on the results of the study, factors were identified that determine the criteria for the initial selection of students to specialize in orienteering at the university. For men, this is the level of development of spatial thinking and working memory, the level of development of spatial thinking and short-term memory, the relationship between the development of short-term memory and the distribution and volume of attention and the performance of physical activity in an aerobic mode, endurance when performing specific work. For women, the determining factors were the level of development of spatial thinking and short-term memory, endurance when performing specific work, and the level of development of operational thinking.

The data obtained can be used when selecting students for orienteering sections.

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Table 2. Factor analysis of the results rotation procedure in the female group

Variables	Factor 1	Factor 2	Factor 3
«Compass»	0,620900	0,283423	-0,338783
«Structures of intelligence»	0,839225*	-0,084374	0,159163
Memory for images	0,773603*	0,222532	0,069496
«Remember and dot the dots»	0,714797*	-0,013360	0,433517
«Main memory»	0,640837	-0,173714	-0,154609
Speed of thinking test	0,169297	0,021916	0,820660*
«Red and black tables»	0,009701	0,443615	0,625021
100 m run	0,284139	0,390452	0,123164
3000 m run	0,000611	0,788067*	0,251527
Completing the orienteering course	-0,025187	0,707028*	-0,465128

**– significance of results, p≤0,05.*

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