Theory & Practice of Physical Culture

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

The Russian sports ecosystem in search of landmarks for the country's Olympic future

In recent years, among the main determinants of the crisis of the international sports movement, political, economic and managerial factors have been highlighted, as a result of which our country has come under sanctions pressure. As a leading vector for solving these problems, Russian Sports Minister Mikhail Degtyarev outlined "Russia's return to the global sports arena" (URL: https://www.sovsport.ru/olympic_games/news/mihail-degtyaryov-vystupil-s-obrashheniem-pered-uchastnikami-olimpijskogo-sobraniya , accessed 12/21/2024).

The field of activity in the country's domestic policy combines such measures as: maintaining a positive attitude towards international sports organizations and foreign athletes in the media space; optimizing the management process of national sports by consolidating resources in the common ecosystem of the Ministry of Sports, the Olympic Committee and the regions.

Understanding the need to protect the interests of the state, in the process of participating in the sports movement, it is necessary to increase the professionalism of lawyers of international sports law who are able to fight for the return of Russian symbols to the Olympic, Paralympic and Deaflympic Games and in defending positions concerning the rights of Russian athletes.

For the effective implementation of these measures, it is necessary to optimize the management mechanism of the national sports system by developing a unified approach to making and implementing decisions on important sports issues together with the international sports community, which unites legal and media services.

The goal of building a sports ecosystem should be based on the results of scientific research related to the identification of cause-and-effect relationships that led to the current crisis in sports and the construction of multifactorial models of ways out of it.

It is known that finding and understanding the reasons leading to the confrontation of ideas and views allows us to build a strategy and tactics for leveling contradictions while respecting the ethics of social relations.

Analyzing the political situation as a crisis determinant of the international sports movement, it should be noted that this problem does not find a definitive solution. Nevertheless, the sports movement must develop, granting equal rights to all its participants. One solution is to adopt a charter that could operate independently of political views, i.e. athletes from any country are allowed to compete regardless of the political regime in that country.

The struggle for leadership at the economic level has been going on in the world for a long time, which provokes crises that significantly reduce the incomes of the largest corporations and social programs in developed countries. And in these conditions, sport becomes a means of political and economic competition. In an effort to secure the right to organize major sporting events and generate large incomes, States often resort to dishonest ways to achieve their goals. As an alternative to voting for the right to host the Olympic Games, a digital form of voting can be proposed that uses probabilistic methods of analyzing and predicting the results, excluding outside interference.

Modern sports require huge financial investments, which is beyond the power of many countries. The way out of this situation may be to focus on the development of sports as a socio-cultural phenomenon.

The problem of managing global sports is becoming more and more in demand due to the fact that the multipolarity of opinions about how it should receive its further promotion is expanding. Obviously, the role of a leader in sports, capable of independent decision-making, who would not serve the interests of the ruling elites, is currently being actualized. In addition, it is necessary to ensure equal representation of countries in international sports associations, such as federations, unions, committees (for example, FISU, WADA, IOC).

Russia's Olympic future largely depends on government-level management decisions. Today, the Russian Olympic Committee has set a course to develop a Strategy for the development of the international Olympic movement, updating regulatory documents to ensure compliance with the requirements of the fundamental document for all participants in the Olympic Movement – the Olympic Charter. These strategic objectives will allow Russian representatives of the sports community to conduct multilateral negotiations and expand equal international sports cooperation. Sports diplomacy is becoming a key component of the process of Russia's return to world sport.

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

Development of the sociology of sport in the aspect of theoretical analysis

UDC 796.014

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Abstract

Objective of the study was to pinpoint the trajectory of sociological inquiry in the realm of physical culture and sports, we will examine the content of the journal «Theory and Practice of Physical Culture».

Methods and structure of the study. A review of articles on the sociology of physical culture and sports published in the journal Theory and Practice of Physical Culture from 2000 to 2024 was conducted.

Results and conclusions. In the present day, the sociology of physical culture and sports has emerged as a distinct discipline, grounded in empirical research and theoretical insights from the field. Sociologists are dedicated to exploring the intricate web of social relationships and interactions within the realm of sports.

The evolution of physical culture and sports into a prominent social phenomenon underscores the necessity for ongoing investigation into its current state and future trajectory. Consequently, a comprehensive examination of sociological publications in this domain is crucial for identifying the key areas of contemporary sociological inquiry and their potential future trajectory.

Keywords: *sociology of physical culture and sports, sociological research, social relations in the field of physical culture and sports.*

Introduction. Currently, scientific periodicals are an important resource for the development of sociological discourse in the field of physical culture and sports [2, 3] both in domestic and Western sociology [1]. The journal «Theory and Practice of Physical Culture» («TPPC») has traditionally been a recognized platform for scientific discussions within the framework of sports sociological topics. Distinctive features of the journal are its high status, unique information base, rich historical archive of publications, as well as editorial strategy in promoting new sociological knowledge and social practice in accordance with the current demands of science and society. In this regard, monitoring of published works on topical issues of the sociology of physical culture and sports for the period 2000-2024 serves as an effective mechanism for determining current trends in the development of the sociology of physical culture and sports.

Objective of the study was to pinpoint the trajectory of sociological inquiry in the realm of physical culture and sports, we will examine the content of the journal «Theory and Practice of Physical Culture».

Methods and structure of the study. Identification of the content and features of the sociological research field requires analysis of quantitative and qualitative parameters of the publication activity of the authors of the articles. In total, over 250 articles were published in 2000–2024, forming the information flow on social aspects in the field of physical culture and sports [1]. The dynamics of publications indicates an increase in the share of articles on sociological topics in the total volume of scientific materials of the journal from 3% for the period 2000–2004 to 4% for 2015–2024. The total number of authors for the period under study exceeded 600 people, while 86% of the articles were written by university professors, the remaining 14% of sociological publications

were written by employees of various sports institutions and organizations. A significant part of the articles (over 90%) were prepared by groups of authors based on the results of scientific research conducted within the framework of scientific grants and joint projects [2]. The geography of sociological research is represented by almost all regions, with a significant volume of it coming from Moscow, St. Petersburg, Chelyabinsk, Tomsk, Surgut, Yakutsk, Smolensk and Tyumen. All this testifies to the growing attention of the scientific community to the sociological issues of physical culture and sports.

Results of the study and discussion. The analysis of the topics of the published materials made it possible to identify the current subject field of sociological research, which combined various social aspects of physical activity and healthy lifestyle, physical education in educational institutions, sports activities, social aspects of mass sports and elite sports, professional training of future specialists in the field of physical education and sports, work of sports and health institutions and services. Most of the materials published in the journal on the sociology of physical education and sports are an overview of the results of empirical studies, a description of the social aspects of physical education and sports practice, an analysis of the attitude of various population groups to physical education and sports. Sports activities have become an actively developing area of sociological research, including such topics as socialization of the individual in sports, problems of mass sports, and social aspects of elite sports. In different years of the last 20 years, specialists studied: the social role of sports in the development of society and socialization of the individual (L.I. Lubysheva); sociological analysis of the mission and potential of sports (L.I. Lubysheva, V.A. Baranov); sports priorities of various social groups of the population (M.V. Sinyutin, E.E. Tarando, L.A. Lebedintseva, R.V. Karapetyan, O.A. Nikiforova); value aspects of sports (P.A. Bulatov, V.B. Myakonkov, T.V. Kopylova); sports culture (L.I. Lubysheva); motivational aspects of sports activity (E.A. Parkhomenko); sports specialization (V.V. Bakaev, A.E. Bolotin, V.S. Vasilyeva), sports career (L.I. Lubysheva, T.A. Danilenko); social adaptation of an athlete (O.A. Sirotin, V.I. Sivakov, T.A. Danilenko, O.I. Milshtein, I.A. Grets), etc. A wide range of areas of sociological research indicates that sports activity is a multifaceted social phenomenon aimed at improving a person in the field of sports.

A separate area of sociological discourse was the study of the problems of socialization of students in the process of physical education and sports in educational institutions. The authors focused on the following: problems of social adaptation of schoolchildren and students in the process of physical education (T.A. Markina, E.S. Levchenko); the place of physical education in the system of students' values (G.V. Ponomareva); understanding the phenomenon of physical fitness and its significance in students' educational activities (A.A. Khristolyubova, E.M. Kadomtseva, V.V. Ponomarev), the attitude of students, students, and teachers to physical education and sports (A.V. Novikov, N.I. Sinyavskiy), physical education and sports activity and its relationship with the psychological state of students (V.G. Shilko, T.A. Shilko, E.S. Potovskaya, O.N. Krupitskaya); social representations of the image of a physical education teacher (I.V. Vasilenko, O.V. Tkachenko). Almost all publications reflect the results of applied sociological research aimed at studying modern social practice in the field of physical culture and sports.

The tendency of growing research interest in considering social aspects of professional education in the sphere of physical culture is noteworthy. The subject of sociological analysis in these works were motivational aspects of choosing the future profession of a sports teacher and coach (M. Radzinska, M. Novak, L. Novak); the level and quality of students' knowledge in the context of their social significance (M.V. Lopatin, O.G. Rumba); attitude of students of physical culture universities to professional education (A.V. Shukaeva); social ideas about athletes' trust in the personality of the coach-teacher (N.A. Vaznin, L.G. Tatyanina, D.A. Vasiliev, E.T. Maiboroda), etc. Separately, it is necessary to note the publications related to the content and tendencies of development of sports education (L.I. Lubysheva, S.I. Rosenko). The actualization of scientific interest in the social aspects of professional education is caused by the ongoing processes of reforming this system, the adoption of educational standards and, in connection with this, the development of new requirements for future specialists, the creation of conditions for their successful social, psychological, and professional adaptation.

Publication activity on the topic of healthy lifestyle is traditionally high. Within the framework of the research field, the influence of physical education and health activities on the formation of the need for a healthy lifestyle in students was assessed (D.A. Ulyanov, T.G. Kovalenko, A.P. Shklyarenko), bad habits

and their influence on the lifestyle of students were monitored (M.D. Kudryavtsev, I.E. Kramida, A.Yu. Osipov, O.B. Gileva, O.S. Rogov, D.A. Polyak); factors determining health and health-oriented behavior of schoolchildren were identified (L.E. Pakhomova, V.N. Irkhin, L.A. Kadutskaya, M.I. Bordukov, A.S. Rybakov) and the values of health culture among young people (S.I. Zheleznyakova, T.I. Shukshina); the motivational and value attitude towards a healthy lifestyle of students was determined (A.Yu. Kolesnikova, V.Yu. Lebedinsky); issues of promoting a healthy lifestyle in the media were raised (V.N. Zuev, P.N. Devaykin, Tyumen), conditions for the formation of a healthy lifestyle at the level of educational institutions and regions were determined (A.M. Gendin, M.I. Sergeev, S.L. Sadyrin, V.P. Rubchevskiy, V.A. Pinaev), etc. Undoubtedly, the study of the above issues is primarily due to the social demands of modern society associated with the importance of physical, social and spiritual health of individuals. Sports and health institutions and the services they provide actively contribute to the popularization and promotion of mass sports. In this regard, the researchers raised issues of the quality of the services provided (V.N. Zuev, N.G. Milovanova, D.V. Gramotin); the efficiency of physical culture and sports management in the municipality (A.A. Peredelskiy, Yu.A. Tsegelny); the impact of sports mega-events on the sustainable development of territories (A.O. Lancev, E.G. Shurmanov, A.V. Ponomarev, L.L. Tolvayshis), as well as the social significance of sports and health facilities and services. This can be explained by the fact that as a result of past sports events of global and Russian significance, such as the 2014 Olympics, the 2018 FIFA World Cup, the 2013 and 2018 Universiades, the need to use the legacy of sports events has increased, as well as to solve the urgent problem of involving the population in a healthy lifestyle.

There is a noticeable predominance of scientific works, the subject field of which includes, first of all, young people. Basically, researchers are interested in the social aspects of the formation, development of physical activity of young people by means of the educational environment, their involvement in sports activities. Also, a significant part of the research is aimed at studying the position of athletes as a social group in the structure of the population as a whole. Publications of this kind meet the needs of society and the state in terms of obtaining reliable information about the population in general and young people in particular as a resource for the development of social and human capital of the country. At the same time, it is necessary to outline the promising trends of the sociological discourse aimed at identifying current social demands in the sports sphere. These include: sociological aspects of the progressive development of physical culture and sports; sociology of management and digital transformation of physical culture and sports; sociological parameters of Olympic and Paralympic sports; sports culture as a new trend in mastering the values of modern society; physical culture and sports in the context of the social structure of society; professional, class, ethnic identity of athletes as a social group, etc. The designated topics of promising research largely form the problematic field of the modern sports sociological space and determine its vector for the near future.

Conclusions. Thus, the main topics of the results of sociological research published in the journal «Theory and Practice of Physical Culture» were: social aspects of sports activities, including problems of socialization of the individual in sports; social problems of mass sports, high-performance sports, the Olympic movement; social aspects of physical education in educational institutions, enterprises, organizations; social aspects of professional education in the field of physical culture and sports; the formation of a healthy lifestyle by means of physical activity; the social significance of sports and health institutions and services. The presented areas of thematic priorities of the editorial board reflect the current state of physical culture and sports in the country.

References

1. Lukashchuk V.I. Sotsiologiya sporta: obzor traditsionnykh zarubezhnykh sotsiologicheskikh paradigm i teoriy. Vestnik Moskovskogo universiteta. Seriya 18. Sotsiologiya i politologiya. 2020. No. 26. pp. 49-69.
2. Mikhaylova T.A., Studenikina E.S. Razvitiye rossiyskoy sotsiologii fizicheskoy kultury i sporta kak nauchnogo napravleniya i uchebnoy distsipliny. Yuzhno-rossiyskiy zhurnal sotsialnykh nauk. 2024. Vol. 25. No. 1. pp. 94-113.
3. Tarasov V.A. Razvitiye sotsialnogo instituta fizicheskoy kultury i sporta. Mir nauki. Sotsiologiya. Filologiya. Kulturologiya. 2022. Vol. 13. No. 1. pp. 1-9.

Personalizing instruction for children aged 5-6 in the acquisition of fundamental football skills

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Abstract

Objective of the study was to validate and demonstrate the efficacy of personalized training for children aged 5-6 years in the development of fundamental football skills.

Methods and structure of the study. The experiment was carried out from September 2021 to November 2023, involving 32 children aged 5-6 from FC Strogino and FC Lokomotiv (Moscow). The experiment involved individual lessons as an additional form of coaching for children already enrolled in the football schools of FC Strogino and FC Lokomotiv (Moscow). This approach allowed for a personalized impact on each student and the creation of a «school of movements» for future purposeful training in playing techniques. The effectiveness of this approach was evaluated by measuring the changes in technical preparedness indicators.

Results and conclusions. The personalization of training sessions for young football players aged 5-6, which includes supplementary instruction, fosters the effective improvement of technical skills and the ability to apply them in game situations. Therefore, for children aged 5-6 who participate in football, it is essential to provide them with additional individualized training sessions, such as one-on-one coaching, which can help them catch up with their peers in a relatively short period of time. These sessions take into account the unique developmental characteristics of each child's body.

Keywords: *football, young players, training sessions, individualization, technical methods of the game, development of motor skills.*

Introduction. The optimal structure of training sessions in football is determined, first of all, by the rational structure of various types of training, which determine the selection of effective means that ensure the growth of sports skills of players of various qualifications. The training of young athletes, at present, has a tendency to systematically increase the training load, but the basis for training young football players should be exercises performed with light loads to form motor skills that ensure mastery of the basics of the game [1, 4]. Due to the fact that football is a team game, of course, the main training is group training. But at the initial stage of training, children aged 5-6 are not yet ready to interact with several partners, it is easier for them to master the methods of handling the ball together with a coach or in a pair with one partner. When there are 15-20 people in a group, the coach simply physically cannot pay due attention to everyone. Even in a group of 5-6 people, there will not be enough attention for everyone. Individual training and training in small groups allow us to pay attention to each of the students and work qualitatively on those aspects that are needed by this particular child, at this particular time. Therefore, the principle of individualization appears in the form of a didactic model, which is based on the laws of training and education in the theory and methodology of physical education and sports [2, 3, 5].

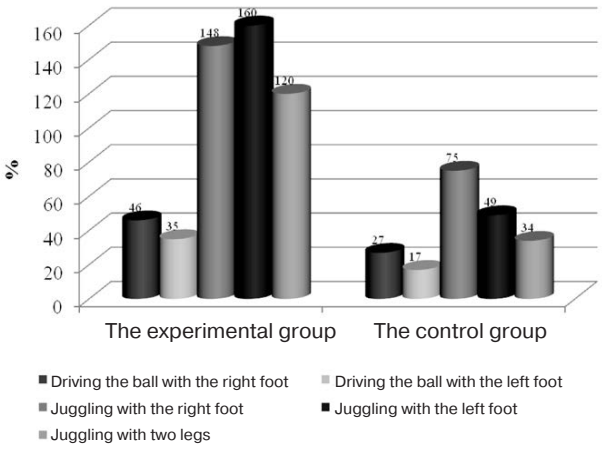
Objective of the study was to validate and demonstrate the efficacy of personalized training for children aged 5-6 years in the development of fundamental football skills.

Methods and structure of the study. The experiment was conducted from September 2021 to November 2023 at FC Strogino and FC Lokomotiv (Moscow), involving 32 children aged 5-6 years involved

in football. To test the effectiveness of individual training sessions with children aged 5-6 years in the process of mastering the basic technical elements of football, two groups were formed: experimental (EG, n = 16 people) and control (CG, n = 16 people). Individual sessions were conducted as an additional form of tutoring for children already studying at the football schools of FC Strogino and FC Lokomotiv (Moscow). This approach ensured a selective impact on each student and made it possible to form a «school of movements» for subsequent targeted teaching of playing technique. The effectiveness of the proposed approach was assessed by testing the dynamics of technical fitness indicators.

Results of the study and discussion. Analysis of changes in technical preparedness showed that young football players in the control and experimental groups showed a systematic improvement in their results throughout the entire educational experiment.

A comparative analysis of the results of young football players aged 5-6 years, obtained at the end of the educational experiment, with the initial data in the ball handling and juggling exercises revealed reliable differences in the experimental and control groups. It should be noted that the increase in results in young athletes in the experimental group, both in ball handling with the right and left foot, and in juggling with the right, left and both feet, was higher than in the control group (see figure).



Increase in results in dribbling the ball 20 m with the right and left foot, in juggling with the right, left and both feet in young football players aged 5-6 years, experimental and control groups

The intra-group variability of technical preparedness indicators during the pedagogical experiment, both in the control and experimental groups, decreased, but for most indicators exceeded 10%. This suggests that not all young football players equally mastered the technique of dribbling and juggling the ball.

To identify the cumulative effect of the developed methodology, an expert assessment of the technical and tactical training of young football players was conducted at the end of the school year. The experts were asked to assess the technical and tactical training of young athletes, the ability to apply technical techniques in a game situation on a five-point scale. The assessment criterion was the requirements for the game activity of young athletes in the first year of study. As a result of the expert assessment, in which five coaches took part, we received 90 assessments in the control group and 100 assessments in the experimental group.

After the first year of football training, the number of excellent, good and satisfactory grades in the control group was 20 (44,4%), 40 (22,2%) and 30 (33,3%), respectively. The football players of the experimental group received 38 (38,0%), 44 (44,0%) and 18 (18,0%) excellent, good and satisfactory grades, respectively. As a result, the average score of young football players of the experimental group was significantly higher than that of the control group ($p<0,05$) (see table).

Evaluation of the gaming activity of young football players aged 5-6 years – participants of the experiment

Expert evaluation, point		T	p
CG (M ± m)	EG (M ± m)		
3,8 ± 0,09	4,1 ± 0,08	2,492	<0,05

Thus, individualization of training sessions for young football players aged 5-6 years, which includes additional training, promotes effective mastery of technical actions and develops their ability to use technical techniques in a game situation.

Conclusions. Thus, for children aged 5-6 years who play football, it is necessary to organize additional individual lessons in the form of tutoring, which allow for a fairly short period of time to pull up the lagging aspects of readiness to the basic parameters, since such lessons take into account the individual characteristics of the child's body development. Taking into account the presented thesis, we consider it very appropriate to recommend and implement the presented experimentally substantiated and effective approach in the practice of coaches of both sports schools and

football academies, thereby ensuring a rapid growth of the sports and technical skills of the young athlete.

References

1. Antipov A.V. Kompleksnaya sistema otbora yunykh sportsmenov na razlichnykh etapakh podgotovki v futbolnykh akademiyakh. Fizicheskaya kultura: vospitaniye, obrazovaniye, trenirovka. 2019. No. 5. pp. 20-21.
2. Guba V.P., Kvashuk P.V., Nikitushkin V.G. Individualizatsiya podgotovki yunykh sportsmenov. Moscow: Fizkultura i Sport publ., 2009. 274 p.
3. Rodin A.V. Teoriya i tekhnologiya individualnoy takticheskoy podgotovki sportsmenov v igrovykh vidakh sporta. Doct. diss. abstract (Hab.). Moscow, 2022. 46 p.
4. Chernetsov M.M. Individualizatsiya protsessa fizicheskoy podgotovki yunykh futbolistov 8-12 let na osnove differentsiatsii somaticheskikh tipov. PhD diss. abstract. Smolensk, 2010. 23 p.
5. Shestakov M.M. Tekhnologiya individualizatsii protsessa podgotovki futbolistov i usloviya yeye realizatsii. Vestnik adygeyskogo gosudarstvennogo universiteta. Seriya: pedagogika i psikhologiya. 2012. No. 2. pp. 249-257.

The diversity of movement patterns in the execution of a «Top spin» right-handed stroke in table tennis among elite athletes

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Abstract

Objective of the study was to investigating the fluctuations in the motion patterns of the «top spin» forehand stroke in table tennis among elite players.

Methods and structure of the study. Eight expert male table tennis players executed a «top spin» on the right side of the ball under standard circumstances, adjusting the speed and power to perfection, aiming to strike the ball in a specific area of the table. Each athlete attempted to execute the «top spin» at least five times.

The spatial and temporal motion parameters were recorded using the Qualisys hardware and software system. The Qualisys Track Manager software was employed to initially gather data from six high-speed ProReflex video cameras during the biomechanical analysis. The shooting frequency in the experiment was set at 200 Hz.

Results and conclusions. Based on the analysis of the trajectory and velocity of the racket, we determined the following kinematic parameters of the «top spin» forehand: - The maximum velocity of the racket. - The duration of each of the three selected phases of the «top spin» stroke. - The path of the racket during each of the three selected phases of the stroke.

The obtained kinematic parameters of the «top spin» forehand for eight tennis players, along with their average values and coefficients of variation, reflect the significant differences in technique among individuals. It is possible that tennis players employ distinct approaches to accelerate the striking arm when executing the top spin forehand.

Keywords: *table tennis, highly skilled male athletes, topspin right, kinematic characteristics of topspin, variability of speed parameters of movement.*

Introduction. The efficiency of the top spin stroke in table tennis may depend on the optimal value of a number of biomechanical characteristics. These characteristics may act as both criteria for the rationality of the technique and indicators reflecting the level of physical fitness of tennis players. In order to control the level of technical fitness of tennis players, it is necessary to have model characteristics of the technique, which may be specific values of the kinematic characteristics of the top spin stroke obtained with the help of modern biomechanical hardware and software systems for highly qualified athletes. It is necessary to understand that the spatial, temporal and spatial-temporal characteristics of the top spin stroke, even for highly qualified tennis players, may have a large variability [4, 6].

Currently, there are a small number of studies in the literature devoted to the study of the technique of the top spin stroke and its variability in highly qualified table tennis players using modern biomechanical hardware and software systems [4, 6].

Objective of the study was to investigating the fluctuations in the motion patterns of the «top spin» forehand stroke in table tennis among elite players.

Methods and structure of the study. To achieve this goal, we conducted a laboratory experiment on the basis of the laboratory of the Department of Biomechanics and UNM RUS (GTSOLIFK) using the three-dimensional shooting method. Eight male tennis players aged 22 to 27 years, whose height was 175-187 cm, weight 75-94 kg, took part in the experiment. All of them had the title of master of sports in table tennis.

During the experiment, each subject performed a «top spin» hit on the right side of the ball, which was thrown by one of the experimenters. The hit was performed under standard conditions with the installation of optimal speed and force of execution in order to hit the ball into a certain area of the table. Before the experiment, the subjects performed a warm-up and trial attempts of the technique being studied. For each subject, at least five attempts of the «top spin» hit were recorded during the experiment. During the execution of striking actions, we performed a three-dimensional biomechanical survey, which was carried out using the hardware and software complex «Qualisys». During the biomechanical survey, using the software «Qualisys Track Manager», primary data collection was performed from six high-speed video cameras «ProReflex». The synchronization system of these cameras allowed us to implement a three-dimensional case of shooting. The shooting frequency in the experiment was 200 Hz. The accuracy of measuring the change in the coordinates of the markers was determined by the error in calibrating the system, which did not exceed 1,6 mm along each of the three axes of space. To build a multi-link model of the athlete's body during the biomechanical survey, we marked the main reference points of the body of the subjects, as well as the conditional center of mass of the racket (Figure 1).

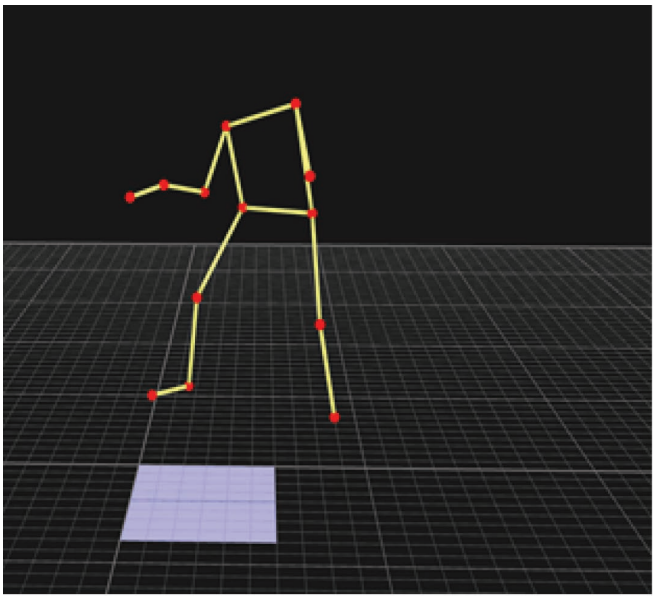

Figure 1. Construction of a tennis player's body model in three-dimensional space using the Qualisys Track Manager software after conducting a biomechanical survey

Results of the study and discussion. After conducting a laboratory experiment based on the analysis of the trajectory of the racket head movement and the graph of the change in racket speed, we determined the phase composition of the topspin strike from the right in table tennis based on the following reference moments of racket movement (Figure 2):

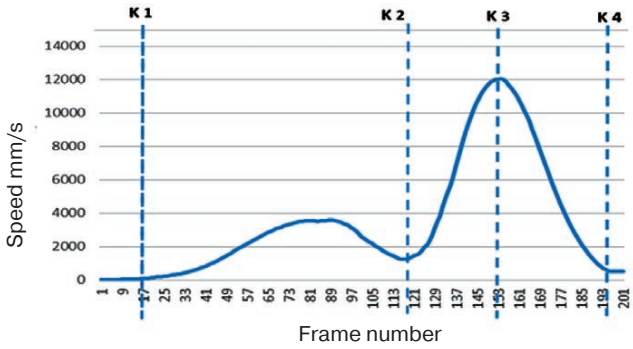

Figure 2. Change in racket speed and main supporting moments of movement when performing a topspin strike from the right

Note: K1 – the moment of the beginning of the movement; K2 – the moment of the end of the swing; K3 – the moment of reaching the maximum speed of the racket; K4 – the moment of stopping the movement of the racket.

Based on the fact that the moment of reaching the maximum speed of the racket (K3) corresponds to the moment of impact with the ball, we identified the following phases of the topspin stroke in table tennis:

1. The swing phase (from the moment K1 to the moment K2).

2. The acceleration phase of the racket (from the moment K2 to the moment K3)

3. The braking phase of the racket (from the moment K3 to the moment K4).

Based on the analysis of the trajectory and speed of the racket, we determined the following kinematic characteristics of the topspin stroke on the right:

- the maximum value of the racket speed;

- the execution time of each of the three identified phases of the topspin stroke;

- the path of the racket in each of the three identified phases of the impact action.

The obtained kinematic characteristics of the topspin stroke on the right for eight tennis players, as well as the average values and the coefficient of variation are presented in the table.

Kinematic characteristics of forehand topspin strokes of highly skilled table tennis players (n=8)

Test takers	Max. racket speed (m/s)	Time of execution of the swing phase (s)	Racket acceleration phase execution time (s)	Racket braking phase execution time (s)	Racket path during swing phase (mm)	Racket travel path during acceleration phase (mm)	Racket travel path during braking phase (mm)
D.E.	13,1	0,73	0,25	0,17	1259	1325	1142
N.E.	9,7	0,5	0,19	0,24	748	987	886
V.A.	11,3	0,6	0,23	0,2	1444	1463	1266
D.A.	15,9	0,43	0,13	0,17	1473	1385	1363
I.V.	15	0,5	0,15	0,15	1493	1379	1262
A.R.	16,9	0,52	0,22	0,15	1640	1550	1484
P.A.	12,4	0,53	0,22	0,2	1182	1230	1303
A.L.	15,3	0,61	0,2	0,18	1323	1194	1370
Average value	13,7	0,55	0,19	0,18	1320	1314	1259
Standard Deviation	2,4	0,09	0,04	0,03	272	175	180
Coef. variations, %	18	16	20	16	20	13	14

For all kinematic characteristics of the forehand topspin stroke obtained in the laboratory experiment, a large intra-group variability is observed, which is reflected in the value of the variation coefficient.

Thus, for the maximum racket speed, the average value for the group was 13,7 (±2,4) m/s, the variation coefficient was 18%. The time to complete the swing phase was 0,55 (±0,09) s, the coefficient of variation was 16%. The time to complete the acceleration phase was 0,19 (±0,04) s, the variation coefficient was 20%. The time to complete the braking phase was 0,18 (±0,03) s, the variation coefficient was 16%. The average racket travel distance in the swing phase for the group was 1320 (±272) mm, with a variation coefficient of 20%. The racket's path in the acceleration phase was 1314 (±175) mm, the variation coefficient was 13%. The racket's path in the deceleration phase was 1259 (±180) mm, the variation coefficient was 14%.

Such variability of the topspin forehand stroke among highly skilled tennis players indicates that athletes can use different options for performing this technique. The variability of the topspin stroke technique can be due to different mechanisms for accelerating the striking link and can be carried out according to the principle of the "whip" mechanism or according to the principle of the rigid rod mechanism [3, 5].

The «whip» mechanism involves sequential acceleration and sequential deceleration of the body links from proximal to distal, and the rigid rod mechanism involves acceleration of the kinematic chain as a single rigid structure. It is noted that these two mechanisms of acceleration of the striking link can be used by different athletes when performing the same type of striking actions in game sports and martial arts [1, 2]. The fact that our subjects accelerate the striking link differently when performing a top spin strike on the right is evidenced not only by the high variability of the kinematic characteristics in the experimental group, but also by the absence of statistically significant intragroup correlations between some kinematic characteristics, which logically should be very closely related to each other.

For example, the definition of the correlation between the maximum racket speed and other temporal and spatial characteristics of the top spin stroke on the right revealed the following. Of all the temporal phases of the top spin stroke on the right, only the time of the braking phase statistically significantly negatively correlates with the maximum racket speed. The correlation coefficient between these kinematic characteristics was – 0,88 (at $p \leq 0,01$). For the other temporal phases of the top spin stroke on the right, we did not find statistically significant correlations with the maximum racket speed.

We also found a positive statistically significant relationship between the maximum racket speed and the length of the racket path in the swing phase and in the braking phase when performing the top spin stroke. Thus, the correlation coefficient between the maximum racket speed and the path of its movement in the swing phase was 0.8 (at $p \leq 0.01$), and between the

maximum racket speed and the path of its movement in the braking phase 0.83 (at $p \leq 0.01$). At the same time, we did not find a seemingly logical statistically significant relationship between the path of the racket in the acceleration phase and the maximum speed of the racket. The absence of seemingly logical statistically significant relationships between the maximum speed of the racket and some temporal and spatial characteristics of the topspin stroke on the right in table tennis among highly qualified athletes may be due to large interindividual differences in the technique of performing this stroke. It can be assumed that tennis players can use fundamentally different mechanisms for accelerating the striking link when performing this stroke. Determining these mechanisms and the features of their implementation based on a detailed study of the linear and angular velocities of the body links involved in accelerating the racket when performing the topspin stroke on the right is our further task.

Conclusions. Based on the analysis of the trajectory and speed of the racket, we determined the following kinematic characteristics of the forehand topspin: maximum racket speed; execution time of each of the three identified phases of the forehand topspin; racket path in each of the three identified phases of the impact action.

The kinematic characteristics of the forehand topspin for eight tennis players, as well as the average values and variation coefficients, are due to large interindividual differences in the technique of performing this stroke. It can be assumed that tennis players can use fundamentally different mechanisms for accelerating the impact link when performing the forehand topspin.

References

1. Vagin A.Yu., Shalmanov A.A. Teoreticheskiye osnovy biomekhaniki udarnykh deystviy v sportivnykh yedinoborstvakh. Proceedings of the VII All-Russian scientific-practical conference with international participation, November 21-22, 2019. Moscow: 2019. pp. 287-290.
2. Kunin A.A., Silaeva L.V., Vagin A.Yu. Individualnyye osobennosti realizatsii razgona zvenyev tela pri vypolnenii podachi v tennise. Proceedings of the VII All-Russian scientific-practical conference with international participation, November 21-22, 2019. Moscow: 2019. pp. 96-102.
3. Alexander R.N. Optimum timing of muscle activation for simple models of throwing. J. Theor Biol. 1991. Vol. 150. pp. 349-372.
4. Bańkosz Z., Winiarski S. Kinematic parameters of topspin forehand in table tennis and their inter-and intra-individual variability [J]. Journal of sports science & medicine, 2020, 19 (1): 138.
5. Elliot B. Spin and power serve in tennis. J. of Human Movement Studies. 1983. Vol. 9. pp. 97- 104
6. He Y., Fekete G., Sun D. et al. Lower limb biomechanics during the topspin forehand in table tennis: a systemic review [J]. Bioengineering, 2022, 9(8): 336.

Contemporary methods and technological advancements for evaluating the swiftness and precision of thrusts in swordsmanship

UDC 796.86

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Abstract

Objective of the study was to create a technological tool for training and assessment, the «Electronic-mechanical fencing target», and to demonstrate its effectiveness in evaluating the swiftness and precision of sword-based thrusts.

Methods and structure of the study. The goal of the proposed invention is to monitor and assess the speed and precision of sword thrusts during training. To assess the impact of incorporating the developed simulator into the training regimen, a pedagogical experiment was conducted. The experiment aimed to verify our hypothesis that the «electronic-mechanical fencing target» enhances and improves the speed, strength, and coordination of fencers. The experiment was conducted among athletes aged 12, during the competitive period, and the experimental group was instructed to incorporate «Electronic-mechanical fencing targets» into their specialized training.

Results and conclusions. The implementation of the «fencing, electronic-mechanical target» and the conducted trial demonstrated a significant improvement in the performance of the experimental group, particularly in terms of accuracy and errors across all exercises. There was no substantial increase in the performance of the control group. Overall, the experimental group outperformed the control group, with the exception of certain metrics in specific exercises. The increasing technical difficulty of the movements is evident in the results achieved by both groups.

Keywords: *fencing, target, develop, simulator, electronic-mechanical, utility model, experiment.*

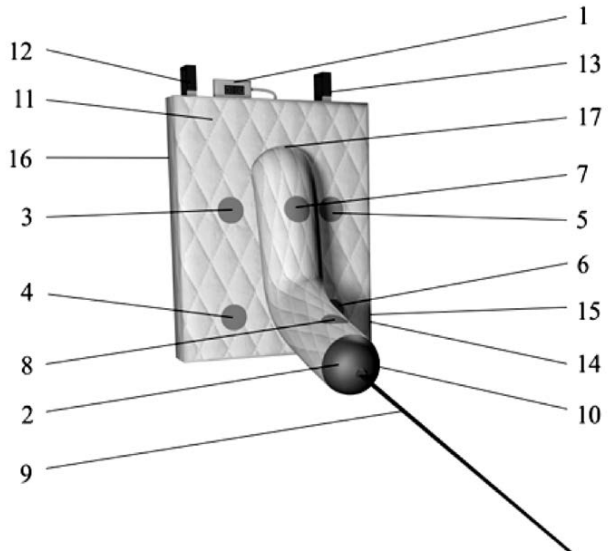
Introduction. The stability and variability of the technical techniques and actions performed in fencing largely depend on coordination and speed-strength preparedness, and the integral indicator is an accurate and timely thrust, which requires an objective instrumental assessment. However, the parameters of performing thrusts in fencing with epees, the methods and techniques for determining the accuracy of thrusts, touched upon in the works of some specialists, do not have an accurate and objective instrumental assessment [1, 4-6]. The objective data obtained on coordination and speed-strength indicators using special equipment allows us to reasonably talk about the problems of objective recording and evaluation of the performance of technical actions and thrusts at all stages of training in fencing [9-11].

Instrumental assessment of the parameters of speed and accuracy of thrusts among domestic fencing specialists in different types of weapons has been touched upon by a number of authors, but in our opinion has not been sufficiently studied. The use of training equipment, including various targets in fencing, is fully applicable at all stages of training in order to improve the skills of fencers, accelerating the assimilation of specific martial arts tools [2-6, 8].

Objective of the study was to create a technological tool for training and assessment, the «Electronic-mechanical fencing target», and to demonstrate its effectiveness in evaluating the swiftness and precision of sword-based thrusts.

Methods and structure of the study. We have developed a «Fencing target, electronic-mechanical».

This utility model relates to the field of sports equipment, to devices for training epee fencers. The technical task of the declared utility model is to record the speed and accuracy of epee thrusts in the training process [7]. The device consists of the following elements: (1) display, (2) fencing epee guard, (3) left upper sensor, (4) left lower sensor, (5) right upper sensor, (6) right lower sensor, (7) upper sensor on the hand, (8) lower sensor on the hand, (9) fencing epee blade, (10) internal bracket for the epee, (11) front panel, (12) outer left bracket, (13) outer right bracket, (14) on/off toggle switch, (15) on/off toggle switch for the sound signal of a thrust, (16) back wall, (17) fastening element for the fighting hand. The fighting hand acts as an imitator of the opponent's armed hand and contains elements 2, 7, 8, 9, 10, 17.



Fencing target, electronic-mechanical (front view)

To evaluate the effectiveness of the implementation of the training device developed by us, a pedagogical experiment was conducted, which was aimed at confirming our hypothesis that the «electronic-mechanical fencing target» allows to increase the level and improve the speed-strength and coordination abilities of epee fencers. The experiment was conducted among 12-year-old athletes (3rd year of basic training), during the competitive period and was aimed at the experimental group, to include the «Electronic-Mechanical Fencing Target» in the special training of 12-year-old epee fencers. Thus, the EG used the advantages and functionality of the training device in special training, the control group used conventional mechanical targets. During the experiment, two groups of trainees were randomly formed, the control (CG) and the experimental (EG), with 10 people in each, consisting of epee fencers aged 12 years, the experiment was conducted during the competitive period and lasted six weeks. During one training session, each athlete of the EG and CG performed a series of exercises (from the three above-mentioned positions) in the main part of one session, a weekly microcycle, and also performed a series of thrusts proposed by us from three positions, at the end of the weekly microcycle at the beginning of the control training, after the warm-up. For control, two modes were selected from the «target» functionality: «red mode» left side and «green mode» right side, the same for both groups. The reliability of differences between the groups and after the experiment was calculated using the Mann-Whitney U-criterion, the growth rates using the Brody formula.

Results of the study and discussion. In the CG in the on-site exercise, high growth dynamics (13 and 14%) were recorded in both modes in the number of misses. In other indicators, the growth dynamics are low (up to 4,6%) and demonstrate a large intra-group spread, a number of indicators demonstrate stabilization.

In the on-site exercise in the EG, we also observe significant increases in the accuracy indicators of hits, the growth indicators of the EG are significantly higher compared to the CG. In speed indicators, the average group indicators of hits are better in the EG compared to the CG. Significant dynamics of reliable increases were obtained in the EG: the number of hits «red mode» (14,1%), the number of misses «red mode» (33%), the number of misses «green mode» (30,4%). Changing the conditions of the exercise showed a similar picture of the increase in the accuracy of the thrusts in the CG, but the magnitude of the increases on average was no higher than 7,9% (the number of hits «red mode»). At the same time, in both exercises, the number of misses during the experiment demonstrates stabilization of the indicators.

The indicators of the EG with a lunge for all the accuracy indicators of the thrusts are significantly better than those of the CG. Reliably high indicators of the EG increases in the «green mode» were obtained in the number of hits (14,2%), the number of misses (17,5%), which indicates the effectiveness of using the target when performing a more complex coordination movement. We do not observe reliably high differences between the CG and EG in terms of time indicators.

In the third, more complex exercise (step/jump lunge), high indicators of increases were obtained in the EG in both exercises: the number of hits (24,1 and 26,7%), the number of misses (29,1 and 41,4%). In the control group, no reliably high increases were obtained.

Conclusions. The implementation of the «Fencing Target, Electronic-Mechanical» and the experiment showed high dynamics of increases in the EG, primarily in the recorded indicators of accuracy and misses in all exercises. In the CG, high, reliably significant increases were not recorded. In general, the dynamics of increases in the EG are better than the CG indicators, except for individual indicators in individual exercises. The increase in the technical complexity of the form of movements is clearly visible in the results obtained in both groups. The use of the target developed by us allowed us to analyze, evaluate and check the accuracy and speed of special indicators of the execution of thrusts by 12-year-old epee fencers. The use of this method and the technical solution developed by us allows us to obtain objective data and indicators of the execution and accuracy of thrusts in various combat situations, based on the capabilities of the recorded indicators of the electronic target.

References

1. Britskiy V.A., Aikin V.A. Apparaturnyye kompleksy dlya issledovaniya tochnosti ukolov v fekhtovanii na shpagakh. Nauchno-metodicheskiye aspekty podgotovki sportsmenov. Proceedings of the II All-Russian scientific-practical conference. K.V. Dikikh [ed]. Omsk, 2022. pp. 42-49.
2. Britskiy V.A., Aikin V.A., Simonova K.Yu. Aktualnyye voprosy sovershenstvovaniya podgotovki fekhtovalshchikov-shpazhistov v zarubezhnoy literature. Teoriya i praktika fizicheskoy kultury. 2022. No. 12. pp. 19-20.
3. Britskiy V.A., Aikin V.A. Pokazateli spetsialnoy koordinatsionnoy tochnosti i bystroty ukolov fekhtovalshchikov-shpazhistov 11-13 let. Kultura fizicheskaya i zdorovye. 2023. No. 1 (85). pp. 176-179.
4. Busol V.A. Eksperimentalnoye obosnovaniye napravlennosti sredstv i metodov fizicheskoy podgotovki yunykh fekhtoval'shchikov na etape nachalnoy spetsializatsii. PhD diss. abstract. Moscow, 1978.
5. Guseva I.A. Eksperimentalnoye issledovaniye vzaimosvyazi bystroty i tochnosti ukolov v fekhtovanii. Moscow, 1974.
6. Movshovich A.D. Fekhtovaniye. Nachinayushchemu treneru. 2011.
7. Patent № 220765 Rossiyskaya Federatsiya, MPK A63V 69/00 (2023.08). Mishen' fekhtovalnaya, elektronno-mekhanicheskaya: № 2023107765: zayavl. 28.03.2023: opubl. 03.10.2023. Patentoobladatel Britskiy V.A., Beresnev D.V. 15 p.
8. Tyshler D.A. Sportivnoye fekhtovaniye. Textbook for physical education universities. Fizkultura, obrazovaniye i nauka. 1997.
9. Gutierrez-Davila M. et al. Effect of dual-attention task on attack and defensive actions in fencing. European journal of sport science. 2017. Vol. 17. No. 8. pp. 1004-1012.
10. Yiou E., Do MC. In fencing, does intensive practice equally improve the speed performance of the touche when it is performed alone and in combination with the lunge? Int J Sports Med. 2000; 21: 122-126.
11. Kim T., Kil S., Chung J., Moon J., Oh E. Effects of specific muscle imbalance improvement training on the balance ability in elite fencers. J Phys Ther Sci. 2015; 27: 1589-1592.

Metrics for comprehensive monitoring that assess the performance of cross-country skiers in sprint races

UDC 796.92+796.015.686

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Abstract

Objective of the study was to assess the usefulness of step-by-step integrated monitoring metrics in forecasting performance in ski sprints, using the outcomes of the Russian Cup 2023-2024 as a case study.

Methods and structure of the study. The research employed a comprehensive approach, incorporating the analysis of scientific literature, pedagogical assessments, biomedical techniques, and statistical methods. The research was conducted using Python 3.10 in the Google Colab environment, with the aid of regression analysis and the least squares method. The analysis was performed using standard Microsoft Office Excel software.

Results and conclusions. It is revealed that the results of the stage-by-stage integrated control are informative for predicting the performance of cross-country skiers in the winter season. A regression model of the rating points of female athletes in the winter season sprint races has been developed. It was determined that the time to overcome the fourth and fifth test laps of the field test on ski scooters, the time of work on the ski ergometer before the threshold of anaerobic metabolism (PANO), the relative power of work at the last stage of the test on the ski ergometer, the stress level during the response of the glycolytic motor units of the right hand in a state of relative rest limit the performance of athletes in sprinting ski season races.

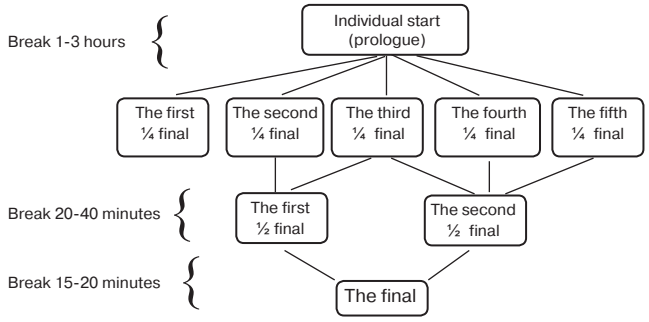
Keywords: *cross-country skiers, preparatory period, field testing, laboratory testing, forecasting, sports performance, regression model, RCCSF rating points, sprint races.*

Introduction. The scientific basis for planning and managing sports activities is forecasting sports performance [2, 3]. The athlete's potential is assessed taking into account current results and their dynamics at the stages of the preparatory and competitive periods.

The sprint race is a separate discipline in the competitive program of female skiers. According to the regulations of the Russian Cross-Country Skiing Federation on rating points, sprint races have a separate rating score. A special feature of the cross-country skiing sprint is the need for the six most successful female skiers to overcome four high-intensity runs. The runs are performed on the same track for ~3-4 hours, with each run lasting ~3 minutes.

The athlete initially participates in an individual time trial (prologue); then the 30 best skiers advance to the quarterfinals (1/4 finals). Unlike the prologue, ¼, ½ and finals are held in the form of elimination runs. The two fastest skiers from each final advance to the next round, with two additional «lucky losers» spots going to the next two skiers (see figure). The duration between rounds in sprint disciplines varies in time (from 15 to 40 minutes), which is shorter than in other cyclic sports [6].

Previously conducted studies reflected the specifics of athlete training methods, tactics for completing «sprints» [7]; the relationship between athlete testing results and FIS points for summer races, with various indicators of competitive activity (time to cover the distance, to overcome individual sections of the distance, speed in the race, athlete's place in the final protocol, etc.) [8]. But the question of which of the indicators of the stage complex control (SCC) limit competitive performance remains insufficiently studied.



Scheme of the sprint discipline in cross-country skiing

Objective of the study was to determine the information content of the indicators of stage-by-stage complex control for predicting performance in ski sprint (using the results of the 2023-2024 Russian Cup as an example).

Methods and structure of the study. The research work was carried out as part of the state work («conducting scientific research») for scientific organizations and higher education institutions subordinate to the Ministry of Sports of the Russian Federation. 30 female cross-country skiers participated in the 2023-2024 season, the age of the athletes was from 19 to 28 years, the qualification of CMS; MS. The staged comprehensive control in the preparatory period was carried out at the training base «Pearl of Siberia» in Tyumen. Field testing on roller skis was carried out according to the standard protocol [4]. In laboratory conditions, the state of the neuromuscular apparatus was assessed using the Chronax-7 device, which allows assessing the latent time of evoked contraction (LTEVC) and the magnitude of the response voltage of motor units (MU) of the muscles of the lower and upper limbs of female athletes [1]. Using a step-increasing load on the Concept2 SkiErg ski ergometer, the strength and aerobic abilities of the shoulder girdle of the athletes were assessed according to the standard testing protocol [5].

Mathematical processing of the research results (132 indicators registered during IVF) was carried out using the Python 3.10 programming language in the Google Colab environment. Regression analysis and the least squares method were used to develop a formula for calculating sprint performance. The Microsoft Office Excel program package was used to calculate the results of field testing for each athlete.

Results of the study and discussion. Competitive performance in sprint races was considered not from the point of view of calculating the actual result of overcoming the race (minutes, seconds, speed), but from the point of view of receiving RCCSF rating points. In our opinion, the position of assessing competitive activity based on rating points is relevant and is of sporting interest to the coaching staff. The athlete receives rating points for her place in the final protocol of each race1. This excludes factors that can significantly affect the time indicator of the race result, but cannot be taken into account when developing a formula predicting the result: sliding conditions, wind strength and direction, humidity, solar activity, quality of snow cover, starting position of the athlete, etc.

132 indicators of the results of the IVF of the preparatory period of ski racers were studied (70 – field test; 62 – laboratory tests). A regression equation was formed to predict the performance. The variables in the equation include the results of the field test on roller skis (2 indicators) and laboratory tests IVF programs (2 indicators) limiting the effectiveness of women's «sprints» in the winter period. The equation for calculating the performance of female cross-country skiers in sprint races during the winter season is as follows:

Sprint points = $591{,}7588-1{,}217205x_1-0{,}033552x_2+3{,}540806x_3-0{,}020716x_4-2{,}470153x_5$,

X_1 – time to complete the fourth test lap in the field test; sec; X_2 – time to complete the fifth test lap in the field test, sec; X_3 – relative work power at the last stage of the step-increasing load on the Concept2 SkiErg ski ergometer, W/kg; X_4 – time spent by the athlete in the step-increasing load on the Concept2 SkiErg ski ergometer until she reaches the individual TAN level, sec; X_5 – tension level at the LTEVC of glycolytic motor units of the right hand in a state of relative rest, before the competitive load, V.

The constants (positive and negative) presented in the equation confirm the logic of using the IVF results in the preparatory period to predict performance in the ski season. Let us consider their practical significance: variable X_1 – with an increase in the time to complete the fourth lap of the field test, the rating points in the race will decrease. On the fourth lap, the athletes reached the TAN level. The higher the lactate threshold, the longer the athlete can work at high intensity. In cross-country skiing sprint races, athletes

[1]Regulations on the rating of Russian ski racers: official website. 2023. Available at: https://flgr-results.ru/attachment/rules/season23-24/Положение_о_рейтинге_сезона_2023-2024.pdf (date of access: 12.08.2024). [Text: electronic].

must demonstrate maximum speed in each of the finals. Variable X_2 - if the time on the fifth lap of the field test increases, the rating points will decrease. The athletes covered this lap in the anaerobic-glycolytic intensity zone. Skiers cover the sprint distance in the race in 2,5-4 minutes, which corresponds to submaximal power work, i.e. the anaerobic-glycolytic energy supply mode, which gives more energy per unit of time than the aerobic one. Variable X_3 - the more steps the athlete completed in the ski ergometer test, the higher the relative power at the last step, which, in turn, will affect the final place in the race. Variable X_4 – the longer it takes the athlete to reach the TAN level, the worse the performance in sprint. Variable X5 – an increase in the threshold of response to the electrical stimulus of fast motor units of the right hand before the load will affect the place in the final protocol, which will be lower. The leading hand during free movement in most skiers is the right [1]. With an optimal state of muscle tone of the upper limbs, athletes in sprint races will be able to realize a greater potential when performing acceleration.

C**onclusions.** The developed regression model of the equation contains constants and variables of the results of field and laboratory testing of the IVF preparatory period, reflecting the physical and functional fitness of female skiers. The indicators limiting the rating points in sprint races are: the time to overcome the test circles of the field test, the time before the onset of the TAN, the relative power of the last (maximum possible) step on the ski ergometer and the level of tension of the response of glycolytic motor units of the right hand. For effective management and correction of the training process, it is worth considering the dynamics of change in the identified indicators, as limiting the final result in sprint races.

References

1. Lenkova S.A., Salova Yu.P., Akselrod A.E. Standartizatsiya metodiki izmereniya latentnogo vremeni vyzvannogo sokrashcheniya myshts verkhnikh i nizhnikh konechnostey u sportsmenov. Nauka i sport: sovremennyye tendentsii. 2024. Vol. 12. No. 3. pp. 23-31.
2. Lubysheva L.I. Mediko-biologicheskoye obespecheniye sporta vysshikh dostizheniy i fizicheskoy kultury: sovremennyye vyzovy. Teoriya i praktika fizicheskoy kultury. 2014. No. 7. 75 p.
3. Platonov V.N. Osnovy podgotovki sportsmenov v olimpiyskom sporte. Handbook of the trainer. Moscow: OOO «Printleto», publ. 2021. Vol. 2. pp. 916-923.
4. Popov D.V., Zagurskiy N.S. Organizatsiya fiziologicheskogo testirovaniya biatlonistov i lyzhnikov. Sovremennaya sistema sportivnoy podgotovki v biatlone. Proceedings of the IV All-Russian scientific-practical conference, Omsk, April 23-24, 2015. V.A. Aikin, N.S. Zagurskiy [ed.]. Omsk: Federalnoye gosudarstvennoye byudzhetnoye obrazovatel'noye uchrezhdeniye vysshego professionalnogo obrazovaniya «Sibirskiy gosudarstvennyy universitet fizicheskoy kultury i sporta», 2015. pp. 236-248.
5. Reutskaya E.A., Zagurskiy N.S., Romanova Ya.S. Issledovaniye funktsionalnykh vozmozhnostey myshts plechevogo poyasa lyzhnits-gonshchits. Aktualnyye voprosy podgotovki lyzhnikov-gonshchikov vysokoy kvalifikatsii. Proceedings of the IV All-Russian scientific-practical conference of cross-country skiing coaches, Smolensk, April 25-28, 2017. V.V. Yermakov, A.V. Gurskiy [ed.]. Smolensk: Federalnoye gosudarstvennoye byudzhetnoye obrazovatel'noye uchrezhdeniye vysshego obrazovaniya «Smolenskaya gosudarstvennaya akademiya fizicheskoy kultury, sporta i turizma», 2017. pp. 209-213.
6. McGawley K., Waerbeke C.V., Westberg K.J., Andersson E.P. Maximizing recovery time between knock-out races improves sprint cross-country skiing performance. J Sport Health Sci. 2022. No. 1. pp. 21-29.
7. Sandbakk O., Losnegard T., Skattebo O., Hegge A.M., Tonnessen E., Kocbach J. Analysis of classical time-trial performance and technique-specific physiological determinants in elite female cross-country skiers. Frontiers in physiology, 2016. Available at: https://doi.org/10.3389/fphys.2016.00326 (date of access: 12.08.2024).
8. Talsnes R.K., Solli G.S., Kocbach J., Torvik P.O., Sandbakk O. Laboratory- and field-based performance-predictions in cross-country skiing and roller-skiing. PLoS One. 2021. No. 24. Vol.16. 8 p. Available at: 10.1371/journal.pone.0256662 (date of access: 12.08.2024).

The variation in the strength of the field during the shuttle's motion

UDC 531.38

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Abstract

Objective of the study was to calculate the concentration of the force field in which the athlete's center of mass shifts during the shuttle run.

Methods and structure of the study. The researchers captured footage of two athletes performing shuttle drills: a jiu-jitsu master (weighing 52 kilograms and standing at 1,6 meters) and a novice athlete (weighing 30 kilograms and standing at 1,2 meters). For each athlete, the path of the center of gravity was plotted for one oscillation of the center of gravity (for one forward and backward movement), and the values of the projections of the velocities and accelerations of the centers of gravity on the coordinate axes were calculated.

Results and conclusions. The differences in the force fields of a highly trained athlete and a beginner athlete were examined. The experiment revealed that the periods of divergence in the force field of a highly trained athlete are considerably longer than those of a novice athlete. Furthermore, it can be inferred that a highly trained athlete relies more on external factors (such as gravity) than a less experienced athlete.

Keywords: *biomechanics of motor activity, jiu-jitsu, divergence.*

Introduction. In a number of studies of recent years, when describing the technique of performing exercises, the authors tend to rely on objective parameters [1, 3, 4]. Therefore, the search for such objective parameters in the field of martial arts is becoming an important task, which has both theoretical and practical significance.

Objective of the study was to calculate the concentration of the force field in which the athlete's center of mass shifts during the shuttle run.

Methods and structure of the study. The researchers captured footage of two athletes performing shuttle drills: a jiu-jitsu master (weighing 52 kilograms and standing at 1,6 meters) and a novice athlete (weighing 30 kilograms and standing at 1,2 meters). For each athlete, the path of the center of gravity was plotted for one oscillation of the center of gravity (for one forward and backward movement), and the values of the projections of the velocities and accelerations of the centers of gravity on the coordinate axes were calculated.

It was then assumed that the center of gravity moves in the force field $\vec{F}$ The divergence of the field is calculated using the formula:

$$div\ \vec{F} = \left(\frac{dF_x}{dx} + \frac{dF_y}{dy} + \frac{dF_z}{dz}\right).$$

In the case of a plane, the formula for divergence leaves two terms:

$$div\ \vec{F} = \left(\frac{dF_x}{dx} + \frac{dF_y}{dy}\right).$$

Divergence is a scalar quantity that reflects the convergence or divergence of a field. In our case, the meaning of the divergence of a force field is $\vec{F}$ distribution of the force under the action of which the center of gravity moves for shuttle-like movement on the coordinate plane, or the density of the force field.

If $div\ F > 0$ the field point is the field source.

I f $div\ F < 0$ the field point is the field sink [2].

To calculate the value $\vec{F}$ for the transition between two adjacent cyclograms, the value of the projections of the resulting force was calculated, under the action of which the center of gravity moves on the coordinate axis:

$F_{xi} = ma_{xi}$

$F_{yi} ma_{yi}$

where F_{xi}, F_{yi} projections of the force acting on the center of gravity for *i* cyclograms, and a_{xi}, a_{yi} projections of accelerations with which the center of gravity moves for *i* cyclograms.

Meaning for $div\,\vec{F}_i$ the transition between two adjacent cyclograms it was calculated by the formula:

$$div\,F_i = \left(\frac{F_{xi} - F_{x(i-1)}}{x_i - x_{i-1}} + \frac{F_{yi} - F_{y(i-1)}}{y_i - y_{i-1}}\right),$$

During the study, the intervals of change in the divergence of the force field for a highly qualified athlete and an athlete at the initial stage of training, the number of sources and sinks of the force field were assessed.

Results of the study and discussion. Figure 1 shows the changes in the divergence values of the force field in which the center of gravity of a highly qualified athlete and a novice athlete moves for one forward movement.

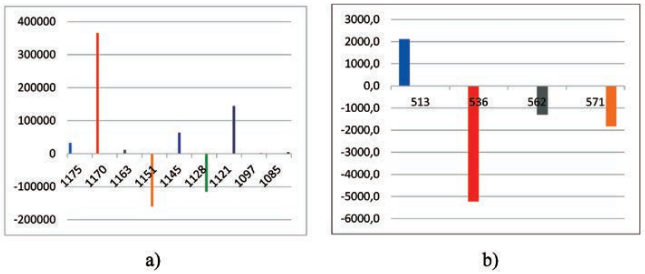


Figure 1. Divergence of the force field in which the athlete's center of gravity moves when moving forward in the shuttle manner a) athlete qualified as a master of sports in jiu-jitsu b) athlete at the initial stage of training

In a highly skilled athlete, the source of the force field can be seen at the beginning of the movement. Then comes the sink. In the middle of the movement, the source of the field is visible again. Then comes the sink. At the end of the movement, the source is visible. In an athlete at the initial stage of training, the source of the force field is visible at the beginning of the movement. Then comes the sink. Then the divergence value approaches zero. The end of the movement ends with the sink. The source of the force field at the end of the movement in a more experienced athlete is associated with the fact that he uses the force of gravity for his movement, and a less experienced athlete, on the contrary, tries to slow down the movement at the landing stage. Therefore, we do not see the source of the force field in a beginner athlete. The source of the force field in the middle of the movement in a highly skilled athlete is not very clearly expressed and, due to the large error of the research method, we cannot speak about it with confidence.

Table 1 shows the limits of change in the values of the divergence of the force field during forward movement and the lengths of the intervals of the divergence values $div\,\vec{F}_i$ for both athletes.

The data presented in Table 1 show that the lower value for a highly qualified athlete it is 30,6 times less than for a beginner athlete. The upper value for a beginner athlete it is 173,0 times less. The overall length of the interval is 71,7 times greater for a highly skilled athlete. This suggests that an experienced athlete is able to create a much greater density of his efforts compared to a less experienced athlete. At the same time, his mass is less than twice as large as that of a beginner athlete. Therefore, we can confidently say that the difference in divergence values is determined not by the difference in body mass, but by the specifics of the movement.

Figure 2 shows the divergence indices of the force field in which the center of gravity moves during the backward movement for both athletes.

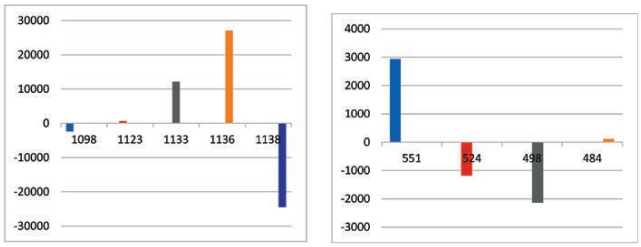
Figure 2 shows that a highly skilled athlete has a drain at the beginning of the movement. However, its value is small and it is impossible to talk about its

Table 1. Value change intervals $div\,\vec{F}_i$ in the process of moving forward

Athletes	Lower limit $div\,\vec{F}_1$	Upper limit $div\,\vec{F}_1$	Interval length $div\,\vec{F}_1$
Highly qualified	-159791,7	365625,0	525416,7
Initial stage of training	-5218,0	2113,1	7331,1

Table 2. Value change intervals $div\,\vec{F}_i$ in the process of moving backwards

Athletes	Lower limit $div\,\vec{F}_1$	Upper limit $div\,\vec{F}_1$	Interval length $div\,\vec{F}_1$
Highly qualified	-8313,95	36761,1236	45075,32
Initial stage of training	-2137,5	2941,071	5078,571



a) b)

Figure 2. Divergence of the force field in which the athlete's center of gravity moves when moving in the shuttle backwards manner a) athlete with the qualification of master of sports in jiu-jitsu b) athlete at the initial stage of training

actual existence due to the error of the method used. Then the source of the field is visible. Then the divergence value remains at the same level, and then the divergence value increases. At the end of the movement, a drain can be seen. For a beginner athlete, the source of the force field is visible at the beginning of the movement. Then two drains can be noted and at the end of the movement, a small source can be assumed.

The origin of the force field at the end of a highly qualified athlete can be explained by the fact that he uses the force of gravity to perform the end of the movement, while a beginner athlete, on the contrary, feeling the acceleration caused by the force of gravity, begins to slow down.

Table 2 shows the largest and smallest values to move backwards.

The data in Table 2 indicate that the minimum value $div\,\vec{F}_i$ y of a highly skilled athlete is 3,9 times less than that of a less experienced athlete. The highest value of a more experienced athlete is 12,5 times greater. The length of the interval in which the value changes $div\,\vec{F}_i$ for a highly qualified athlete it is 8.9 times greater.

It is obvious that the force field in the problem under consideration will be variable, because the center of gravity will move in two opposite directions: forward and backward.

Based on the results of the study, the following conclusions can be made:

- in the case under study, the density of the applied forces is significantly greater for a highly qualified athlete than for an athlete at the initial training stage;
- the range of values of the divergence of the force field is significantly higher for a highly qualified athlete compared to a beginner athlete.

References

1. Levitskiy A.G., Matveev D.A., Potsipun A.A. et al. Biomekhanicheskaya klassifikatsiya priyemov sportivnoy borby. Teoriya i praktika fizicheskoy kultury. 2017. No. 10. pp. 66-68.
2. Fikhtengolts G.M. Kurs differentsialnogo i integralnogo ischisleniya. Leningrad, Fizmatgiz publ., 1963. Vol. 3. pp. 371-372.
3. Shulika Yu.A., Koblev Ya.K., Nevzorov V.M., Skhalyakho Yu.M. Dzyudo. Sistema i borba. Rostov-on-Don: Feniks publ., 2006. 798 p.
4. Sacripanti A.A. Biomechanical Reassessment of the Scientific Foundations of Jigoro Kanos Kodokan Judo. Available at: http://www.academia.edu/2401906/A_Biomechanical_Reassessment_of_the_Scientific_Foundations_of_Jigoro_Kanos_Kodokan_Judo (date of access: 01.03.2018).

The efficiency of developing coordination skills in figure skaters during the initial training phase

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Abstract

Objective of the study was to enhancing the coordination skills of young skaters aged 6-8 years during the initial training phase to enhance their technical proficiency.

Methods and structure of the study. The pedagogical experiment was carried out from June to April of the 2023-2024 educational and training year. The experiment involved figure skaters 6-8 years old with the norm of a young skater and 2-3 youth categories of the State Budgetary Institution of Educational Institution of the Republic of Moldova, Secondary School «Academy of Figure Skating» under the guidance of the Honored Coach of Russia, head coach of the Republic of Mordovia, L.N. Yakovleva. During the year, sets of exercises developed for the experiment for training figure skaters were introduced, and a number of motor and medical-biological tests were carried out to determine the level of development of coordination abilities and the state of the vestibular analyzer.

Results and conclusions. The outcomes of the development of coordination skills in figure skaters during the initial training phase, before and after the experiment described in the article, show a positive trend. There was a substantial enhancement in the development of coordination abilities in figure skaters aged 6-8 years during the initial training phase, which confirms the efficacy of the proposed set of exercises. The research of several authors is examined in the context of the topic, and a set of exercises is practically suggested based on the analysis.

Keywords: *coordination abilities, development of coordination abilities, set of exercises, indicators of development of coordination abilities, initial training stage.*

Introduction. The relevance of the study is due to the modern conditions of development of figure skating, the increasing technical complexity of the skaters' programs, which requires time to master highly coordinated technical elements. The process of teaching complex elements of figure skating, as noted in the Federal Standard1, must be accompanied by a comprehensive physical training. The history of the development of sports emphasizes the importance of creating conditions for the formation of a foundation of various basic movements and physical fitness, taking into account the age characteristics of athletes [5]. However, the rationale for the sports training of figure skaters is poorly presented in scientific and methodological literature, which would take into account the requirements of modern figure skating and the results of assessing the physical fitness of children aged 6-8 years, engaged in the initial training stage.

Objective of the study was to enhancing the coordination skills of young skaters aged 6-8 years during the initial training phase to enhance their technical proficiency.

Methods and structure of the study. The educational experiment was conducted from June to April

[1] Federalnyy standart sportivnoy podgotovki po vidu sporta «Figurnoye kataniye na konkakh ot 30.11.2022 № 1092. Available at: https://fsrussia.ru/files/docs/fssp_fs_301122.pdf (date of access: 08.09.2024).

of the 2023-2024 training year. The experiment involved skaters aged 6-8 with the standard of a young skater and 2-3 youth categories of the State Budgetary Institution of Additional Education of the Republic of Mordovia, the Sports School «Academy of Figure Skating» under the guidance of the Honored Coach of Russia, Head Coach of the Republic of Mordovia, L.N. Yakovleva. The study was conducted in the control and experimental groups, with 10 skaters in each. As part of the experiment, a developed set of exercises was introduced aimed at effectively developing the coordination abilities of skaters at the initial training stage. The set of exercises is presented in the author's course «Basics of Figure Skating for Young Skaters and Their Parents»1 on the online platform Stepik.

Results of the study and discussion. The development of coordination abilities occupies a central place in the theory of the training process of figure skating. From the point of view of physiology, the concept of «coordination» is presented in the form of coordinated activity of individual organs and systems in a holistic physiological act, namely nervous, muscular and motor coordination [4, 8].

In the cybernetic aspect, according to the laws of information process control, dynamic systems, it is generally accepted that the athlete's body carries out a coordinated action at several levels at once in the process of its motor activity: coordination, correction and control of motor acts [4, 9].

Modern researchers (I.V. Absalyamova, D.D. Baranova, N.V. Mitina [1], I.V. Bogdanov, V.V. Gorshkova, N.A. Rychkova [2], E.E. Gubaeva, N.N. Mugallimova [3], and others) continue to study coordination abilities, since they play a key role in the performance of elements by figure skaters, such as jumps, spins, step sequences and spirals. However, it is difficult to understand the polysemic versatility of the term «coordination».

Thus, in a number of studies, the need for the formation and development of coordination abilities during the athletic development of a figure skater is appropriate. Agreeing with the researchers [4, 6, 9, 10], we will understand coordination abilities as the athlete's ability to coordinate movements, accurately measure and regulate the parameters of movements in space, time and dynamics, maintain the position of his own body and perform motor actions without any unnecessary muscle tension, ensuring stability of posture in static positions and balance during movements. As a result of the analysis of the studied studies (E.E. Gubaeva, N.N. Mugallimova [3], K.S. Dunaev, I.O. Cherepanova, S.A. Yarushin [11] and others), interviews with specialists, personal training experience and involvement в эксперимент, были выявлены показатели сформированности координационных способностей:

1) kinesthetic differentiation – an indicator that was assessed using the «throwing the ball into the hoop» exercise. The criterion the highest number of hits (for example, 20) served as the assessment of this indicator;

2) spatial orientation – an indicator that was measured using the «obstacle course» exercise, which the skaters performed on one leg. The subjects were asked to go through an obstacle course of three cones and three gymnastic sticks lying on the ice. They had to go around the cones by pulling on one leg and then jump over all the sticks also on one leg. This exercise had to be completed in a shorter amount of time;

3) complex reaction – an indicator that was measured by performing a rotation in place with a head tilt back (looking at the ceiling), after which, upon a signal, it was necessary to run forward and catch the ball. The distance in centimeters from the place of rotation to the place of contact with the ball was measured. A decrease in the distance served as an improvement in the result. Three attempts were given for this exercise;

4) dynamic balance – an indicator measured when performing a pistol on a bosu sphere. It was proposed to adopt the Biellmann position after performing a pistol on a sphere. The result was improved by reducing the time;

5) rhythm – an indicator measured during the execution of a jump combination with a change of four positions with two repetitions, from the section of the GDE (general development exercises), aimed at identifying a quick reaction to the execution of a certain rhythm and error-free repetition of this combination in a shorter amount of time.

Thanks to the planned use of exercises at the initial training stage, mainly aimed at developing coordination abilities, it was possible to identify the dynamics of growth in the indicators of coordination abilities of figure skaters aged 6-8 years (see table).

To determine the reliability of differences in the average values of the obtained results, we used the Student's t-test. Reliability (P – probability of error) was

[1] Avtorskiy elektronnyy kurs «Osnovy figurnogo kataniya dlya yunykh figuristov i ikh roditeley». Available at: https://stepik.org/198561 (date of access: 08.09.2024).

Results of testing indicators of coordination abilities at the initial training stage in figure skaters aged 6-8 years (n=10 at p> 0,05)

Indicators of the development of coordination abilities		Kinesthetic differentiation, points	Orientation in space, s	Complex reaction, cm	Dynamic balance, s	Rhythm, s
Before the experiment	CG n=10	3,64	12,67	155,6	16,84	18,64
	EG n=10	3,89	12,82	157,2	16,87	18,54
	T P	0,51>0.05	0,30>0,05	0,71>0,05	0,08>0,05	0,23>0,05
After the experiment	CG n=10	9,9	10,45	132,1	14,47	12,2
	EG n=10	19,58	8,14	105,9	11,09	8,21
	T P	21,84>0.05	5,74>0.05	16,79>0.05	11,67>0.05	11,56>0.05

determined according to the table. If the calculated T is greater than the tabular T for n – the number of subjects, then the differences are reliable – $p < 0,05$; $p < 0,01$ or $p < 0,001$ (D.S. Melnikov, 2018 [7]).

Indicators of the formation of coordination abilities (kinesthetic differentiation, orientation in space, complex reaction, dynamic balance, rhythm) are taken to compare the calculated values and identify the reliability of the results obtained.

The effectiveness of the implementation of the selected set of exercises is confirmed by comparative data on the obtained indicators of the formation of coordination abilities before and after the experiment, verification of reliability using the Student's t-test, where the tabular t is 2,15 at $p > 0,05$ gives reason to assert that the indicators after the experiment are higher than before the experiment.

Conclusions. Thus, during the experiment, the obtained results confirmed the effectiveness of the proposed set of exercises, which is expressed in the positive dynamics of the studied indicators of coordination abilities. The conducted study allows us to determine further prospects and directions of research in the field of formation and development of athletes' coordination abilities at subsequent stages of training in figure skating.

References

1. Absalyamova I.V., Baranova D.D., Mitina N.V. Razvitiye koordinatsionnykh sposobnostey u yunykh figuristov. Aktualnyye problemy fizicheskoy kultury, sporta i turizma. Proceedings of the XI International scientific-practical conference, Ufa, March 23-25, 2017. Ufa: GOU VPO «Ufimskiy gosudarstvennyy aviatsionnyy tekhnicheskiy universitet», 2017. pp. 165-169. Available at: https://www.elibrary.ru/item.asp?id=29929076 (date of access: 20.08.2024).
2. Bogdanov I.V., Gorshkova V.V., Rychkova N.A. Razvitiye koordinatsionnykh sposobnostey molodozhi. Chelovek. Sport. Meditsina. 2023. No. 3. pp. 135-141.
3. Gubaeva E.E., Mugallimova N.N. Razvitiye koordinatsionnykh sposobnostey u figuristov gruppy nachalnoy podgotovki. Nauka i sport: sovremennyye tendentsii. 2015. Vol. 8. No. 3 (8). pp. 132-137. Available at: https://www.elibrary.ru/item.asp?id=24229157 (date of access: 20.08.2024).
4. Dveyrina O.A. Koordinatsionnyye sposobnosti: opredeleniye ponyatiya, klassifikatsiya form proyavleniya. Uchenyye zapiski universiteta im. P.F. Lesgafta. 2008. No. 1 (35). pp. 35-38.
5. Mamedov A.A., Sherstyuk M.V., Zaitsev A.A., Gnezdilova E.V. Nauchno-filosofskaya teoriya sporta: realnoye sostoyaniye i perspektivy razvitiya. Teoriya i praktika fizicheskoy kultury. 2024. No. 8. pp. 13-15.
6. Melnikova Yu.A., Mukhina M.P. Dinamika razvitiya dvigatelnykh sposobnostey yunykh figuristov v gruppakh nachalnoy podgotovki pervogo goda obucheniya. Omskiy nauchnyy vestnik. 2015. No. 5 (142). pp. 101-103. Available at: https://www.elibrary.ru/item.asp?id=25048383 (date of access: 20.08.2024).
7. Melnikov D.S., Povareshchenkova Yu.A., Seliverstova V.V., Kudryavtseva N.V. Metody fiziologicheskikh issledovaniy. Study guide. Natsionalnyy gosudarstvennyy universitet fizicheskoy

kultury, sporta i zdorovya im. P.F. Lesgafta, Sankt-Peterburg. St. Petersburg: [n.p.], 2018. 85 p. Available at: https://elibrary.ru/item.asp?id=36336590 (date of access: 20.08.2024).
8. Sadykova S.V., Tarasova E.G. Metodika primeneniya sredstv razlichnykh vidov sporta pri vospitanii koordinatsionnykh sposobnostey u figuristov na etape nachalnoy podgotovki. Sovremennyye problemy nauki i obrazovaniya. 2020. No. 5. 79 p.
9. Serikova Yu.N., Aleksandrova V.A., Nechayeva A.Yu. Koordinatsionnyye sposobnosti: opredeleniye, osnovnyye podkhody k izucheniyu, sovremennyye sredstva i metody razvitiya. Uchenyye zapiski universiteta im. P.F. Lesgafta. 2018. No. 6(160). pp. 224-231. Available at: https://www.elibrary.ru/item.asp?id=35266305 (date of access: 20.08.2024).
10. Trotskaya T.M., Melnikova Yu.A. Soderzhaniye fizicheskoy podgotovki na etape nachalnoy podgotovki v figurnom katanii na konkakh. Fizkulturnoye obrazovaniye Sibiri. 2018. No. 1(39). pp. 47-50. Available at: https://www.elibrary.ru/item.asp?id=41000960 (date of access: 20.08.2024).
11. Cherepanova I.O., Dunaev K.S., Yarushin S.A. Otsenka koordinatsionnoy podgotovlennosti i vestibulyarnoy ustoychivosti figuristov po rezultatam funktsionalnykh prob. Fizicheskaya kultura. Sport. Turizm. Dvigatelnaya rekreatsiya. 2020. Vol. 5. No. 1. pp. 79-82.

Evaluation of the physical condition of gymnasts who specialize in team routines

UDC 796.4

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Abstract

Objective of the study was to creation of assessment exercises to gauge the physical condition of gymnasts participating in team routines.

Methods and structure of the study. Athletes participating in the Masters of Sports program engaged in scientific research. The evaluation tasks, based on the definition of gymnasts' physical fitness, included standards for assessing the level of flexibility, strength, coordination, speed, and special endurance. The evaluation scale for gymnasts' physical fitness was created using average standards for the advanced level in rhythmic gymnastics.

Results and conclusions. The framework of the tasks encompasses both the fundamental principles of pedagogy, applied to the structured educational process, and the principles of sports training, which establish the necessary connections between the training impact and its consequences. The developed assessment instruments will enable professionals to make timely modifications to the training regimen and develop their own approach to sports training.

The developed test tasks will enable coaches to effectively tailor the training regimen and enhance the physical fitness of gymnasts participating in group exercises.

Keywords: *group exercises, rhythmic gymnastics, physical fitness, physical abilities.*

Introduction. The rules of rhythmic gymnastics competitions are currently regularly modified. The search for the optimal combination of Difficulty of the body and the apparatus is underway. The rapid increase in various motor actions with the apparatus is being replaced by a significant complication of the content of Difficulty of the body. Bundles of several elements, waves, and roundabouts have returned to the competitive compositions of gymnasts, which adds spectacle and individuality to the performance. Particular attention is also paid to the stylistic expression of the composition and the interpretation of musical accompaniment by means of combinations of dance steps. A distinctive feature of group exercises is collective activity aimed at achieving the highest sports result. All gymnasts must have an equally high level of physical and technical training. To perform specific components of difficulty, the rules of the competition impose clear performance requirements regarding the height and flight range of the apparatus, which, in turn, changes the pedagogical approaches to the formation of a technically competent performance of a gymnast to perform Difficulty. Based on the above, there is a need to modernize the physical training of gymnasts at all stages of preparation to increase the functional capabilities of the body and improve athletic skills. In order to quickly assess the state of physical fitness of gymnasts, it is necessary to improve the assessment system to meet the needs and technical features of group exercises.

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Results of the study and discussion. Physical training is aimed at developing and improving physical abilities, increasing the body's adaptive reserve, increasing athletic achievements and restoring the body during rehabilitation after injuries [1]. A high level of physical fitness determines the success of mastering various technical groups of movements in rhythmic gymnastics [3]. In domestic scientific literature, coordination abilities (the ability to combine and restructure movements, perform elements at a given pace and rhythm, spatial orientation, balance) and flexibility are traditionally considered the leading physical abilities. Speed and strength abilities are considered complementary, and endurance is secondary. The ratio of special physical training tools is predominant [2]. As a result of the study, the following test tasks were developed to determine the level of physical fitness of gymnasts performing in group exercises.

1. Flexibility. Determining mobility in the hip joints.

Tools:

- "splits" from a support 75 cm high. The distance in centimeters from the groin area to the floor is measured. The "splits" are performed with the right and left legs.

Evaluation indicators:

- significant errors. Distance over 8 cm;
- minor errors. Distance from 1 to 7 cm;
- no errors. Distance 0 cm. Tight fit of the groin area to the floor.

2. Strength abilities. Determining the speed-strength abilities of gymnasts.

Tools:

- "splits". Alternating legs.

Evaluation indicators:

- significant errors. 10-11 jumps, insufficient amplitude less than 180 degrees, legs bent;
- minor errors. 13-14 jumps without distortion of technique, for the required amplitude of 180 degrees;
- no errors. 15 or more jumps, without distorting the technique, for the required amplitude of 180 degrees.

Determination of the gymnasts' own strength abilities.

Means:

- raising legs while hanging on a gymnastic wall. The legs are raised above 160 degrees (above head level). Raising legs through "extension" and alternate lifting is not allowed.

Evaluation indicators:

- significant errors. Performed 8-10 times;
- minor errors. Performed 11-13 times;
- no errors. Performed 14-16 times.

3. Coordination abilities. The level of development of vestibular stability and static balance is determined.

Means:

- forward somersault with balance fixation in various positions ("swallow", "low", "back" with the opposite hand gripping the leg, balance with the leg forward, using the hands at 180 degrees).

Assessment indicators (the exercise is assessed in points from 1-5):

- significant errors. Falling, insufficient amplitude less than 180 degrees, 1-2 points;
- minor errors. The test task is completed with a demonstration of all balances, with sufficient amplitude of 180 degrees or more. There are minor steps and fluctuations during the performance of the test task;
- no errors. Holding positions without moving from the spot, maintaining maximum amplitude, 5 points.

4. Speed abilities. Jumping exercises are performed with a rubber rope.

Tools:

- jumping into the rope with acceleration, from foot to foot (within 20 seconds).

Assessment indicators:

- significant errors. Less than 20 jumps, the rope catches on the foot, stops;
- minor errors. From 21 - 23 jumps;
- no errors. From 24 jumps and more.

5. Special endurance. Jumping exercises are performed with a specialized rope designed for the sport of "rhythmic gymnastics".

Equipment:

- jumping into a rope with double rotation. The maximum number of jumps is taken into account.

Evaluation indicators:

- significant errors. Less than 80 jumps;
- minor errors. From 80 to 99 jumps;
- no errors. More than 100 jumps.

Test tasks are used in accordance with the methodological provisions:

- these exercises are simple to perform, easily measured and visual;

- the exercises are accessible and understandable to all gymnasts performing the testing;

- test tasks must be conducted in the same conditions for the gymnasts.

Conclusions. Thus, test tasks were developed to determine the level of physical fitness of gymnasts. The structure of the tasks included both general pedagogical principles applied for the pedagogically organized process and the principles of sports training, which determined the necessary connections between the training impact and their effect. The developed assessment tools will allow specialists to make timely adjustments to the training process, as well as to design their own concept of sports training.

References

1. Bolotin A.E., Yan Sh. Kharakternyye osobennosti nachalnoy sportivnoy podgotovki yunykh gimnastov 8-10 let. Studencheskiy sport v sovremennom mire. Proceedings of the All-Russian scientific-practical conference with international participation, St. Petersburg, May 17-18, 2024. Sankt-Peterburg: Sankt-Peterburgskiy politekhnicheskiy universitet Petra Velikogo, 2024. pp. 93-95.
2. Udalova M.A., Zyukin A.V. Stabilizatsiya vypolneniya spetsifichnykh komponentov trudnosti v gruppovykh uprazhneniyakh khudozhestvennoy gimnastiki. Izvestiya Tulskogo gosudarstvennogo universiteta. Fizicheskaya kultura. Sport. 2024. No. 1. pp. 93-100.
3. Udalova M.A. Pedagogicheskaya model stabilizatsii vypolneniya spetsifichnykh komponentov trudnosti v gruppovykh uprazhneniyakh. Kultura fizicheskaya i zdorovye. 2023. No. 3(87). pp. 203-206.

Improvement of speed abilities of young tennis players

UDC 796.386

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Abstract

Objective of the study was to theoretically and practically, we will demonstrate the efficacy of the approach to enhancing the speed capabilities of table tennis players.

Methods and structure of the study. The experiment was conducted using the resources of the Rostov-on-Don municipal budgetary institution of additional education «Sports School № 3». The analysis of literary sources, pedagogical observation, pedagogical testing, pedagogical experiment, methods of mathematical statistics are carried out. The direct participants of the pedagogical experiment were 20 young tennis players aged 9-10 years from the groups of primary training at the sports school (PT 3), 10 of whom were included in the experimental group and 10 players in the control group.

Results and conclusions. The outcomes of the trial demonstrated the efficacy of the devised approach in enhancing speed abilities during the educational and training regimen of the tennis players in the experimental group. It was observed that the implementation of specific sets of exercises and game-based activities had a beneficial impact on the performance of all speed-related abilities of the participants in the experimental group, who demonstrated a significant improvement compared to their peers who followed the conventional training program.

Keywords: *table tennis, speed abilities, physical training.*

Introduction. Changes in competition rules, improvements in sports equipment and facilities in table tennis have resulted in an increase in the dynamism and pace of the game, which requires athletes to have a high level of physical, technical and tactical, and psychological preparedness. However, it should be noted that often in sports schools, already at the early stages of training, coaches focus primarily on the technical and tactical training of athletes and do not fully pay attention to the targeted development of physical qualities, in particular speed, which is of decisive importance in the process of developing sports skills. This circumstance determined the relevance of our study, aimed at finding effective ways to improve the methodology for developing speed abilities in table tennis athletes at the initial stage of training.

Objective of the study was to theoretically and practically, we will demonstrate the efficacy of the approach to enhancing the speed capabilities of table tennis players.

Methods and structure of the study. An experimental study aimed at improving the speed abilities of table tennis players at the initial stage of training was conducted from September 2023 to April 2024 at the Rostov-on-Don Municipal Budgetary Institution of Additional Education “Sports School No. 3”.

During the study, a formative pedagogical experiment was organized and conducted, aimed at testing the developed sets of exercises and game tasks for compliance with the tasks to be solved to improve the speed abilities of young athletes. To test the effectiveness of the tools and methods used, a battery of tests was formed to assess all speed parameters important for the further growth of tennis players’ sports skills.

At the end of the study, the data obtained during the pedagogical experiment were analyzed,

theoretical and practical conclusions were formulated.

Results of the study and discussion. Based on the initial data obtained during pedagogical observations of the educational and training process of young athletes in the table tennis department at the initial training stage of the third year of study, it was established that for the development of speed abilities, mainly general preparatory track and field and general developmental gymnastic exercises are used. Analysis of the results of ten training sessions showed that the sports training tools used are mainly aimed at developing the speed of holistic motor actions, and tasks for the speed of a single movement, for a simple and complex motor reaction are practically absent (Figure 1).

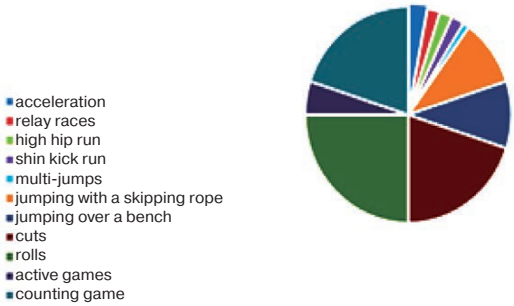

Figure 1. Composition and volume of funds aimed at developing the speed abilities of young tennis players

In order to correct the content of the educational and training process in the experimental group of initial training, sets of exercises and game tasks were compiled aimed at improving all forms of speed abilities necessary in the competitive activity of tennis players.

In particular, to improve the speed of a simple motor reaction, non-specific exercises for reaction speed were used, which were aimed at reducing the latent time between the preliminary and executive commands of the coach. To develop a simple motor reaction at the tennis table, game tasks and selected competitive exercises of a low degree of complexity were used with an installation for a quick response with a certain technical action (push, cut, roll) to a predetermined action of a partner or coach.

As part of the development of the speed of a complex motor reaction in tennis players from the experimental group, special preparatory exercises and game tasks were used with the modeling of holistic competitive actions aimed at reducing the response time to a moving object. The content of the exercises contributed to the improvement of the reaction of choosing from several actions the most adequate in a given situation. During the experiment, when improving the speed of a single movement, necessary for tennis players both in attacking blows and in fast movements and movements near the table, special preparatory exercises with small weights and game tasks to increase the speed-strength capabilities of athletes were used.

The increase in the tempo of single movements and the speed of movements of young tennis players who trained according to the experimental program was carried out with the installation of performing exercises with maximum frequency, while in each subsequent approach it was necessary to try to exceed the result of the previous attempt.

To improve complex forms of manifestation of speed in young tennis players, both specific and non-specific means of sports training in table tennis were used with the use of repeated, competitive, game and variable exercise performance methods.

To test the effectiveness of the developed sets of exercises, a pedagogical experiment was organized and conducted over a period of six months with the participation of 20 young tennis players from the initial training groups of the third year of study, ten of whom were included in the experimental group, and ten in the control group. It should be noted that the difference in the indicators of the level of development of speed abilities between the participants of the experiment was insignificant.

During the formative pedagogical experiment, the control group studied according to the generally accepted training program approved in the sports school, and the content of the training sessions of the experimental group included specially developed sets of exercises and game tasks aimed at improving the speed abilities of young tennis players.

At the beginning and end of the pedagogical experiment, the athletes were tested for the level of development of speed abilities (see table).

Based on the results of the pedagogical experiment, a comparative analysis of all parameters of the speed abilities of tennis players aged 9-10 years revealed significant dynamics of their growth in the experimental group, which was reflected in the final values of the increase in all speed indicators (Figure 2).

Indicators of the level of development of speed abilities of tennis players aged 9-10 years at the beginning and at the end of the experiment

Test name	KG before the experiment	KG after the experiment	With growth in KG, %	EG before the experiment	EG after the experiment	At growth in KG, %
Single movement speed indicators						
Final strike to the distance of rebound from the table, m	3,1±2,74	3,5±1,16	12,91	3,3±1,25	4,1±2,48	24,24
Throwing a tennis ball for distance, m	4,2±0,64	4,4±1,34	4,76	4,4±0,79	6,5±2,47	47,72
Indicators of maximum frequency of single movements						
Tapping test by hands, number of times	26,4±3,01	27,2±2,12	3,90	26,8±1,33	31,3±1,23	16,75
Tapping test with feet, number of times	23,4±1,17	25,1±2,12	7,26	25,1±1,71	31,4±2,65	25,06
Indicators of simple and complex motor reactions						
Ruler test, cm	6,4±1,19	6,1±2,01	4,97	7,1±1,48	5,8±2,11	22,43
Stability of hitting the table, number of times	9,4±1,27	10,4±2,29	10,63	10,1±2,11	13,4±2,71	32,67
Speed indicators in integral motor actions						
20 m run, s	5,1±1,23	5,0±1,77	2,12	4,9±1,92	4,1±0,25	19,51
Movement in a 3-meter zone, number of times	15,3±1,57	16,7±1,78	9.15	17,1±1,45	20,3±2,02	18,71
Jumping rope, number of times	35,2±4,12	39,2±2,16	11,36	32,8±3,49	41,2±2,18	25,61

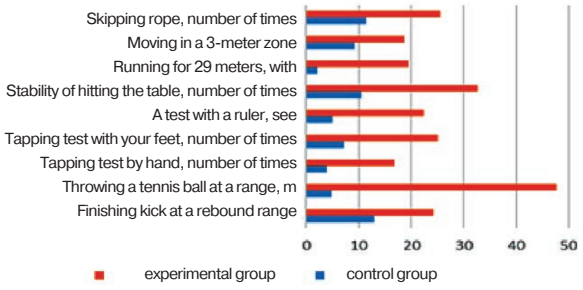

Figure 2. Increase in the level of development of speed abilities of tennis players aged 9-10 years at the end of the experiment

Conclusions. In the presented study, based on the data at the end of the experiment, the effectiveness of the developed method in the process of forming the speed abilities of young table tennis players was proven. It was found that the use of special sets of exercises and game tasks had a positive effect on the indicators of all speed abilities of the participants in the experimental group, who began to significantly surpass their classmates who trained according to the traditional program.

References

1. Agafonov S.V., Mavropulo O.S., Zavodnyy N.A. Nastolnyy tennis. Study methodological guide. Rostov-on-Don: Donskoy gosudarstvennyy tekhnicheskiy universitet, 2022. 37 p.
2. Serova L.K. Teoriya i metodika izbrannogo vida sporta. Nastolnyy tennis. Textbook. Natsionalnyy gosudarstvennyy universitet fizicheskoy kultury, sporta i zdorovya im. P.F. Lesgafta. St. Petersburg, 2013. 232 p.

The dynamics of the condition of athletes depending on organization of training activities high-speed power orientation

UDC 796.015.68

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Abstract

Objective of the study was to discern objective trends that reveal the correlation between the performance of female sprinters and the extensive training regimen they undergo in speed and strength training during the initial phases of the annual cycle.
Methods and structure of the study. Seven young sprinters, aged between 15 and 17, were observed for a period of thirteen weeks. Their specific physical abilities were evaluated through a series of tests, including a ten-fold jump from a standing position and measurements of muscle strength in the isometric mode while extending the leg at the knee and hip joints. The frequency of these tests was two to three times a month, and it was adjusted to coincide with the phases of each athlete's OMC.
Results and conclusions. It was discovered that during the initial six weeks of the program, the athletes experienced a statistically significant decrease in both absolute and explosive strength in the leg extensor muscles, as well as a decline in their performance in the tenfold jump. The subsequent reduction in the jumping and strength training (from the seventh to the thirteenth week) resulted in a substantial improvement in speed and strength indicators. The observed phenomenon in the course of the study aligns with a general biological pattern observed when applying substantial training effects that require a substantial mobilization of energy resources and can disrupt the body's homeostasis, leading to the development of long-term adaptive changes.

Keywords: *short-distance runners, speed-strength training, dynamics of condition, training load, preparedness, indicators.*

Introduction. The effectiveness of the training process largely depends on the competence of the trainer in establishing the relationship between the dynamics of the athlete's condition and the specified training load on various structural units of the annual cycle [2, 3, 6]. At the same time, objective management of the training process is possible only when identifying the individual reaction of the body of those involved to the specific effects of training means [1, 6].

Objective of the study was to discern objective trends that reveal the correlation between the performance of female sprinters and the extensive training regimen they undergo in speed and strength training during the initial phases of the annual cycle.

Methods and structure of the study. Seven short-distance runners (aged 15-17) were observed for 13 weeks. Their level of special training was assessed based on the results of a ten-fold jump from the spot and indicators characterizing the athlete's ability to demonstrate "explosive efforts" that are inaccessible to direct measurement using traditional means. The following were determined on a dynamograph stand: Fmax - the maximum value of force demonstrated in explosive isometric effort (kg); Tmax - the time to reach the maximum force (sec); P0 - absolute muscle strength demonstrated in isometric mode (kg) during leg extension at the knee and hip joints. The frequency of control tests was two to three times a month and was correlated with the phases of the ovarian-menstrual cycle (OMC) of each athlete.

Results of the study and discussion. Figure 1, 2 show how during the performance of a large

volume of speed-strength load (the first 6 weeks) the athletes statistically significantly ($p<0,05$) decreased the indicators characterizing the absolute and explosive strength of the leg extensor muscles. In particular, in the 5th week, when the volume of exercises with weights and jumping exercises was the greatest (Figure 2), the absolute muscle strength decreased by an average of 9,7%, the explosive muscle strength decreased by an average of 11,1%, compared with the background level (Figure 1). Considering the low level of speed-strength training, it can be assumed that at this time not only are the prerequisites for productive work on improving special running training not created, but also conditions arise for injuries to the musculoskeletal system of athletes. After the subsequent decrease in the volume of the load (from the 7th to the 13th week), the athletes showed an intensive increase in the indicators of speed-strength fitness. In the last (13th) week of the study, the explosive power of the leg extensor muscles increased by 13,5%, the results in the 10-fold jump from the spot increased by 7,1%, compared with the initial level in the first week of observation (Figure 1). Thus, the increase in the level of speed-strength fitness of the runners after volume loads of a strength and jumping nature is a phenomenon of the delayed cumulative training effect (DCTE), repeatedly noted in the theory and practice of sports as a natural manifestation of the aftereffects of performing a large training load [2, 3, 5]. The high level of motor potential of the athletes during this period creates a favorable functional background for targeted work on improving special running fitness.

Conclusions. The temporary decrease in speed-strength preparedness recorded during the study

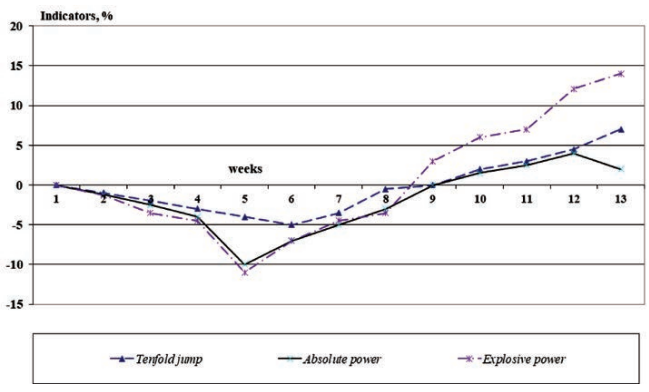

Figure 1. Dynamics of control indicators in short-distance runners during pedagogical observations

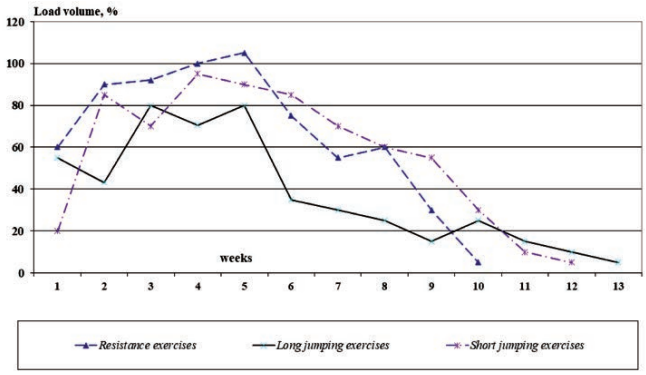

Figure 2. Dynamics of the volume of speed-strength load in short-distance runners during pedagogical observations

reflects the general biological regularity of the body, observed when using significant training effects that can cause a violation of the body's homeostasis and, thus, cause the development of long-term adaptive changes [2, 5]. In this case, the depletion of the body's energy resources caused by physical activity is compensated by exceeding the initial level, as a result of which the functional capabilities of the body increase, which brings it to a higher level of performance [5]. It is also important that after an intense training load, the athlete's body needs a certain period of time to adapt to the level of load and consolidate the required adaptive changes [2, 3]. The obtained results, characterizing the dynamics of the recorded indicators from the biorhythmics of the OMC course of runners, are also noteworthy. Thus, the highest level of strength capabilities in the observed athletes was recorded in the postmenstrual and postovulatory phases ($p < 0.05$). This fact should also be taken into account when planning speed-strength work in women's training. Thus, the conducted pedagogical observations have sufficiently fully characterized the features of training structure for short-distance runners in the preparatory period of the macrocycle, and also showed the existence of a relationship between the dynamics of the indicators of special training of athletes and the speed-strength load performed. Based on this, their training process should be planned with the expectation, first of all, of a very specific (and pre-supposed!) orientation in the individual dynamics of the level of special training of the athlete and organized in such a way as to achieve the desired level of the corresponding indicators by the time of the most important competitions in the upcoming season [4, 7].

References

1. Bondarchuk A.P. Upravleniye trenirovochnym protsessom sportsmenov vysokogo klassa. Moscow: Olimpiya Press publ., 2007. 272 p.
2. Verkhoshanskiy Yu.V. Programirovaniye i organizatsiya trenirovochnogo protsessa. Moscow: Fizkultura i sport publ., 1985. 176 p.
3. Vrublevskiy E.P. Osobennosti podgotovki sportsmenok v skorostno-silovykh vidakh legkoy atletiki. Teoriya i praktika fizicheskoy kultury. 2005. No. 7. pp. 60-63.
4. Kozhedub M.S., Godun D., Vrublevskiy E.P. Postroyeniye godichnogo makrotsikla beguniy na korotkiye distantsii na etape uglublennoy spetsializatsii. Teoriya i praktika fizicheskoy kultury. 2022. No. 6. pp. 17-19.
5. Meyerson F.Z. Adaptatsionnaya meditsina. Mekhanizmy i zashchitnyye effekty adaptatsii. Moscow: Hypoxia Medical LTD publ., 1993. 138 p.
6. Platonov V.P. Sistema podgotovki sportsmenov v olimpiyskom sporte. Obshchaya teoriya i yeye prakticheskiye prilozheniya. K.: Olimpiyskaya literature publ., 2004. 808 p.
7. Khao U., Kozhedub M.S., Vrublevskiy E.P. Podgotovka molodykh sportsmenok v bege na korotkiye distantsii v godichnom tsikle trenirovki. Teoriya i praktika fizicheskoy kultury. 2022. No. 11. pp. 33-36.

A method for personalizing the training regimen for elite female athletes in modern pentathlon over an annual training cycle

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Abstract

Objective of the study was to create and support a method for personalizing the year-long training of elite athletes in modern pentathlon.

Methods and structure of the study. The research was conducted at the Gomel Olympic Reserve Center for Applied Sports and the Scientific Research Laboratory of the Gomel State University named after F. Skorina. The study aimed to establish a systematic approach to personalizing the training of female athletes in modern pentathlon. The developed algorithm was implemented in the training of six elite athletes.

Results and conclusions. A series of steps has been devised to tailor the training of athletes in the sport of modern pentathlon, which encompasses a range of activities. These include:

a) Identifying the collective and personal characteristics of the athletes' competitive performance and readiness, which serves as the foundation for creating personalized training plans.

b) Establishing the individualized approach to training, selecting the appropriate tools, and determining their distribution within the annual training cycle.

c) Considering the interplay between training load, physical attributes, psychological factors, and biorhythms, we design a personalized training program for the athlete, spanning an entire annual cycle.

The final phase of this process involves monitoring the planned and actual performance indicators, making adjustments to the training regimen, and evaluating the athlete's performance in both training and competition.

The efficacy of the algorithm we developed is evident from the substantial enhancement in the physical and athletic performance of the athletes who participated in the study, as well as the improvement in their results in the events of modern pentathlon.

Keywords: *qualified female athletes, modern pentathlon, algorithm, modeling, planning, individualization.*

Introduction. Tracing the dynamics of views on the process of training highly qualified female athletes and trying to identify the main central link, we certainly encounter the problem of individualization. The latter is justified by the fact that the highest result in sports is a singular and unique phenomenon, and preparation for it requires each time the search for new ways. Therefore, the transformation of general patterns of growth of sports skills through the prism of individual characteristics of an athlete is an extremely difficult task, and an active search for reserves of sports training puts the individualization of the training process among the most priority researched problems.

Sports all-around events are distinguished by increased demands on athletes due to the need to show high results in motor actions that vary in kinematic and dynamic structure. Thus, representatives of the modern pentathlon must have a whole complex of seemingly incompatible motor abilities, characteristic of athletes specializing in swimming, fencing, equestrian sports, shooting and running. The mutual, not always positive, influence of the types included in complex sports all-around events requires a special approach to planning the training process. In addition, the coach

must take into account the biological characteristics of the female body [1, 8].

Experts attribute the following to the main areas of individualization of training of qualified female athletes: modeling the competitive structure and level of special training, adequacy of the content of training and competitive loads to the morphofunctional characteristics of athletes, taking into account the current state of athletes and fluctuations in performance in connection with the phases of the OMC, correction of training, competitive and non-training effects in accordance with the individual characteristics of athletes [2, 7].

An analysis of specialized literature shows that almost all modern literary sources available to us, considering the features of individualization of the training process in women's sports, are devoted to individual types (athletics, swimming, rowing, etc.), less often to sports games. Research studying this problematic field in complex types of all-around events is represented by isolated publications. It should be emphasized that recent years have been marked not only by changes in competition rules, but also by the indefinite suspension of Russian and Belarusian athletes from participation in international competitions. All this seriously complicates the process of planning the training process.

Objective of the study was to create and support a method for personalizing the year-long training of elite athletes in modern pentathlon.

Methods and structure of the study. The research was conducted at the Gomel Olympic Reserve Center for Applied Sports and the Scientific Research Laboratory of the Gomel State University named after F. Skorina. The study aimed to establish a systematic approach to personalizing the training of female athletes in modern pentathlon. The developed algorithm was implemented in the training of six elite athletes.

Results of the study and discussion. An analysis of literary data, recommendations from experts, our own practical experience and experimental research made it possible to develop an algorithm for individualizing the annual training of qualified female athletes in modern pentathlon.

The developed algorithm has three blocks: analysis, development and management. It highlights two most significant objects of individualization – competitive activity, reflecting the totality of the athlete's actions during the competition and the training process - the main way of preparing athletes for competitive activity.

The analysis block includes an assessment of the integral components of individual competitive activity and the leading specific qualities and abilities that ensure the effectiveness of its manifestation. Thus, based on the analysis of the competitive activity of the world's strongest athletes [3, 5, 7], group models are created, from which a model is selected that is closest to the individual characteristics of the competitive activity of a specific athlete, including the possible range of results in various types of pentathlon. Then a promising model of the individual level of development of the motor potential and functional characteristics of the athlete's body, parameters of technical skill that determine and limit the components of her competitive profile in the following year is developed.

The development block assumes an individual focus of the training process, for which the necessary training effects are selected and their distribution in the structural units of the annual cycle is specified. The model of the annual cycle planning structure is developed based on traditional, generally accepted theoretical approaches to planning the training process [2, 5], taking into account the features of the competition calendar and individual adaptive capabilities of the athlete, a detailed analysis of previous training cycles. When building a training process in various all-around events, specialists recommend paying special attention to the types to which athletes have a pronounced predisposition [3, 5]. The annual training cycle we developed included two macrocycles. The first (September-March) consists of a general preparatory (3 mesocycles) and special preparatory (2 mesocycles) stage, a competitive (1 mesocycle) and a transitional period (1 mesocycle). The second (March-August) includes a general preparatory (1 mesocycle) and special preparatory stage (2 mesocycles), a competitive stage (5 mesocycles) and a transition period (1 mesocycle).

The training process management unit involves organizing individualized training of the all-around athlete in an annual cycle, which is based on taking into account the relationship between the training load and the condition, morphological, psychological and biorhythmological characteristics of the athlete. In turn, the final stage of training process management is monitoring the planned and actual indicators, with subsequent correction of the training effects and

competitive activity of the all-around athlete. The effectiveness of the training program was ensured by a feedback system, the function of which was to regularly (two to three times a month) control assessment of the current state of the athlete, the level of her technical skill, comparison of real characteristics with model ones and correction, if necessary, of the training program. For this purpose, the most informative physical tests, indicators of functional and technical readiness were selected, having a high correlation with the competitive result [4, 6]. At the same time, the training program acted as the main technological basis for turning the target setting into reality. The organization of the training process for female athletes requires taking into account the biological cycle of their body's biorhythmics [1, 8]. In this case, special attention is paid to the premenstrual and menstrual phases of the OMC, in which physical performance is at a relatively low level. As a rule, in these phases, an "unloading" week of the mesocycle should be planned.

Conclusions. The practical implementation of the developed algorithm in a pedagogical experiment made it possible to significantly reduce the total annual volumes of training loads of various types, since its organization was more efficient and individualized. In addition, the developed content and distribution of training effects made it possible to streamline and facilitate current and stage control. Analysis of the data obtained based on the results of competitive activities in the 2022-23 season revealed a statistically significant improvement in the results in such pentathlon disciplines as fencing and combined relay, as well as in the final pentathlon total. Thus, the basis of the methodology for individualization of training in modern pentathlon should be an integrated approach that helps to combine into a single whole different aspects of an athlete's preparedness, components of her athletic skills for the implementation of effective competitive activities. The organization of individualized preparation of a multi-event athlete in the annual macrocycle should be based on the consideration of the adequacy of the magnitude and direction of the assigned training effects to the athlete's condition, her morphological, psychological and biorhythmological features. At the same time, the central place in the individual preparation system should be occupied by exercises that are the main elements of competitive disciplines and are as close to them as possible in form, kinematic and dynamic structure, the mode of operation of the neuromuscular apparatus and the activity of the functional systems of the multi-event athlete's body.

References

1. Asinkevich R., Sevdalev S.V., Vrublevskiy E.P. Osobennosti proyavleniya polovogo dimorfizma u vysokokvalifitsirovannykh sportsmenov, spetsializiruyushchikhsya v sovremennom pyatiborye. Teoriya i praktika fizicheskoy kultury. 2022. No. 1. pp. 17-19.
2. Verkhoshanskiy Yu.V. Programirovaniye i organizatsiya trenirovochnogo protsessa. Moscow: Fizkultura i sport publ., 1985. 176 p.
3. Dobrynskaya N., Kozlova E. Modelirovaniye sorevnovatelnoy deyatelnosti kak osnova individualizatsii postroyeniya mnogoletney podgotovki v legkoatleticheskom mnogoborye (zhenshchiny). Nauka v olimpiyskom sporte. 2013. No. 3. pp. 31-37.
4. Sevdalev S.V., Borovaya V.A., Netsvetayeva E.S., Vrublevskiy E.P. Organizatsiya makrotsikla podgotovki vysokokvalifitsirovannykh sportsmenok, spetsializiruyushchikhsya v sovremennom pyatiborye. Teoriya i praktika fizicheskoy kultury. 2023. No. 9. pp. 94-96.
5. Platonov V.N. Sistema podgotovki sportsmenov v olimpiyskom sporte. Obshchaya teoriya i yeye prakticheskiye prilozheniya. Kiyev: Olimpiyskaya literature publ., 2004. 808 p.
6. Sevdalev S.V., Kotovenko S.V., Vyrskiy M.M. Osobennosti funktsionalnoy podgotovlennosti sportsmenok, zanimayushchikhsya sovremennym pyatiboryem. Izvestiya Gomelskogo gosudarstvennogo universiteta im. F. Skoriny. 2022. No. 5(134). pp. 72-76.
7. Sevdalev S.V., Vrublevskiy E.P., Narskin G.I. Individualnyye osobennosti struktury sorevnovatelnoy deyatel'nosti vysokokvalifitsirovannykh sportsmenok, spetsializiruyushchikhsya v sovremennom pyatiborye. Chelovek. Sport. Meditsina. 2023. Vol. 23. No. 2. pp. 150-158.
8. Shakhlina L.Ya.-G. Mediko-biologicheskiye osnovy sportivnoy trenirovki zhenshchin. K.: Nauk. dumka publ., 2001. 326 p.

The impact of intermittent normobaric hypoxia-hypoxic training on the blood and biochemical parameters of an athlete

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Abstract

Objective of the study was to assess the impact of intermittent hypoxia-hypoxic training on the biochemical and hematological characteristics of an athlete.

Methods and structure of the study. The research involved a group of ten male athletes aged 16 to 17, who were swimmers and had achieved the level of first-category sports and were candidates for master of sports. The athletes were in the preparatory phase of their training.

All participants underwent a series of interval normobaric hypoxia-hypoxic training sessions using the OXYTERRA device, a Russian-made device. The training protocol consisted of five cycles, each cycle consisting of five minutes of hypoxia (oxygen concentration of 13%) followed by three minutes of hyperoxia (oxygen concentration of 32%).

Results and conclusions. It has been confirmed that of interval normobaric hypoxia-hypoxic training results in a rise in hemoglobin levels following a series of treatments for athletes who engage in swimming. The analysis revealed statistically significant variations in lactate dehydrogenase activity before and after the treatment cycle, indicating an enhancement in the delivery of oxygen to tissues and an activation of recovery processes in athletes.

Keywords: *interval hypoxic-hyperoxic training, athletes, hemoglobin, creatine kinase, lactate dehydrogenase.*

Introduction. In clinical practice, interval hypoxic-hyperoxic training (IHHT) at normal atmospheric pressure (normobaric) is widely used, but the use of such therapy to improve recovery processes and the effect on the dynamics of hematological and biochemical markers in athletes has been little studied. All tissues of our body require a constant supply of oxygen at a rate corresponding to changing metabolic needs. The oxygen delivery chain begins in the lungs and ends in the mitochondria, the search for factors that allow regulating and activating the work of each link in the process of restoring the functional state of the body, ensuring an increase and expansion of the athlete's functional reserves is an urgent task of sports medicine. Hypoxia in organs and tissues activates increased pulmonary ventilation, an increase in the minute volume of blood circulation, a decrease in blood pressure, as well as the activation of biochemical reactions at the cellular level aimed at overcoming the lack of oxygen [1]. Hyperoxia, in turn, increases the level of oxyhemoglobin and tissue oxygen saturation, increases the rate of oxygen utilization, namely the intensity of the aerobic pathway of ATP synthesis in mitochondria, increases the rate of calcium transport, increasing the contractile function of muscles [8].

Objective of the study was to assess the impact of intermittent hypoxia-hypoxic training on the biochemical and hematological characteristics of an athlete.

Methods and structure of the study. The scientific experiment involved 10 male athletes, aged 16-17, swimming, 1st sports category and candidates for master of sports, in the preparatory period. The training sessions were held as usual 10-11 times a week for 1.5-2 hours. All athletes underwent interval normobaric hypoxic-hyperoxic training according to the standard protocol: 5 cycles, including 5 minutes of hypoxia (oxygen concentration 13%) and 3 minutes of hyperoxia (oxygen concentration 32%). There were 2-3 training sessions per week, 10 training sessions in total. Interval normobaric hypoxic-hyperoxic training was performed using the OXYTERRA device, Russia. Venous blood was collected before the IHGT procedure, after 1 training session, and after the interval normobaric hypoxic-hyperoxic training course. Biochemical parameters were determined in blood serum using vacuum tubes with a coagulation activator. The serum was obtained by centrifugation at 10 000 rpm for 15 minutes on a Mindray 800 automatic biochemical analyzer (China) using calibrators and control materials from the manufacturer. The dynamics of the following biochemical parameters were determined: lactate dehydrogenase (LDH) and creatine phosphokinase (CPK) activity; concentration of total protein, urea, creatinine, cholesterol and triglycerides; level of iron, phosphorus, calcium in the blood serum. Clinical blood analysis was performed in whole venous blood taken on a Mindray BC-6800 Plus automatic hematology analyzer; the number of erythrocytes, leukocytes, platelets, hemoglobin, hematocrit volume, erythrocyte indices, the number of reticulocytes and the content of hemoglobin in a reticulocyte (RHE) were determined.

Results of the study and discussion. According to the clinical blood test, no parameters exceeding the reference value limits were detected before and after interval normobaric hypoxic-hyperoxic training (Table 1).

Initially, the clinical blood test parameters did not exceed the reference values. After 1 training session,

Table 1. Results of clinical blood analysis for the entire observation period

Indicators	Group 1 (Before) M±SD (min;max)	Group 2 (1 procedure) M±SD (min;max)	Group 3 (10 procedures) M±SD (min;max)	p
Erythrocytes, 10^12/l	4,8± 0,25 (4,5;5,2)	4,8 ±0,27 (4,4;5,3)	4,96 ±0,3 (4,6;5,7)	p>0,05
Hemoglobin, g/l	145 ±6 (137;152)	148 ±5 (140;157)	153 ±5 (146;164)	$p_{1,3}$=**0,01**
Hematocrit, %	43,7 ±1,6 (41,7;46,3)	43,1± 1,7 (41;45,8)	44 ±2 (41,5;48)	p>0,05
MCV, fl	90,2 ±2,7 (84,7;94,6)	89,5 ±2,5 (84,6;93,4)	89,9± 2,6 (84,2;94)	p>0,05
MCH, pg	30,5± 1,2 (27,9;32,1)	30,5±0,9 (28,7;31,6)	30,6 ± 0,9 (28,7;31,5)	p>0,05
MCHC, g/l	339 ± 8 (330;355)	341± 7 (330;353)	340 ±4 (334;349)	p>0,05
RDW, %	13 ±0,6 (12,2;14)	12,9 ±0,6 (12;13,7)	12,9 ±0,5 (12;13,5)	p>0,05
Reticulocytes, 10^12/l	0,07± 0,02 (0,05;0,12)	0,07± 0,01 (0,05;0,11)	0,07 ±0,02 (0,06;0,12)	p>0,05
RHE, pg	29,6 ±1,6 (25,3;30)	29,6 ±1,6 (25;31)	30 ±0,7 (28;31)	p>0,05
Platelets, 10^9/l	259 ±40 (213;319)	258± 32 (219;307)	262 ±44 (211;319)	p>0,05
Leukocytes, 10^9/l	5,1±0,7 (3,6;6)	5,7± 1,3 (3,9;8,6)	5,3±0,7 (4,6;6,5)	p>0,05
Neutrophils, %	51,2±7 (41,8;62)	57,3± 11 (41;78)	48± 17 (37;58)	p>0,05
Lymphocytes, %	36,3± 6,2 (29,1;45,5)	32,6 ±9,4 (14;49)	34,5± 4,2 (29;44)	p>0,05
Monocytes, %	8,5± 0,9 (7,1;10,4)	7,2 ±1,1 (5,5;9,2)	8,5±0,85 (7;9,6)	p>0,05

no statistically significant differences were found. After 10 procedures, a statistically significant difference in hemoglobin concentration was noted and amounted to 153±5 g/l (p=0,01).

The biochemical blood test data are presented in Table 2.

Most of the parameters before training did not exceed the reference limits. Creatine phosphokinase activity before training was increased and amounted to 254±203 (min58; max750) U/L. No statistically significant differences were found after 1 procedure. After 10 procedures, a statistically significant difference was noted in the serum iron content and amounted to 16±6 μmol/L (p=0,01) and lactate dehydrogenase activity – 152±31 U/L (p=0,04). A tendency towards a decrease in creatine phosphokinase activity was revealed – 154±62 U/L (p>0,05). Our study has shown for the first time an increase in hemoglobin concentration after a course of interval normobaric hypoxic-hyperoxic training in swimmers (p=0.01). This is due to the activation of hematopoiesis under the influence of alternating hypo- and hyperoxia [4, 6, 7]. But the activation was smooth, since no increase in the number of erythrocytes and reticulocytes was noted.

The study observed a decrease in the content of serum iron in athletes after the end of the cycle of procedures (p = 0.01), but within the reference values. Thus, no iron deficiency was detected, in addition, the hemoglobin content in reticulocytes (RHE) was within the normal range, which indicates the safety and physiological nature of such a decrease and proves the effectiveness of normobaric hypoxic-hyperoxic training.

In the biochemical blood test, an assessment was made of a group of markers of muscle damage induced by regular intense physical activity. These markers include urea, creatinine, CPK, LDH. The average value of urea and creatinine both before and after the therapy were within the reference values, which indicates that the athletes received adequate physical activity. No effect of the interval normobaric hypoxic-hyperoxic training on these parameters was noted. The average value of creatine kinase activity exceeded the reference level for the entire observation period. Since the generally accepted clinical norms of enzyme activity were developed without taking into account the effect of physical activity, therefore, the increased average data on the marker level obtained in our study can

Table 2. Results of biochemical blood analysis for the entire observation period

Indicators	Group 1 (Before) M±SD (min;max)	Group 2 (1 procedure) M±SD (min;max)	Group 3 (10 procedures) M±SD (min;max)	p
Total protein, g/l	71,2 ±3,9 (64;77)	71,6 ±4,9 (65;77)	69,8 ±3 (65;73)	p> 0,05
Urea, mmol/l	5,4 ±1,3 (3,6;7,6)	4,9 ±1,02 (3,8;7,1)	5,2 ±0,7 (3,8;6,3)	p>0,05
Creatinine, μmol/l	94 ±18 (72;122)	94± 22 (60;125)	90 ±17 (60;115)	p>0,05
CPK, U/L	254 ±203 (58;750)	319 ±286 (57;914)	154± 62 (75;240)	p>0,05
Cholesterol, mmol/l	3,8 ±1,6 (2,45;6)	4,1 ±1,2 (2,9;6,4)	4,1 ±1,2 (2,7;6,4)	p>0,05
Triglycerides, mmol/l	1 ±0,6 (0,4;2,1)	0,9 ±0,6 (0,3;2,5)	1,4± 0,9 (0,4;2,8)	p>0,05
LDH, U/L	174 ±33 (137;242)	181 ±28 (151;235)	152± 31 (110;216)	$p_{1,3}$ = **0,04**
Iron, μmol/l	22±5 (16;35)	20± 5 (14;32)	16 ±6 (8;31)	$p_{1,3}$ = **0,01**
Phosphorus, mmol/l	1,3 ±0,2 (0,9;1,6)	1,1 ±0,2 (0,9;1,6)	1,5 ±0,08 (1,4;1,6)	p>0,05
Calcium, mmol/l	2,5± 0,09 (2,4;2,7)	2,56 ±0,1 (2,4;2,7)	2,62± 0,05 (2,5;2,7)	p>0,05

be considered an adaptive response of the athlete's body to the load [2, 5]. After the cycle of procedures, a tendency towards a decrease in enzyme activity in the blood was noted, which indicates an improvement in recovery processes under the influence of interval normobaric hypoxic-hyperoxic training. The study obtained statistically significant differences in LDH activity before and after the cycle of procedures, which shows an improvement in blood supply and oxygen delivery to tissues, as well as activation of recovery processes in athletes under the influence of interval normobaric hypoxic-hyperoxic training [3].

Conclusions. Inclusion of interval normobaric hypoxic-hyperoxic training in courses into the training process leads to acceleration of recovery processes and better tolerance of constantly increasing physical loads. To assess the effectiveness of the interval normobaric hypoxic-hyperoxic training program, the clinical significance of determining the dynamics of hemoglobin, serum iron, creatine phosphokinase and lactate dehydrogenase in the blood is shown.

References

1. Primeneniye apparata dlya polucheniya gipoksicheskikh, giperoksicheskikh i normoksicheskikh gazovykh smesey «OXYTERRA» v klinicheskoy praktike. Guidelines. St. Petersburg, 2024. 14 p.
2. Callegari G.A., Novaes J.S., Neto G.R., Dias I., Garrido N.D., Dani C. Creatine Kinase and Lactate Dehydrogenase Responses after Different Resistance and Aerobic Exercise Protocols. J Hum Kinet. 2017 Aug 1;58:65-72. doi: 10.1515/hukin-2017-0071. PMID: 28828078; PMCID: PMC5548155.
3. Chen X., Liu L., Kang S., Gnanaprakasam J.R., Wang R. The lactate dehydrogenase (LDH) isoenzyme spectrum enables optimally controlling T cell glycolysis and differentiation. Sci Adv. 2023 Mar 24;9(12).
4. Gaur M., Sehgal T. Reticulocyte count: a simple test but tricky interpretation! Pan Afr Med J. 2021 Sep 2;40:3. doi: 10.11604/pamj.2021.40.3.31316. PMID: 34650653; PMCID: PMC8490160.
5. Koch A.J., Pereira R., Machado M. The creatine kinase response to resistance exercise. J Musculoskelet Neuronal Interact. 2014;14:68-77.
6. Pinto J.M., Nogueira L.S., Rios D.R.A. Hematological parameters: is there a difference between those released by the hematological analyzer and to the customer? Einstein (Sao Paulo). 2023 Dec 22;21:eAO0501. doi: 10.31744/einstein_journal/2023AO0501. PMID: 38126661; PMCID: PMC10730264.
7. Piva E., Brugnara C., Spolaore F., Plebani M. Clinical utility of reticulocyte parameters. Clin Lab Med. 2015 Mar;35(1):133-63. doi: 10.1016/j.cll.2014.10.004. Epub 2014 Nov 26. PMID: 25676377.
8. Salvagno M., Coppalini G., Taccone F.S., Strapazzon G., Mrakic-Sposta S., Rocco M., Khalife M., Balestra C. The Normobaric Oxygen Paradox-Hyperoxic Hypoxic Paradox: A Novel Expedient Strategy in Hematopoiesis Clinical Issues. Int J Mol Sci. 2022 Dec 21;24(1):82. doi: 10.3390/ijms24010082. PMID: 36613522; PMCID: PMC9820104.

The impact of peak aerobic capacity on the performance of elite ski racers aged 18 to 20 in competitions at different distances

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Abstract

Objective of the study was to assess the impact of indicators of peak aerobic capacity in elite ski racers aged 18-20 on their performance in key races at different distances during the 2023-2024 ski racing season.

Methods and structure of the study. The research project encompassed 11 athletes, aged between 18 and 20, who were experts in different sports. They had achieved the rank of CMS or MS. The study focused on their maximum aerobic capacity, evaluating their overall physical performance, strength, and the efficiency of their oxidative and lactic acid energy systems.

Results and conclusions. It was discovered that the success of performances at goal-oriented events in cross-country skiing is largely determined by the extent to which the absolute and relative (related to the physical effort exerted) level of maximum oxygen consumption is developed, as well as the intensity of the lactic acid energy system's functioning, which contributes to the overall energy capacity required for muscular activity.

Keywords: *cross-country skiing, highly skilled athletes aged 18-20 years, aerobic performance, power of oxidative and lactic acid energy systems, sports results, different cross-country skiing distances, correlation relationship.*

Introduction. The results of the conducted studies [1, 2] showed that the effectiveness of competitive activity, both for adults and young athletes, significantly depends on the formation of the main energy supply systems (oxidative and lactic acid), the differentiated significance of which (in terms of contribution to the sports result) is determined by the requirements of the specifics of competitive activity [3, 4]. One of the possible areas for improving the training process is the study of correlation relationships and establishing the significance of indicators reflecting the influence of the functional capabilities of the oxidative and lactic acid energy systems on achieving a high sports result, taking into account the specifics of muscle activity [5]. In this regard, for scientifically based management of the training of highly qualified young athletes, specialists need to have information not only on the level of development of the functional capabilities of the oxidative and lactic acid energy systems, but also on the degree of relationship of the selected indicators with the sports result at various distances of cross-country skiing [6, 7].

Objective of the study was to assess the impact of indicators of peak aerobic capacity in elite ski racers aged 18-20 on their performance in key races at different distances during the 2023-2024 ski racing season.

Methods and structure of the study. The solution to the set goal was carried out on the basis of the following research methods: pedagogical; ergometric methods, ensuring the implementation of the test procedure on a running treadmill, mathematical and statistical methods [8].

A feature of the procedure for carrying out a stepwise increasing load was its implementation on a Cosmos Quasar Med running treadmill (Germany) with an initial running speed of 3,0 m/s, at an inclination angle of 1o and a duration of the loading step of 3 minutes,

the increase in load was carried out by increasing the running speed by 0,5 m/s. The choice of the testing protocol (tested when working with highly qualified athletes of national teams) ensured the step-by-step implementation of muscle activity in the range from moderate to submaximal power, ensuring an exit to the maximum level of functioning of the oxidative and lactic acid energy systems [9, 10]. During the test loads, the following indicators were recorded and calculated, which are included in the nomenclature of the 2022 Olympian model characteristics [10]: maximum running speed at failure, maximum oxygen consumption (absolute and relative value), maximum lactate concentration.

During the 2023-2024 sports season, 11 athletes of the Russian junior national cross-country skiing team aged 18 to 20 years, with qualifications from CMS to MS, were observed.

To achieve the stated goal of the study, the magnitude and direction of the correlation coefficients were considered through the nature of the relationship "selected indicator" – "goal-setting significance of the selected competition". That is why, in order to identify the influence of maximum aerobic performance on sports results, the nature of the correlation links between the functioning indicators of the oxidative (VO_{2max}, VO_{2max}/kg) and lactic acid (maxLa) energy systems and their implementation manifestation in the test load (Vmax) and the results of performances at various distances of individual sprint (qualifying races), individual races (10-20 km), skiathlon (20 km) and mass starts (10-50 km) were studied at the following stages of the 2023-2024 annual cycle: at the end of the snowless stage of the preparatory period, including the All-Russian Competitions (ARC) and the Summer Championship of Russia (Arkhangelsk Region, mid-late September), the middle and end of the competitive period, including the II All-Russian Spartakiad of the strongest athletes of Russia (VUSSR, Tyumen, February), the Championship of Russia 19-20 years old (PR19-20, Kirovo-Chepetsk, mid-to-late February), Russian Championship 21-23 years old (PR21-23, Syktyvkar, late February), Russian Championship (Championship of Russia, Arkhangelsk Region, mid-March), Russian Cup Final (FKR, Kirovsk, early April) and Russian Championship 19-20 years old (PR19-20, Monchegorsk, mid-April), the timing of which is associated with reaching the peak level (February, March) at the main starts of the season (VUSSR, PR19-20, PR21-23, Championship of Russia), as well as the LCR races (September) at the end of the snowless stage of the preparatory period and the FKR and PR19-20 years old (April) at the end of the competitive period.

Results of the study and discussion. The following recorded and calculated parameters were used for the correlation analysis: body mass (BM), running speed at work refusal in the step test (Vmax), absolute and relative values of maximum oxygen consumption (VO_{2max}, VO_{2rel}), maximum lactate concentration (maxLa) and sports results at the main starts of the season.

The dynamics of the correlation coefficients of the body mass (BM) indicator, reflecting the current state of the morphological status, is characterized by a predominantly unidirectional by the sign «+» change in the tightness of the relationship in the range from 0,092 to 0,660 (and only at the winter Russian Championships minus 0,234) in the individual sprint, multidirectional by the sign (+/-) from -0,113 to 0,647 in individual races, from -0,256 to 0,014 in the skiathlon and from -0,714 to 0,703 in the mass start. The direction of the peak level of the correlation relationship (Rtk) of the studied indicator with sports results in the individual sprint with the sign «+» falls on the FKR race in Kirovsk (Rtk = 0,610, April), with the sign «-» on the race of the winter Russian Championship in the Arkhangelsk region (Rtk = -0,234, March), in individual races with the sign «+» falls on the FKR race in Kirovsk (Rtk = 0,815, when moving in skating style, April), with the sign «-» on the race of the winter Russian Championship (and summer Russian Championship) in the Arkhangelsk region (Rtk = -0,113 and -0,140, respectively, March and September), in the skiathlon with the sign «+» falls on the race of the winter Russian Championship (Rtk = 0,014, skating style, March), with the sign «-» on the VSSSR race in Tyumen (Rtk=-0,256, February) and in the mass start with a «+» sign falls on the FKR race in Kirovsk (Rtk= 0,703, classic, April), with a «-» sign for the 50 km race in Monchegorsk of the Russian Championship for 19-20 years (Rtk=-0,714, classic, April). The presented dynamics of the correlation relationship indicates the presence of a direct (with a «+» sign) significant influence of MT on the final result in sprint races and a negative relationship with the results in distance activities, which increases with an increase in the length of the distance. The dynamics of the correlation coefficients of the integrated indicator of physical per-

formance (PP), expressed in the maximum running speed «to failure» (Vmax), reflecting the cumulative effect of the degree of formation of the energy supply systems and physical qualities, is characterized by a unidirectional change in the tightness of the relationship by the «+» sign in the range from 0,289 to 0,621 in the individual sprint, from 0,351 to 0,663 in individual races, from 0,532 to 0,805 in the skiathlon and from 0,450 to 0,855 in the mass start. The peak level of correlation relationship (Rtk) with the sign «+» in the individual sprint falls on the FKR race in Kirovsk (Rtk = 0,621, April) and the VSSSR in Tyumen (Rtk = 0,544, early February), in individual races falls on the FKR race in Kirovsk (Rtk = 0,663, when moving in the classic style and Rtk = 0,547, when moving in the skating style, April), at the Winter Russian Championships (Rtk = 0,515, when moving in the skating style), in skiathlon falls on the VSSSR race (Rtk = 0,805, early February), the Winter Russian Championships (Rtk = 0,532, March) and in mass start falls on the FKR race in Kirovsk (Rtk = 0,855, classic, April) and PR 21-23 years (Rtk=0,658, classic, March and in the 50 km race PR 19-20 years (Rtk=0,645, classic, April). The presented dynamics of the correlation relationship indicates the presence of a pronounced tendency to increase the degree of relationship of the Vmax indicator with all types of competitive activity (from sprint to marathon), reflecting the degree of stability of the basic level of PR and the length of competitive distances.

The dynamics of the correlation coefficients of the absolute value of maximum oxygen consumption (MOCabs.), reflecting the degree of development of the power of the oxidative system, is characterized by a unidirectional change in the tightness of the relationship by the «+» sign in the range from 0,446 to 0,579 in individual sprint, from 0.,417 to 0,851 in individual races, from 0,566 to 0,685 in skiathlon and from 0,555 to 0,677 in mass start. The peak level of correlation relationship (Rtk) in individual sprint is reached at the Summer Russian Championships race (Rtk=0,579, September) and the Russian Championships race (Rtk=0,551, April), in individual races it is reached at the Russian Championships race in Kirovsk (Rtk=0,851, when moving in skating style and Rtk=0,635, when moving in classical style, April), at the Winter Russian Championships (Rtk=0,604, classical style), in skiathlon it is reached at the All-Union USSR race (Rtk=0,685, early February), the Winter Russian Championships (Rtk=0,566, March) and in mass start it is reached at the Russian Championships race in Kirovsk (Rtk=0,881, classical style, April) and the 21-23 years old PR (Rtk=0,677, classic, March and in the 50 km race PR 19-20 years (Rtk=0,561, classic, April). The presented dynamics of the correlation relationship indicates the presence of a positive relationship between the power of the oxidative system (VOCabs.) and the results shown in all types of competitive activity (from sprint races to marathons), with a pronounced differentiation into distance races (in intensity, exceeding the level of the anaerobic threshold), in total indirectly indicating not only the high significance of the absolute level of VOC, but also the significance of the overall dimensions of the body, affecting the very level of the power of the oxidative system. The dynamics of the correlation coefficients of the relative value of maximum oxygen consumption (MOCrel.), associated with the degree of development of regulatory mechanisms reflecting the balance of the functional reserve of the oxidative system in relation to body weight, is characterized by a unidirectional change in the tightness of the relationship by the «+» sign in the range from 0,283 to 0,617 in individual sprint, from 0,359 to 0,561 in individual races, from 0,550 to 0,833 in skiathlon and from 0,698 to 0,905 in mass start. The peak level of correlation relationship (Rtk) in the individual sprint is reached at the Winter Russian Championships race (Rtk=0,617, March) and the All-Russian Ski Championships race (Rtk=0,530, early February), in individual races it is reached at the Winter Russian Championships race (Rtk=0,667, when moving in the classic style, March), the Russian Ski Championships race (Rtk=0,561, classic) and the Russian Ski Championships 21-23 years old (Rtk=0,556, classic, February), in skiathlon it is reached at the All-Russian Ski Championships race (Rtk=0,833, early February), the Winter Russian Championships (Rtk=0,550, March) and in mass start it is reached at the Russian Ski Championships race in Kirovsk (Rtk= 0,905, skating style, April), in the 50 km race PR 19-20 years (Rtk=0,715, classic, April) and PR 21-23 years (Rtk=0,712, classic, March). The presented dynamics of the correlation relationship indicates the presence of a strong relationship between the oxidative system power indicator (VOCrel.) and the achieved speed in races in all types of competitive activity, with a pronounced differentiation in races

that fall during the main start period (winter Russian Championship, PR21-23 and PR19-20 years), dominating at distances of the distance type, the result of which is due to the development of the formed functional reserve by physical loads.

The dynamics of the correlation coefficients of the maximum lactate concentration (maxLa in the step test), associated with the intensity of functioning and readiness for implementation activities, reflecting the functional reserve of the lactic acid system, is characterized by a unidirectional change in the tightness of the relationship by the «+» sign in the range from 0,278 to 0,472 in the individual sprint, from 0,257 to 0,684 in individual races, from 0,439 to 0,485 in the skiathlon and from 0.,359 to 0,575 in the mass start. The peak level of correlation relationship (Rtk) in individual sprint is reached at the All-Union Soviet Union races (Rtk=0,472, February) and the winter Russian Championships (Rtk=0,440, March), in individual races it is reached at the PR21-23 races (Rtk=0,684) and PR19-20 (Rtk=0,630, February), at the winter Russian Championships (Rtk=0,582, March), in skiathlon it is reached at the Winter Russian Championships race (Rtk=0,485) and the All-Union Soviet Union (Rtk=0,439, early February), and in mass start it is reached at the Russian Championships race in Kirovsk (Rtk=0,575, April) and PR21-23 (Rtk=0,525, classics, March). The presented dynamics of the correlation relationship indicates the presence of a positive (at the level of «medium» - «high») relationship between the maximum lactate concentration in all types of cross-country skiing with differentiation into races that fall during the period of the main starts (winter Russian Championship, PR19-20 and PR21-23 years), dominating at the distances of individual races and in the mass start, not exceeding the duration of muscle activity of the «large zone of relative power», which places increased demands on the power capabilities of the oxidative and lactic acid energy systems and, as a consequence of this, going above the level of the anaerobic threshold.

Conclusions. The results of the correlation analysis of the studied indicators of maximum aerobic performance and results at the main starts of the 2023-2024 sports season made it possible to establish that the effectiveness of performances at goal-oriented starts (PR19-20, PR21-23, winter Russian Championship) at various distances of cross-country skiing turned out to be significantly dependent on the degree of formation of the absolute and relative (associated with the development of body weight through physical activity) level of maximum oxygen consumption and the intensity of the functioning of the lactic acid energy system, which form the total energy potential, which is a key mechanism for the formation of the functional potential involved in ensuring muscle activity. The obtained results allowed us to establish the following patterns of manifestation of maximum aerobic performance indicators depending on the specifics of the competitive activity of 18-20 year old cross-country skiers:

- in individual sprint, the success of the performance is determined by a high level of development of the power capabilities of the oxidative (VO_{2max}, VO_{2max}/kg) and lactic acid (maxLa) energy systems, with a stable tendency for the final result to depend on the overall dimensions of the athletes' bodies;

- in individual races, the success of the performance is determined by an increased importance of the balance of overall dimensions of the body with the development of the power capabilities of the oxidative (VO_{2max}) and lactic acid (maxLa) energy systems, with a continuing tendency for the final result to depend, as in sprint races, on the overall dimensions of the body (ODB), which affect the formation of the total energy potential;

- in skiathlon, the success of the performance is determined by a high level of balance between the overall dimensions of the body with the development of the power capabilities of the oxidative system (absolute and relative levels of VO_{2max}), with a decreasing significance of the lactic acid system (maxLa) and a pronounced (in relation to individual races) tendency of the final result to depend on the formation of integrative indicators (Vmax) reflecting the level of development of regulatory mechanisms; - in mass start (race with a mass start), the success of the performance is determined by a high level of balance between the overall dimensions of the body with the development of the power capabilities of the oxidative (relative level of VO_{2max}) with a decreasing significance of the absolute level of VO_{2max} and lactic acid (maxLa) energy systems, with a pronounced (even more so in relation to the previously considered races) tendency of dependence on the formation of integrative indicators reflecting the level of development of regulatory mechanisms with a dominant level of the oxidative system (VO_{2max} value reduced to MT).

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References

1. Golovachev A.I., Kolykhmatov V.I., Shirokova S.V. Sovremennyye metodicheskiye podkhody kontrolya fizicheskoy podgotovlennosti v lyzhnykh gonkakh. Vestnik sportivnoy nauki. 2018. No. 5. pp. 11-17.
2. Golovachev A.I., Kolykhmatov V.I., Shirokova S.V. Modelnyye pokazateli fizicheskoy podgotovlennosti lyzhnits-gonshchits vysokoy kvalifikatsii pri podgotovke k XXIV zimnim Olimpiyskim igram 2022 goda v Pekine (Kitay). Chelovek. Sport. Meditsina. 2019. Vol. 19. No. 2. pp. 81-87.
3. Deryabin V.E. Kurs lektsiy po mnogomernoy biometrii dlya antropologov. Moscow, 2008. 328 p.
4. Carlsson M., Carlsson T., Hammarstrom D. Prediction of race performance of elite cross-country skiers by lean mass. International Journal of Sports Physiology and Performance. 2014. Vol. 9 (6). pp. 1040-1045.
5. Ingjer F. Maximal oxygen uptake as a predictor of performance ability in women and men elite cross-country skiers. Scandinavian journal of medicine & science in sports. 1991. No. 1. pp. 25-30.
6. Losnegard T., Hallen J. Physiological differences between sprint and distance-specialized cross-country skiers. Int. J. Sports Physiol. Perform. 2014. Vol. 9. No.1. pp. 25-31.
7. Carlsson T., Carlsson M., Hammarstrom D. et al. Optimal VO_2 max-to-mass ratio for predicting 15 km performance among elite male cross-country skiers. Open Access Journal of Sports Medicine. 2015. pp. 353-360.
8. Carlsson T., Carlsson M., Felleki M. et al. Scaling maximal oxygen uptake to predict performance in elite-standard men cross-country skiers. Journal of sports sciences. 2013. Vol. 31. No. 16. pp. 1753-1760.
9. Sandbakk O., Holmberg H.C. A reappraisal of success factors for Olympic cross-country skiing. International journal of sports physiology and performance. 2014. Vol. 9. No. 1. pp. 117- 121.
10. Sandbakk O., Grasaas C.A., Grasaas E. Physiological determinants of sprint and distance performance level in elite cross-country skiers. 6 International Congress on Science and Skiing 2013, St. Christoph a. Arlberg, Austria. St. Christoph a. Arlberg. 2013. 93 p.

Subjective evaluation of the functional well-being of an athlete with a disability: key features, dependability, and external validity

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Abstract

Objective of the study was to creation and validation of a questionnaire-based approach to assess the performance of athletes with disabilities, focusing on the functionality of their body systems in relation to the demands of their sport.

Methods and structure of the study. The framework for the creation of the methodology was based on the theoretical framework of functional comfort. The theoretical framework is a subsystem level of functional comfort, consisting of five subsystems that differ in their functional purpose and unique characteristics: sensory, cognitive, volitional, adaptive, and motor.

The research methods used included testing, expert evaluation by coaches, analysis of training process data, assessment of the progress in developing sports skills, and examination of performance at competitions.

The retest reliability was assessed in two stages, with a six-month interval between them.

Results and conclusions. Based on the majority of scales, the retest reliability is strong and meets the psychometric standards. However, the cognitive subsystem scale stands out with inconsistent results. The internal consistency of the sensory and motor subsystems scale is average, suggesting that subjective functional comfort is influenced by external factors. The correlation analysis results indicate a satisfactory level of empirical validity. This method can be employed for scientific research and as a diagnostic tool for athletes with disabilities.

Keywords: *functional comfort, athlete, disabilities, methodology, reliability, validity.*

Introduction. The category of functional comfort acts as a psychological determinant of the success of the subject, the effectiveness of his activity, implemented in the performance of the task and the achievement of the goal in such a way as to meet the predetermined criteria [3, 5]. Functional comfort is the result of the functioning of the system of mental processes in interaction with environmental factors [7, 8]. When disclosing issues of subjective assessment of functional comfort of athletes with disabilities, it is important to take into account studies that reveal the features of the athlete's condition [2], motivational and volitional characteristics of the athlete's personality [4], and adaptive mechanisms of the body [1]. The relevance of the creation of the technique "Subjective assessment of functional comfort of an athlete with disabilities" ("SAFC") is due to the objective need caused by the deficit of methods for diagnosing subjective comfort in general and athletes with disabilities (AWD) in particular. The subsystems included in the concept of "SAFC" are traditional and have repeatedly appeared in the studies of domestic and foreign authors. However, an integrated approach involves defining functional comfort as a system [4], which necessarily requires an assessment of the interrelations of all subsystems of the phenomenon under consideration.

Objective of the study was to creation and validation of a questionnaire-based approach to assess the performance of athletes with disabilities, focusing on the functionality of their body systems in relation to the demands of their sport.

Methods and structure of the study. Research methods: testing, expert assessment by trainers, including data on control results of the training process, assessment of the dynamics of development of sports skills of the experiment participant, as well as data on performances in competitions. The "SAFK" technique includes 50 statements that allow an athlete to evaluate the components of five subsystems of the body (sensory, cognitive, volitional, adaptive, motor. The subject evaluates the components of the body's subsystems using a 5-point system, where 1 is the level of development of the component does not meet the requirements, 2 is extremely rare, 3 is rare, 4 is often 5 is always compliant. The sensory subsystem includes reactions to visual and auditory stimuli, as well as the features of perceiving a large number of signals at the same time, changes occurring in the environment or in activity (with an object, work object, etc.), clarity and awareness of perception when performing exercises. The cognitive subsystem combines the processes involved in the information processing associated with awareness of one's own states, finding errors, the ability to interpret the causes of defeats, characteristics of attention and memory. The volitional subsystem includes the subject's assessment of the ability to maintain performance over a long period of training (during training camps), to combat fatigue and exhaustion, readiness to take the initiative, to work in monotonous conditions activity, in conditions of time regulation, volitional qualities in achieving the goal of the activity. The adaptation subsystem includes a set of resources that allow adaptation to various environmental factors: adaptation to physical, spatial features of the environment, to the requirements of sports activities, to physical activity. The motor subsystem includes the ability to manipulate objects, memorization of large and small motor skills, the presence or absence of muscle tension when performing training exercises, coordination of movements, readiness to perform movements of various natures, tolerance of prolonged motor loads, motor activity.

Mathematical statistics were conducted using the Statistica 20.0 software package using the Pearson linear correlation coefficient and the alpha coefficient. The retest reliability check was conducted in two stages with a 6-month interval between testing. The sample consisted of students – athletes of the Russian State University of Social Technologies with disabilities. A total of 87 people aged 17 to 23 years took part in the study.

Results of the study and discussion. When checking the retest reliability, relationships were established between the results of the first and second measurements (Table 1). The values of the correlation coefficient for all scales have a high level of significance, with the exception of the "cognitive subsystem" scale, which speaks in favor of the reliability of the scales and indicates high retest reliability and compliance of the methodology with psychometric requirements. As for the cognitive subsystem, the fact of the multifaceted nature of the cognitive sphere itself,

Table 1. Results of checking the retest capability of the "SAFK" method

Scales of the «SAFK» methodology	r	p
Sensory subsystem	0,547	0,001
Cognitive subsystem	0,156	0,243
Volitional subsystem	0,647	0,001
Adaptation subsystem	0,874	0,001
Motor subsystem	0,433	0,001

Table 2. Results of testing the "SAFK" methodology for reliability according to internal consistency (at a significance level of p≤0,05)

Scales of the «SAFK» methodology	Alpha coefficient
Sensory subsystem	0,256
Cognitive subsystem	0,376
Volitional subsystem	0,445
Adaptation subsystem	0, 431
Motor subsystem	0,276

Table 3. Correlation links between the indicators of the scales of the "SAFK" methodology and the effectiveness of sports activities

Scales of the «SAFK» methodology	Results of control trainings		Competition results		The presence of dynamics in the development of sports skills	
	r	p	r	p	r	p
Sensory subsystem	**0,356**	0,004	0,247	0,002	0,258	0,025
Cognitive subsystem	0,272	0,023	0, 265	0,000	**0,422**	0,000
Volitional subsystem	0,347	0,054	**0,465**	0,031	0,376	0,001
Adaptation subsystem	**0, 647**	0,036	**0,574**	0,093	**0,668**	0,003
Motor subsystem	**0,543**	0,092	**0,356**	0,065	**0,465**	0,022

Note: the value of the Pearson correlation coefficient; p is the level of significance of the relationship. Significant relationships are highlighted.

including both general and special cognitive abilities, played a role here. The subject's assessment of cognitive functions can vary depending on external factors (the presence or absence of success in a given period of time) and internal conditions (the dominance of emotional positive or negative experiences regarding one's own success).

The results of the calculation of the reliability check for internal consistency are presented in Table 2.

As can be seen from Table 2, the developed method shows excellent results in terms of reliability of internal consistency. The measure of internal consistency of individual scales is mediocre. This may be a manifestation of the specificity of the phenomenon being studied: the same manifestation of functional comfort may be caused by different reasons.

Table 3 shows the results of testing the empirical validity of the "SAFK" methodology.

It was revealed that the adaptive and motor subsystems have positive relationships with the results of sports activities. The psychological meaning of the revealed correlations is as follows: the more an athlete with disabilities is able to adapt to the physical, hygienic, psychological requirements of sports activities, the more he feels ready for long-term physical exertion during the training process, the more effective his activity. The sensory, volitional and cognitive subsystems also have connections, but only with one of the types of sports performance. With an increase in the ability to perform various movements by nature, to endure long-term motor loads, to accurately perceive and respond to environmental signals, the more successful an athlete is in control training in familiar conditions. However, the success of performances in competitions, as this study showed, requires the inclusion of other subsystems. The volitional subsystem has close connections with the results of competitions. This confirms the data on the specificity of volitional processes of athletes. An interesting fact is the connection between the cognitive subsystem and the presence of dynamics of sports performance. It is obvious that for the progressive development of sports skills, cognitive activity is necessary, which allows the athlete to conduct self-reflection, memorize information, quickly switch from one object to another, distribute attention or concentrate on objects that are significant for sports activity. The correspondence of the results of the correlation analysis allows us to speak about the satisfactory empirical validity of the methodology.

Conclusions. The structure of subjective functional comfort of an athlete with disabilities, identified on the basis of the systemic and systemic-activity approaches, made it possible to formulate its operational definition as a multi-level system of specific and non-specific cognitive, adaptive, sensory, volitional, motor formations generated by the conditions of activity and assessed by the subject from the point of view of their compliance with the proposed requirements of the activity.

Testing of retest, internal reliability and empirical validity allow us to talk about the possibility of using the "SAFK" method to assess the functional comfort of athletes with disabilities.

References

1. Akopyan A.O., Portugalov S.N. Optimizatsiya adaptatsii sportsmenov v usloviyakh tsentralizovannoy podgotovki. Vestnik sportivnoy nauki. 2013. No. 4. pp. 12-15.
2. Baykovskiy Yu., Shumova N., Baydychenko T., Kovaleva A., Sopov V. Razrabotka sistemy di-

agnostiki i korrektsii osnovnykh komponentov predstartovykh sostoyaniy u sportsmenov vysokoy kvalifikatsii. Sportivnyy psikholog. 2019. No. 3 (54). pp. 24-30.
3. Miroshnik E.V. Uroven funktsionalnogo komforta kak marker professionalnoy nadezhnosti rabotnikov vysshego zvena. Obrazovaniye lichnosti. 2018. No. 1. pp. 44-46.
4. Fironova E.A., Baykovskiy Yu.V. Issledovaniye sily voli i motivatsii k uspekhu u studentov raznykh spetsializatsiy prikladnykh vidov sporta. Ekstremalnaya deyatelnost cheloveka. 2015. No. 4 (37). pp. 26-30.
5. Chaynova L.D. Kontseptsiya funktsionalnogo komforta rabotayushchego cheloveka – teoreticheskaya osnova sovremennogo ergodizayna. Vestnik RGGU. Seriya: Psikhologiya. Pedagogika. Obrazovaniye. 2015. No. 1. pp. 125-133.
6. Shelkov O.M., Abalyan A.G. Sistema kompleksnogo kontrolya v protsesse podgotovki sportsmenov-paralimpiytsev. Adaptivnaya fizicheskaya kultura. 2011. No. 4. pp. 48-50.
7. Lyon A.R., Brewer S.K., Arean P.A. Leveraging human-centered design to implement modern psychological science: Return on an early investment. American Psychologist. 2020. Vol. 75. No. 8. 1067 p.
8. Zhang Y., Sun J., JiangT., YangZ. Cognitive Ergonomic Evaluation Metrics and Methodology for Interactive Information System. Advances in Artificial Intelligence, Software and Systems Engineering, Proceedings of the AHFE 2019. International Conference on Human Factors in Artificial Intelligence and Social Computing. Washington D.C., USA. 2019. pp.559-570.

The spiritual and moral growth of young children through collaborative sports with older individuals

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Abstract

Objective of the study was to examination of the influence of collaborative sports activities with older individuals on the personal growth of pre-schoolers and early school-age children.

Methods and structure of the study. The observation was conducted as part of the training sessions for athletes of various ages, including the charity table tennis tournament «Steel Tree-2024». The study involved 23 participants, including 14 retirees and 9 children from preschool and primary school. Four aspects were chosen as the focus of the observation: cooperation, encouragement, respect, and appreciation.

Results and conclusions. It was discovered that during joint training and competitions, preschoolers and younger schoolchildren exhibited positive behavioral responses both towards their peers and towards the older participants, but these responses were more pronounced towards the elderly. There were no instances of age-based discrimination, which is often observed in society when it comes to the elderly. The criteria for respect were the athletic abilities and experience of the older competitors. The age factor was only evident in the interactions between the adults and the children, where the adults sought to provide moral support to the younger athletes. In response, there was not only respect, but also gratitude, which contributed to the spiritual and moral development of the children.

Keywords: *spiritual and moral development, table tennis, competitions, training, old age, preschool age, primary school age.*

Introduction. Modern scientific research, as a rule, confirms a direct connection between communication of older people with preschool and primary school children and their psychological well-being [4]. At the same time, the inverse relationship – the positive influence of older people on the development of the personality of preschoolers and primary school children has been practically not studied.

Spiritual and moral development of the individual is a multifaceted process that includes various aspects. One of these aspects is the education of a respectful attitude towards the older generation.

In some studies devoted to the problems of personality education in childhood, it is noted that preschoolers and primary school children do not have a positive attitude towards older people and do not want to help them [1]. We believe that such a need can be actively formed in the process of mutual activity, and such activity can be physical education or sports. At the same time, modern research is focused mainly on the issue of studying the relationship between physical education and cognitive development of children of preschool age [3].

Objective of the study was to examination of the influence of collaborative sports activities with older individuals on the personal growth of preschoolers and early school-age children.

Methods and structure of the study. The experiment was conducted using included observation of the process of mixed training and competitions by age criterion, in which preschoolers, primary school students and elderly people participated.

The study was conducted in the tennis hall of the Yelets State University named after I.A. Bunin, where joint training of athletes of different ages, as well as table tennis competitions, take place. The main event, within the framework of which the study was conducted, was the table tennis tournament "Steel Tree-2024", which was held in June-July 2024. It recorded 90 participants of different ages, from 6 to 72 years old, including 14 pensioners and 9 preschoolers and primary school students. Moreover, the competitors were not divided into groups by gender and age: a preschooler could play with a pensioner, a man with a woman, etc.

The object of observation was the behavioral manifestations of the attitude of preschoolers and primary school students towards the elderly and vice versa. Four indicators were selected as observation elements: mutual assistance; mutual support; showing respect; expressing gratitude.

Results of the study and discussion. In the process of participant observation, aspects of the positive influence of joint training and competitions on preschoolers and primary school children were highlighted. The following data were obtained. Older athletes were more sympathetic to children than their coaches, more often performing the functions of psychological support and mitigating the difficulties in practicing table tennis techniques. Since the status of both children and older participants was formally equal during training - they were both the object of the coaches' guidance, then the preschoolers and older participants in training and competitions developed friendly relations. They were expressed by older athletes in an effort to increase the attractiveness of individual elements of practicing tennis techniques, since children perceived them as more monotonous and uninteresting. In response, children expressed gratitude in various forms for help and support and tried to reciprocate (see table).

As can be seen from the table, positive behavioral reactions were demonstrated by preschoolers and younger schoolchildren both in relation to their peers and to the elderly participants in training, but they were expressed to a greater extent in relation to the elderly. For example, such a reaction as searching for a ball that had rolled under the bench was carried out by children for elderly athletes significantly more often than for their peers. This was designated as a manifestation of respect for elders.

The same range of behavioral reactions, in which the positive attitude of children towards the elderly was recorded, was recorded during the competition. Moreover, the competitive activity itself, despite the fact that it involves tough competition, did not cause negative emotions in children. Older, more experienced participants in the competition behaved extremely correctly in the event of a victory over a preschooler or younger schoolchild. They showed respect during a handshake after the game and thanked for a wonderful game and positive emotions received. Children, receiving praise from an adult opponent, did not reduce the level of self-esteem.

Joint competitions revealed several points that ensure a decrease in the victimization of older people due to the nature of sports activities. Victimization as a quality that contributes to the transformation of a person into a victim is conditioned in the silver age, as noted in the scientific literature, by suffering from the loss of respect due to the emergence of the status of a pensioner and age discrimination [2]. In observation of the course of the competition, on the contrary, it was revealed that the very fact of participation in the tournament, regardless of age, became an object of respect. In addition, the child participants focused not on the advanced age of their opponents, but on their playing experience and sports

Quantitative indicators of children's personality elements revealed during 8 joint training sessions

Elements of positive personal development of children	Number of element manifestations during training in relation to elderly people	Number of manifestations of the element during training in relation to peers
Mutual assistance	6	3
Mutual support	7	5
Showing respect	10	5
Expressing gratitude	10	6

status (master of sports, candidate for master of sports, etc.). Thus, mixed age sports competitions contributed to the formation of respect for the individual regardless of age.

In some cases, the manifestation of legitimate respect for the athletic form of older athletes even contributed to the mobilization of the physical capabilities of older athletes. Thus, in one of the episodes of the competition, an elderly tennis player jumped over the judge's chair to publicly demonstrate his dynamic capabilities. At the same time, the child tennis players set a high tempo of the game and often quite tough, not focusing on the advanced age of the opponent, which in fact also became a form of showing sports and human respect.

Some of the elderly participants came to the competition with their grandchildren, who also took part in the tournament. In general, this contributed to both the transfer of sports experience and interage mutual support and assistance. Joint photography and filming of episodes of the game were elements of such support.

Conclusions. Thus, it has been proven that in the process of joint training and mixed age competitions, a positive effect is exerted on the development of the personalities of preschoolers and junior schoolchildren. They develop spiritual values associated with respect for the older generation, recognition of their merits and experience.

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References

1. Akopyan L.S., Kerzil D. Vospriyatiye det'mi lyudey pozhilogo vozrasta: kross-kulturnoye issledovaniye [Children's perception of elderly people: a cross-cultural study]. Mir psikhologii. 2016. No. 3 (87). pp. 190-197.
2. Aminu A.Q., Torrance N., Grant A., Kydd A. Is age discrimination a risk factor for frailty progression and frailty development among older adults? A prospective cohort analysis of the English Longitudinal Study of Ageing. Archives of Gerontology and Geriatrics. 2024. Vol. 118. March. pp. 105-282.
3. Best J.R. Effects of physical activity on children's executive function: Contributions of experimental research on aerobic exercise. Developmental Review. 2010. Vol. 30. No 4. pp. 331-351.
4. Dsouza J.M., Chakraborty A., Kamath N. Intergenerational communication and elderly well-being. Clinical Epidemiology and Global Health. 2023. Vol. 20. March–April. pp. 101-251.

The importance of values and leadership in shaping the pro-social behavior of future sports organization leaders

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Abstract

Objective of the study was to determining the nature, extent, and hierarchy of leadership abilities and life priorities of future leaders in sports-oriented organizations is a crucial aspect in fostering their pro-social engagement.

Methods and structure of the study. The research was carried out at the Institute of Physical Culture, Sports, and Health at Moscow State University, focusing on graduate students. The methods employed included the «Morphological Test of Life Values» (V.F. Sopov, 2001), the «Diagnosis of Leadership Abilities» (R.V. Nemov, 2001), the «Self-Assessment of Leadership Style» (T.V. Bendas, 2006), and the methodology for the study of prosocial behavior (D.V. Sochivko, 2019).

Results and conclusions. It was discovered that the more pronounced the leadership traits among students at the Institute of Physical Culture, Sports, and Health, the more likely they are to exhibit empathy and altruism as forms of pro-social behavior. Conversely, the less they value material security, the more likely they are to display narcissism and social anxiety as forms of pro-social behavior. Additionally, the higher the students' self-perception of their leadership abilities in a business context, the more likely they are to engage in manipulative behavior as a form of social interaction.

Keywords: *professional training of future managers of sports-oriented organizations, prosocial behavior, leadership, value orientations.*

Introduction. Modern young people form the foundation of the future of Russia, they determine the vector of development, the quality of life of the population and lead the country, developing it and implementing innovative solutions and projects. This issue is of particular importance in relation to the management of the development of physical education and sports organizations and organizations of general sports or educational focus. Specialists in professional sports activities, both individually and in group interaction, transmit values that are significant for society - the value of sports, a healthy lifestyle, striving for success, team spirit, achieving results, etc. This is impossible without developed leadership qualities. It follows that today the state needs strong and spiritually developed leaders who can lead. The strategic priority of the state youth policy is to create conditions for the development of a harmonious personality. It is important to support the prosocial activity of students through the factors of life values and the development of leadership qualities, especially among future leaders of physical education and sports organizations, forming the values of unity, a healthy lifestyle and career achievements of students. Leaders solve not only organizational problems, but also social ones in the context of how youth is educated in sports, where responsibility, leadership qualities, willpower and the ability to work, especially in a team, are formed. Leadership is a characteristic feature of a person in the ability to influence people individually and society as a whole, directing their efforts and interest to achieve the goals of the group, believed J. Maxwell [4]. A leader is a person who plays a key role in managing, controlling and changing the activities of group members to achieve common goals. The basis of leadership in the domestic understanding is the process of interaction that occurs between the leader, who is the most influential member of the group, and the rest of the group members who do not have such a status [7]. The leader demonstrates a model of behavior, therefore the most important area of training and education of the generation is the development of prosocial ac-

tivity. Prosocial behavior is a type of social voluntary behavior designed to benefit society. Leading a person seems to be a rather labor-intensive and stressful process, directing followers to implement socially useful goals, therefore it is important for a leader to form a value-semantic professional self-concept [5]. The domestic scientist B.P. Tugarikov approached the understanding of values from the side of benefit. He understands values as those phenomena that bring benefit to the individual and contribute to the satisfaction of needs [8].

Objective of the study was to determining the nature, extent, and hierarchy of leadership abilities and life priorities of future leaders in sports-oriented organizations is a crucial aspect in fostering their prosocial engagement.

Methods and structure of the study. The research was conducted at the Moscow Pedagogical State University, Institute of Physical Culture, Sports and Health, among master's students. Research methods: «Morphological test of life values» (V.F. Sopov, 2001), «Diagnostics of leadership abilities» (R.V. Nemov, 2001), «Self-assessment of leadership style» (T.V. Bendas, 2006), methodology for studying prosocial behavior (D.V. Sochivko, 2019).

Results of the study and discussion. As a result of the study of value orientations of future managers of sports-oriented organizations, we found that the priority position is occupied by the values of family (Note. M is the average value) (M = 4,33), health (M = 4,29) and career (M = 4,26), fame (M = 4,20), material security (M = 3,8). As for prosocial behavior, we determined that master's students have a high level of empathy (M = 13,2), altruism (M = 11,8) and narcissism (M = 10,4). It was revealed that students have an average expression of leadership qualities (M = 29,5), and the priority for them is the socio-emotional leadership style (M = 4,2). This means that students are focused on human relations even in the production process and are quite capable of taking leadership positions and demonstrating to others their moral values of health, family and career aspirations. Future leaders of sports organizations are open, ready to help and show empathy to others, but at the same time tend to focus on their own personality. Using correlation, the following relationships were determined: the higher the degree of expression of leadership qualities of the subjects, the higher the tendency to empathy (Note: p-level of significance) (p=0,624) and altruism (p=0,581); the lower the subjects assess the value of material security, the higher their tendency to narcissism (p=0,608) and social anxiety (p=0,541); the higher the students assess their leadership abilities in a business leadership style, the higher the tendency to manipulativeness (p=0,617). Future leaders can convey these value orientations in the process of interaction with colleagues, clients of different age groups.

Conclusions. The study has proven the relationship between the level of development of leadership skills, life values and features of prosocial behavior of future leaders of sports-oriented organizations. This means that future leaders will be able to take responsibility, correctly prioritize the planning of tasks of sports-oriented organizations, correctly convey the essence and values that are most significant for sports activities in working with children and adults to the team of coaches. The results of the study can be useful for teachers in preparing students, specialists in the field of physical education, sports and health, as well as employees of the psychological and pedagogical service of educational and sports organizations.

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References

1. Koloskov I.A. Sovremennyye podkhody k teorii liderstva. Vestnik RMAT. 2015. No. 3. pp. 51-57.
2. Lubysheva L.I. Politizatsiya sporta kak novaya sotsialnaya realnost. Teoriya i praktika fizicheskoy kultury. 2024. No. 4. 107 p.
3. Maksvell D. Vospitay v sebe lidera. G.I. Levitan [transl.]. Minsk: Popurri publ., 2005. 400 p.
4. Novikova I.S. Pedagogicheskiye usloviya formirovaniya tsennostno-smyslovoy professionalnoy ya-kontseptsii studentov pedagogicheskogo universiteta. Izvestiya Baltiyskoy gosudarstvennoy akademii rybopromyslovogo flota: psikhologo-pedagogicheskiye nauki. 2023. No. 4 (66). pp. 98-101.
5. Bazhenova I.N. Pedagogicheskiy poisk. Moscow: Pedagogika publ., 1987. 544 p.
6. Slastenin V.A., Chizhakova G.I. Vvedeniye v pedagogicheskuyu aksiologiyu. Moscow: Akademiya publ., 2003. 192 p.
7. Tamarskaya N.V. Formirovaniye upravlencheskoy kultury pedagoga v protsesse nepreryvnoy professionalnoy podgotovki. Kaliningrad: KGU publ., 2003. 159 p.
8. Tugarinov V.P. O tsennostyakh zhizni i kultury. Leningrad, 1960. 152 p.

The approach to coaching student teams in competitive sports, both amateur and professional, in the realm of sports

UDC 796.012

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Abstract

Objective of the study was to theoretically, to create and substantiate a plan for training student teams in competitive sports, both at the amateur and professional level.

Methods and structure of the study. The methods employed were theoretical and sociological research methods, as well as strategic planning. The theoretical methods included: studying specialized scientific and methodological literature and regulatory documents; constructing a model of the subject; employing the structural and functional approach; describing and comparing; analyzing theoretical solutions and verifying the feasibility of resolving contradictions.

The sociological method involved conducting an expert survey among 48 professionals from higher education institutions, who were asked to share their insights on the strategic directions for training student sports teams in competitive sports.

The strategic planning method involved conducting a SWOT analysis, which involves identifying the factors within and outside the environment of the subject under study.

Results and conclusions. From a managerial perspective, the crafted strategy encompasses objectives, milestones, and anticipated outcomes. Through the application of theoretical and sociological research techniques, as well as strategic planning, the elements of a comprehensive management plan for preparing student teams in competitive sports within the framework of amateur and professional sports have been devised and validated.

Keywords: *: mass and professional sports, student sports, sports games, sports team, management, player training.*

Introduction. In accordance with the approved nomenclature and passport of scientific specialties (Order of the Ministry of Science and Higher Education of the Russian Federation dated February 24, 2021 No. 118), research in the field of student sports relates to the theory and methodology of sports. According to the approved concept and methodological recommendations for the development of student sports in the Russian Federation for the period up to 2025, it is developing in the context of mass and professional sports, which requires constant scientific and practical substantiation[1] [2].

Sports games, which are the object of research, are included in the general strategy for the development of student sports, which requires scientific justification for the need to form sports teams and their effective training at the university [1-3]. Within the framework of mass sports, such types as basketball, volleyball, football, etc., solve many pedagogical and social problems, among which the leading place belongs to involving students in systematic classes, satisfying the need for physical activity, acquiring positive emotions and fostering a sense of collectivism, as well as strengthening the vital systems of the body. Sports games at the university can also solve the problems of professional sports, which consist in the effective preparation of a sports reserve for professional teams, as well as the implementation of sports skills in competitive activities, which determines the achievement

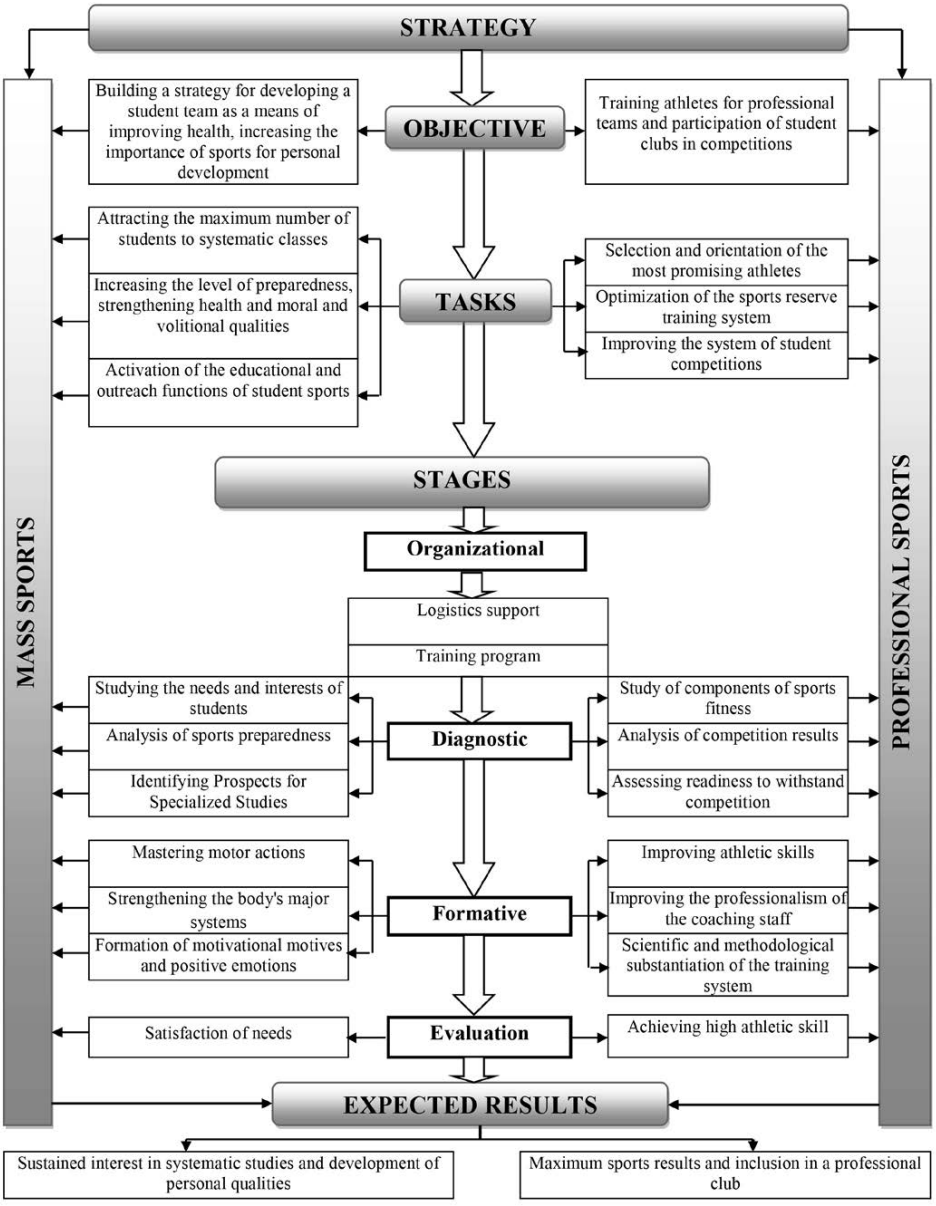
1 Ob utverzhdenii kontseptsii razvitiya studencheskogo sporta v Rossiyskoy Federatsii na period do 2025 goda. Prikaz Ministerstva sporta Rossiyskoy Federatsii ot 21 noyabrya 2017 goda №1007. Available at: https://docs.cntd.ru/document/555766975

2 Metodicheskiye rekomendatsii po razvitiyu studencheskogo sporta v Rossiyskoy Federatsii. Utverzhdeno Minobrnauki Rossii 01.12.2023, Minsportom Rossii 05.12.2023, Minprosveshcheniyem Rossii 04.12.2023. Available at: https://legalacts.ru/doc/metodicheskie-rekomendatsii-po-razvitiiu-studencheskogo-sporta-v-rossiiskoi-federatsii/

of high sports results. Thus, the available program and regulatory documentation, as well as the analysis of the opinions of specialists in the field of student sports indicate the presence of contradictions between the need to develop an effective strategy for managing the preparation of student sports teams in game sports and the weak scientific and methodological justification of these issues in the system of mass and professional sports.

Objective of the study was to theoretically, to create and substantiate a plan for training student teams in competitive sports, both at the amateur and professional level.

Methods and structure of the study. The methodological techniques were theoretical and sociological methods of research, as well as the method of strategic planning. Theoretical methods of research included: analysis of special scientific and methodological literature and program and regulatory documentation; construction of an object model; structural and functional method; description and comparison; analysis of theoretical solutions, verification of the possibility of eliminating contradictions. The sociological method was an expert survey of 48 specialists of higher education institutions, who were asked to express their opinion on the strategic directions of train-



Strategy for managing the preparation of student teams in game sports within the framework of mass and professional sports

ing student sports teams in team sports. The strategic planning method involved the use of SWOT analysis, which consists in identifying factors of the internal and external environment of the object under study.

The proposed methodology made it possible to generalize and present a strategy for managing the system of training student teams in team sports within the framework of mass and professional sports.

Results of the study and discussion. According to management theory, any strategy should provide for the presence of a goal, objectives, stages of implementation and expected results. In this regard, using theoretical and sociological research methods, as well as the method of strategic planning, the components of the general plan for managing the preparation of student teams in game sports in the context of mass and professional sports were developed and substantiated.

The target component of the strategy for managing the preparation of a sports team within the framework of mass sports should ensure the achievement of health improvement of young people, increasing the significance of the sport for personal development. In professional sports, the goal of the management strategy is to achieve high-quality training of athletes for professional teams and their participation in competitions.

The tasks, as a component of the strategy under consideration in mass sports should be solved: attracting the maximum number of students to systematic classes; increasing the level of training, strengthening health and moral and volitional qualities; activating the educational and educational function of student sports. The implementation of the strategy within the framework of professional sports solves completely different problems, such as: selection and orientation of the most promising athletes; optimization of the system of training of the sports reserve; improvement of the system of student competitions.

Achieving the goal and solving the tasks of the strategy is determined by holding four stages: organizational, diagnostic, formative and evaluation. Within the framework of the organizational stage, an important component of mass and professional sports training of a student team in game sports is high-quality logistical support of classes, as well as the presence of a training plan in the short-term and long-term. The diagnostic stage in mass sports is aimed at studying the needs and interests of students, analyzing sports readiness and determining the prospects for specialized classes. In professional sports, the diagnostic stage of the strategy includes studying the components of sports readiness, analyzing competition results, assessing readiness to withstand competition. The results obtained during the diagnostic stage are the basis for the formation of rational and effective motor actions, incentives and positive emotions through mass sports, as well as strengthening the main systems of the body. For professional sports, the formative stage of the strategy for managing the training of student teams in game sports includes improving athletic skills; increasing the professionalism of the coaching staff; scientific and methodological substantiation of the training system. The assessment stage allows determining in the context of mass sports the satisfaction of needs for physical activity, the level of health and physical fitness in the process of playing sports games. In professional sports, the assessment stage of the strategy under consideration is aimed at analyzing the achievements of high sportsmanship in the chosen sport. The implementation of all stages is expressed by the component «expected results». In mass sports, they are determined by the formation of a stable interest in systematic training and personal qualities. In professional sports – by maximum sports results and the inclusion of the player in the club. Achieving the expected results determines the fulfillment of the goal and the solution of the tasks.

Conclusions. The developed, generalized and substantiated strategy for managing the preparation of a student team in game sports is a completely new approach that meets the needs and demands of students, and also fits into the concept of developing mass and professional sports in the Russian Federation.

References

1. Gabibov A.B., Karasev D.Yu., Khustochkin V.G., Litvinov V.A. Organizatsionno-metodicheskoye obespecheniye podgotovki studencheskikh sportivnykh komand po igrovym vidam sporta. Teoriya i praktika fizicheskoy kultury. 2022. No. 8. pp. 79-81.
2. Pleshakov A.A., Egorycheva E.V., Zhemchug Yu.S., Sedov I.A., Rodin A.V. Model komplektovaniya igrovykh zvenyev sostava zhenskoy studencheskoy komandy v mini-futbole. Teoriya i praktika fizicheskoy kultury. 2024. No. 3. pp. 104-106.
3. Guba V.P., Rodin A.V., Bulykina L.V., Zaynetdinov M.V. Teoriya i metodika obucheniya bazovym vidam sportivnykh igr v sisteme fizicheskogo vospitaniya. Study guide. Moscow: Sovetskiy sport publ., 2023. 289 p.

Essential metrics for assessing the success of physical education at the local government level

UDC 796.01

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Abstract

Objective of the study was to process of determining and validating the essential metrics that enable the evaluation of the success of physical education initiatives at the local government level.

Methods and structure of the study. The research employed a combination of methods, including participant observation, expert evaluation, and mathematical statistical analysis. The empirical data encompassed a set of criteria and ten indicators of physical fitness, which are commonly used at the municipal level. A questionnaire was created for experts to assess the importance of these criteria for evaluating the success of physical education initiatives at the municipal level. The criteria were ranked based on their average score (median), the degree of consensus among experts (interquartile range), and the first quartile.

Results and conclusions. Assessing the efficacy of physical education necessitates a comprehensive approach that encompasses both quantitative and qualitative metrics. The research underscores the importance of developing initiatives to foster physical culture and sports, which entails organizing informational campaigns to raise public awareness about the significance of physical activity. Hosting sports festivals and other events can greatly contribute to this endeavor.

The key metrics are: the number of children and adolescents aged 6-15 who participate in sports programs on a regular basis.

The proportion of residents who have achieved the standards set by the All-Russian Physical Culture and Sports Complex «Ready for Work and Defense» (GTO). The percentage of the population actively engaged in physical education and sports compared to the total population. These metrics directly impact the physical activity levels of the population at the municipal level.

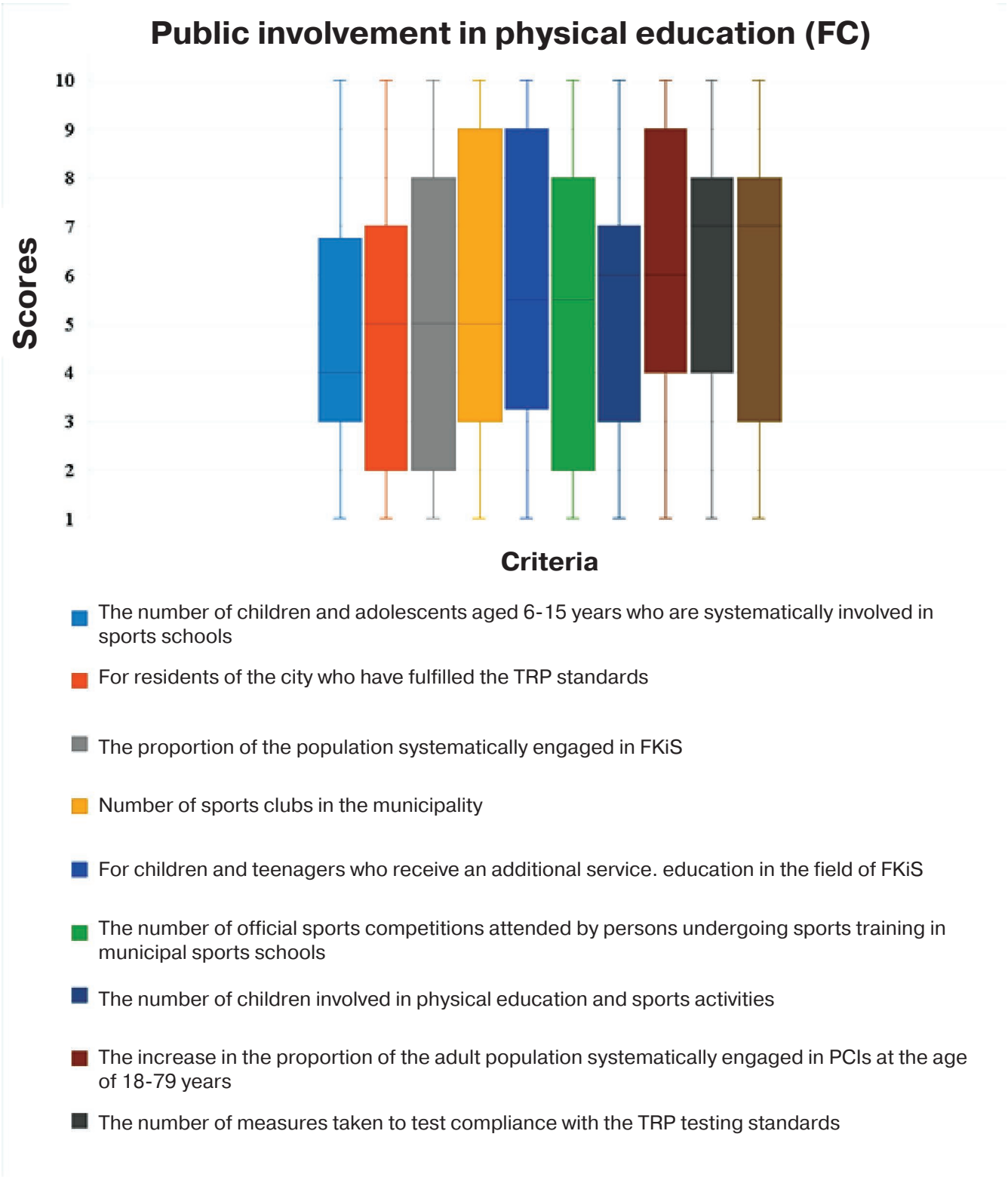
Keywords: *indicator, assessment, efficiency, physical education, sport, municipal level.*

Introduction. The effectiveness of the implementation of municipal policy in the field of physical culture (PC) is becoming an increasingly important task in the context of modern challenges and changes in society. At the current stage of development of society, physical culture and sports are becoming not only important components of a healthy lifestyle, but also significant elements of state policy. In the context of globalization and rapid changes in the socio-economic sphere, the issue of the effectiveness of the implementation of physical culture and sports programs is becoming especially relevant. Municipalities occupy a central place in creating conditions for sports, providing access to the necessary infrastructure, modern educational programs and the organization of sports events [1]. This requires a systematic approach to the organization and evaluation of physical culture within the municipal level, as well as the identification of key performance indicators for the functioning of the physical culture and sports system at the municipal level [2, 3].

The following are used as the main target indicators at the municipal level:

1) The proportion of the population of the municipality systematically engaged in physical culture and sports from the total number;

2) The number of children, adolescents and young people involved in physical education and sports sections, clubs, sports schools;



Tukey's Range Schemes of Ranked Performance Criteria «Population Engagement in Physical Education»

3) The number of assigned sports categories;

4) The number of physical education and sports events.

Despite the identified target indicators, there is a problem in their systematic interpretation and assessment of the effectiveness of management in this area of «physical education».

Objective of the study was to process of determining and validating the essential metrics that enable the evaluation of the success of physical education initiatives at the local government level.

Methods and structure of the study. The research used the method of included observation, expert assessment, and methods of mathematical statistics.

The empirical material consists of one group of criteria and 10 indicators of physical education development typical for use at the municipal level. In the presented group, experts determined the priority of criteria for the development of physical education in the municipality, in accordance with their order of analysis, where 1 is the highest priority indicator, and 10th is the lowest priority. A questionnaire on the topic «Determining the priority of criteria for assessing the effectiveness of physical education development at the municipal level» was developed for the experts. The ranking of criteria is carried out by ordering: by average assessment (median – Me), by the cohesion of expert opinions (interquantile range – IQR), by the first quartile (Q1). The results of the study will serve as a basis for developing recommendations for improving the situation in the field of physical education in municipalities.

Results of the study and discussion. To objectively assess the situation and identify key areas of development, we turned to experts in this field. A questionnaire on the topic of «Determining the Priority of Criteria for Assessing the Effectiveness of Physical Culture Development at the Municipal Level» was developed for the experts. The sample for the criteria ranking study included 44 experts aged 22 to 67 years, where the average age is Mage = 40,9 years and standard deviation SDage = 13,9; with experience from 1 year to 43 years (Mexperience = 15,4 years and SDexperience = 11,3); of which 59,1% are men; 40,9% are women.

To visualize the data and understand the distribution of the research results, we will construct a Tukey span diagram for the ranked indicators of the criteria group "Population Involvement in Physical Culture" for assessing the effectiveness of physical culture development management, where 1 is the highest priority indicator and 10 is the lowest priority. The data are presented in the figure.

The Tukey boxplot shows that each criterion was rated at both minimum and maximum by the experts. Each boxplot in this rating system ranges from first to tenth priority, indicating that each criterion was rated at both maximum (1) and minimum (10) priority by multiple experts. If there were only one expert who rated 1 or 10, this would be seen as an outlier, but there are no such cases in our analysis. It is also clear that the range of opinions among the experts does not differ significantly.

The most significant indicator is the number of children and adolescents aged 6–15 years (Me=4; IQR=3.25; Q1=3). The presence of a significant number of children in this age category opens up opportunities for attracting new participants to sports events and developing infrastructure. On the other hand, the least significant criterion is the «number of events held to test the implementation of the GTO complex test standards» (Me=7; IQR=5; Q1=3). According to experts, this indicator should be used in assessing the development of physical culture last of all, since it does not reflect the real state of affairs in the field of "physical culture" and does not take into account the most important factors affecting the involvement of children and adolescents in sports. In addition, the number of tests may not correlate with the quality of physical fitness of the population. Thus, the data obtained confirm the need for a comprehensive approach to assessing the effectiveness of physical culture development at the municipal level. It is necessary not only to take into account quantitative indicators, but also to pay attention to the quality of the events held and their accessibility for residents of the municipality.

Conclusions. Assessing the effectiveness of physical education requires a comprehensive approach that includes both quantitative and qualitative indicators. The study reveals the need to develop programs to popularize physical education and sports, which involves organizing information campaigns to raise public awareness of the importance of physical activity. Sports festivals and other events can significantly contribute to this process. The key indicators are: the number of children and adolescents aged 6-15 who regularly attend sports schools; the proportion of city residents who have met the standards of the All-Russian Physical Education and Sports Complex «Ready for Labor and Defense» (GTO); the proportion of the population regularly engaged in physical education and sports in the total population. These indicators directly affect the physical activity of the population at the municipal level.

References

1. Gatsulya O. Razvitiye otraslevogo upravleniya v sfere fizicheskoy kultury i sporta: kontseptualnyye osnovy. Gosudarstvennoye upravleniye i mestnoye samoupravleniye. 2015. Issue. 1. pp. 176-185.
2. Pochinkin A.V. Menedzhment v sfere fizicheskoy kultury i sporta. Study guide. Sport publ., 2016. 53 p.
3. Problemy razvitiya fizicheskoy kultury molodezhi. Collection of scientific works. A.V. Lotonenko, B.K. Zykova [ed.]. Voronezh: VGAU publ., 2002. 142 p.

Physical activity for children with autism in a school setting

UDC 796.012.1-056.266

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Abstract

Objective of the study was to pinpoint the unique aspects of implementing physical education and sports programs for children with autism spectrum disorder within an educational institution.

Methods and structure of the study. The process of examining and summarizing the implementation of physical education and sports programs for children with autism spectrum disorder is underway. The research focuses on children aged 9-10 who attend both special (correctional) schools and mainstream schools.

Results and conclusions. The data collected during the testing demonstrate the physical fitness of children with autism spectrum disorder. There is a notable disparity between the examined parameters of children who participate in after-school activities and those who only attend regular classes. The outcomes of the experimental group, in contrast to the control group, improved for girls from 7% to 30% and for boys from 9% to 28%. This underscores the necessity of integrating extracurricular physical education and sports into the subject "Physical Culture" to specifically target the enhancement of motor skills, coordination, self-control of movements, and the ability to maintain a stable posture.

Keywords: *physical education, children, autism spectrum disorder.*

Introduction. An analysis of scientific papers studying the problems of physical development of children with autism spectrum disorder shows that regular physical activity can help reduce anxiety, improve mood and increase the level of social interaction [1-3]. Many children of primary school age have undeveloped motor skills, the child does not know how to change body positions, step over obstacles, throw a ball, control movements, etc. To overcome problems with motor disorders, special exercises are recommended aimed at developing motor skills and improving overall physical fitness. As a rule, many preschool children of this nosological group attend rehabilitation centers, but the experience of working in an educational organization is not significant. The organization of physical education within the educational process with children with autism spectrum disorder of school age has been studied only in correctional schools. The question remains open, what is the content of the means and methods of physical education, as well as the regulation of the load will be more effective in achieving optimal results of physical fitness.

Objective of the study was to pinpoint the unique aspects of implementing physical education and sports programs for children with autism spectrum disorder within an educational institution.

Methods and structure of the study. The analysis and generalization of the implementation of physical education and sports activities for children with autism spectrum disorder was conducted. The study involved children aged 9-10 years, attending educational organizations both in special (correctional) schools and general education schools.

Organized physical education and sports activities are aimed at restoring impaired motor functions of the body. Solving multi-aspect tasks of the educational process, physical education is aimed at mastering the basic content of training, developing the communicative sphere, sensory perception for the implementation of full-fledged social connections. The program for the subject “Physical Education” consists of 80% of the compulsory part and 20% formed by the participants of the educational process, in moderate and severe forms of the disease, the ratio of parts

changes (70-30%, 60-40%). The selection of means, methods and methodological techniques depends on the mental state and motor experience of children. Autism spectrum disorder has individual typological features, since children's locomotor functions are developed depending on the severity and manifestations of the disease (mild, moderate, strong and severe). During classes, the teacher selects accessible game exercises using balls, skittles, gymnastic sticks, hemispheres, etc. The subject "Physical Education" is aimed at developing the child's knowledge about his body (understanding the connection between bodily well-being and mood, his own activity, independence and autonomy); the capabilities and limitations of his physical functions, compensatory mechanisms, the ability to follow the rules of a healthy lifestyle, maintain a daily routine with the necessary health procedures, adhere to an individual diet and sleep; the permissible amount of physical activity, the attitude to maintaining and strengthening health. Mastering accessible types of physical education and sports activities allows you to join in outdoor games accessible to the child, develops basic physical qualities (strength, speed, endurance, coordination, flexibility). As practice has shown, students with autism spectrum disorder are most often not adapted to the educational environment and are dependent on their parents. Difficulty interacting with people around them, especially if it is a class of 25-30 students, which leads to the lack of opportunity to engage in physical education. It is possible to compensate for the lack of physical activity through additional forms of physical education and sports activities outside of school hours. However, it is also not advisable to completely isolate a child from the class, since the function of an educational organization is to socialize all children. Extracurricular activities contribute to the correction and development of impaired functions, prevention of secondary deviations, optimization of social adaptation and integration of students due to physical and / or mental deficiencies. The result of the work is personal, subject and meta-subject universal actions. The personal result contributes to the formation of an attitude towards a safe, healthy lifestyle, the presence of motivation for creative work, work for results, a careful attitude to material and spiritual values. The meta-subject result is aimed at the ability to define a goal and find the most effective ways to achieve it. Subject results are focused on the formation of initial ideas about the importance of physical education for strengthening human health (physical, social and psychological); the positive impact of physical exercise on human development (physical, intellectual, emotional, social); the ability to properly organize health-preserving life activities (daily routine, morning exercises, health activities, etc.). Taking into account the complexity of the nature of the disease, the skills are divided into four groups:

1. Developing the skill of systematically monitoring one's physical condition, the amount of physical activity, health monitoring data (height, body weight, etc.), indicators of the development of basic physical qualities (strength, speed, endurance, coordination, flexibility).

2. Understanding simple instructions during games and when performing physical exercises; mastering, in accordance with age and individual characteristics, accessible types of physical education and sports activities.

3. Developing the ability to maintain a lifestyle appropriate to age, needs and health limitations, maintain a daily routine with the necessary health procedures, monitor one's physical condition, the amount of physical activity in proportion to one's own individual health characteristics.

4. Ability to perform accessible types of movements in physical education classes and outside of them, mastering basic movements (walking, running, jumping, climbing) to a degree accessible to each child, performing accessible types of exercises by imitation, by example, by verbal instructions, participating in accessible outdoor games and activities, mastering accessible types of physical education and sports activities.

Results of the study and discussion. The work carried out in educational organizations has shown that children with autism who are engaged in physical education demonstrate better results in social and communicative interaction and social and everyday independence. They adapt more easily to the educational environment. Maximum efficiency is achieved when using a structured program that includes both group and individual lessons, which emphasizes the importance of an individual approach. The testing results showed that all children have mild (5-24%) violations of motor-reflex functions. For example, functions associated with the coordination of simple and complex voluntary movements, or the execution of movements in a given combination. There is a moderate violation of the right-left coordination, visually guided movements associated with the control and coordination of simple

or isolated voluntary movements. The indicators of the primary and repeated testing are given in Table 1. The table shows that in the repeated testing, children in the experimental and control groups achieved positive dynamics.

When comparing the results of re -testing, a significant increase in indicators in the experimental group is noted (Table 2). In the process of motor activity, afferent information occurs in the cortical structures of the cerebral cortex, a holistic idea of the spatial orientation, the projection of the body's scheme, and control the position of the body with the movement of the eyes are created.

To compare two independent samples, the Mann-Whitney method of mathematical processing of information was used; when calculating the obtained data, the criterion value and the probability of difference between the obtained values in the groups were determined. All control exercises showed a reliable change in the feature and are in the significance zone, that is, when comparing values, they are higher than the U-empirical value.

Conclusions. The experiment showed that children with autism spectrum disorder find it difficult to perform precise tasks. Where the child does not make intellectual efforts, the result was higher, which is confirmed by the present study. This means that it will be more difficult for a child with autism spectrum disorder to master the educational program, so work on correcting motor disorders should begin at an early age. For this category of children, it is necessary to strengthen work in the field of extracurricular physical education and sports activities aimed at improving motor-reflex and cognitive characteristics. Physical exercises have a versatility of motor actions, differing in structure and nature, providing an opportunity to engage in favorite

Table 1. Physical fitness testing indicators for 9-10 year old children with autism spectrum disorder

П/п	Control exercises (in points)		Group of children with musculoskeletal disorders			
			Experimental		Control	
			girls - 5	boys - 6	girls - 4	boys - 7
1	Static balance	before	12,2±0,7	12,2±0,6	12,0±0,7	12,1±1,0
		after	14,4±0,5	14,3±1,0	12,7±0,7	13,0±0,6
2	Dynamic balance	before	4,0±0,5	4,0±0,5	3,7±0,4	4,1±1,4
		after	4,3±0,5	4,7±0,4	4,0±0,1	4,3±0,7
3	30 m run	before	1,0±1,0	1,8±0,4	1,3±1,0	1,1±0,8
		after	3,0±0,5	3,2±0,4	1,7±0,4	2,9±0,3
4	6 min run	before	1,5±0,75	1,3±1,0	1,3±1,0	1,7±1,0
		after	3,25±0,6	3,2±0,6	1,7±0,4	2,25±0,6
5	Shuttle run	before	1,0±1,0	1,8±0,4	2,0±0,0	1,7±0,5
		after	3,0±0,5	3,2±0,6	2,3±0,4	2,8±0,3
6	Pull-ups while hanging on a low bar	before	1,0±1,0	1,8±0,4	1,3±1,0	1,0±1,0
		after	3,25±0,6	3,2±0,4	2,7±0,4	2,25±0,6
7	Long jump from a place	before	1,0±1,0	1,7±0,5	2,0±0,0	1,0±1,0
		after	3,0±0,5	3,3±0,4	2,3±0,4	2,25±0,6

Table 2. Dynamics of physical fitness testing indicators for 9-10 year old children with autism spectrum disorder

№	Control exercises (in points)	girls		Δ%	boys		Δ%
		ex. gr. 5 pers.	cont. gr. 4 pers.		ex. gr. 5 pers.	cont. gr. 6 pers.	
1	Static balance	14,4±0,5*	12,7±0,7	14	14,3±1,0	13,0±0,6	10
2	Dynamic balance	4,3±0,5*	4,0±0,1	7	4,7±0,4	4,3±0,7	9
3	30m run	3,0±0,5	1,7±0,4	23	3,3±0,4	2,25±0,6	28
4	Shuttle run	3,0±0,5	2,3±0,4	30	3,2±0,6	2,8±0,3	14
5	Pull-ups while hanging on a low bar	3,25±0,6	2,7±0,4	20	3,2±0,4	2,25±0,6	28
6	Long jump from a place	3,0±0,5	2,3±0,4	30	3,2±0,4	2,9±0,3	10

*at p≤0,05 (* – significant differences between groups).*

types of motor activity, have a health and correction effect. The complexity of the use of physical education tools and methods contributes to the targeted support of optimal results of physical fitness.

References

1. Ayres E.Dzh. Rebenok i sensornaya integratsiya. Ponimaniye skrytykh problem razvitiya. Yuliya Dare [transl.]. 5th ed. Moscow: Terevinf publ., 2011. 272 p.
2. Geslak D. Adaptivnaya fizkultura dlya detey s autizmom : Metodicheskiye osnovy i bazovyy kompleks uprazhneniy dlya uvelicheniya fizicheskoy aktivnosti detey i podrostkov s RAS. U. Zharnikova [transl.]. Yekaterinburg: Rama Pablishing publ., 2019. 192 p.
3. Gilyazetdinova E.M. Obzor issledovaniy o fizicheskom vospitanii detey s autizmom. Aktualnyye voprosy sportivnoy psikhologii i pedagogiki. 2023. Vol. 3. No. 1. pp. 50-55.
4. Chastnyye metodiki adaptivnoy fizicheskoy kultury. Study guide. L.V. Shapkova [ed.]. Moscow: Sovetskiy sport publ., 2003. 464 p.
5. Yanushko E.A. Igry s autichnym rebenkom. Ustanovleniye kontakta. Moscow: Terevinf publ., 2018. 128 p.

Implementing extensive sports initiatives for individuals with disabilities, adopting an inclusive strategy

UDC 304.4+316.35

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Abstract

Objective of the study was to thorough examination of both domestic and international volunteer initiatives for sporting events that include individuals with disabilities.

Methods and structure of the study. A theoretical examination of scholarly and methodological publications on the topic has been conducted. Employing a range of theoretical approaches, the authors have thoroughly examined the issue of integrating individuals with disabilities into the realm of sports volunteering. Through the application of methods such as systematization and comparative analysis, the authors were able to pinpoint the fundamental strategies employed by organizers of large-scale sporting events when implementing inclusive volunteer programs that involve individuals with disabilities.

Results and conclusions. At present, the area of physical culture and sports is regarded as a crucial issue on the social agenda of the volunteer movement and the accumulation of volunteer work. The article provides an analysis of the volunteer programs of the organizing committees of international mass sporting events, with a focus on attracting volunteers with disabilities and organizing work with them. The article presents the findings of a study conducted by domestic and international researchers on the assessment of the involvement of individuals with disabilities in voluntary activities in the field of physical culture and sports. Based on these findings, a list of recommendations has been developed to enhance the practice of participation of individuals with disabilities in domestic sports volunteering.

Keywords: *volunteers, volunteer program, people with disabilities, inclusion, sports events.*

Introduction. Over the past decades, an inclusive approach to the implementation of volunteer programs for sports events has been actively developing thanks to international projects in the field of physical education and sports. Organizers of sports events support people with disabilities and help them in self-realization within the framework of Olympic (sports) volunteering. «Volunteering for All» is the motto of volunteer programs for international sports projects.

Objective of the study was to thorough examination of both domestic and international volunteer initiatives for sporting events that include individuals with disabilities.

Results of the study and discussion. Currently, the sphere of physical culture and sports is considered one of the priority topics of the social agenda of the volunteer movement and accumulation of volunteer labor. A special contribution to the popularization of the ideas of inclusion, equality and tolerance was made by the volunteer program for training sports volunteers for the XXX Summer Olympic Games and XIV Paralympic Games in London in 2012. The Organizing Committee took the path of adapting the volunteer program taking into account the characteristics of people with disabilities. For example, the communication campaign for this target audience of the volunteer corps started 7 weeks earlier, on July 27, 2010, than for volunteers without health restrictions. According to the organizing committee, more than 8 thousand people with disabilities applied to participate in the work of the 70-thousand volunteer corps of the sports event. At the selection stage, 3500 people with disabilities re-

ceived an offer to become a volunteer for the games, which amounted to 5% of the total number of volunteer assistants of the large-scale event.

At the end of the Olympic and Paralympic Games, the author's team S. Darcy, Simon, Tracey J., Angel M., with the support of the International Paralympic Committee, held an online survey of 786 volunteers with disabilities-participants in the event, which made it possible to create a profile of voluntary assistants [3]. Of the respondents, 15,6 % are volunteers with violation of the musculoskeletal system, 2,2 %-with visual impairment, 4,8 % with hearing problems. The main age of volunteers-disabled games was in the range from 55 to 64 years. As for the employment of volunteers with disabilities, the authors of the study noted that the most volunteers of the games were among working citizens – 41,5 %, 21,5 % pensioners are in second place, then there are respondents with partial employment (part – time mode), In fourth place, student youth - among it, 6,6 % of voluntary assistants, followed by unemployed citizens, but in an active search for work – 6,2 %. 4,7 % of the participants in the online survey chose the position «Another answer option». 86,8% of volunteers had the experience of volunteering behind the «shoulders». Accordingly, 13,2% did not have such experience. Of the total number of respondents, 63,5% of disability volunteers were involved in the Olympic Games and 46,8% worked out their shifts at the Paralympic Games. In most cases, as the analysis of respondents showed, volunteers were involved in the following functional areas of activity: «transport» (24,6 %), «Work with spectators (visitors)» (16,9 %), «Safety» (10, «Safety» (10, «Safety» (10, «Safety» (10,5 %) [3].

It was this volunteer program of the event that laid the foundation for modern volunteer management in working with disabled people. For example, the organizers paid special attention to the creation of a barrier-free architectural environment, the structure of space in the territory of a sports event, the presence of free space, the absence of obstacles to the following volunteers with disabilities along the main routes of movement on sports facilities.

In 2011, an ambitious task was set to the ANO «Sochi 2014» organizing committee: in 3 years to prepare a 25,000-strong qualified volunteer corps, guided by the principles of diversity and inclusion. The implementation of the volunteer program provided for the creation of 26 volunteer centers on the basis of higher educational institutions, and only the profile of the activities of two centers of Moscow State University named after Sholokhov and the Russian State Social University (hereinafter – the Russian State Social University) was associated with the preparation of volunteers for the XXII Olympic and XI Paralympic winter games of 2014 in Sochi. The International Paralympic Committee provided directors of the training centers for the necessary methodological and consulting support in matters of the participation of disabled people in a sporting event, training and seminars were held [1].

In 2013, employees of the Volunteer Center of the Russian State Social University initiated an applied study of candidates for volunteers with disabilities [2]. According to the results of the survey, the gender asymmetry of volunteers of the sports event was identified. 64,8 % of respondents accounted for men and 35,2 % for women. In the age structure of the target audience, a group from 26 to 38 years (70,6 %) predominated. As for the family status of candidates for games, the largest percentage indicator accounts for people with disabilities who are not married. As shown, the results of the survey, its participants had different experience in the practice of socially significant activities. 44,7 % of respondents announced the lack of experience in volunteer groups, but at the same time expressed a desire to acquire it in the near future. The leading motives of volunteer activities in the role of volunteers of the games were «the desire to be involved in the common cause», «help to other people», «self – realization», «leisure organization» and «acquaintance with interesting people». According to the results of the qualifying stage of the ANO Organizing Committee «Sochi 2014», about 100 people with disabilities became part of a large volunteer game team, each of which worked at least 13 shifts. The functionality of inclusive volunteers varied from streaming in the Olympic Park, including the creation of a positive mood, meeting, guests' wires at the airport and at the station, before helping in the organization of the zone for honored guests at the objects of the event and work on information racks, stands with spectators and the audience and Fans in stadiums. On the eve of games in test competitions in 2012-2013. The functionality of volunteers with disabilities was worked out.

The road map of the candidate with disabilities in the Games volunteers from the registration procedure to participation in the event itself can be presented as follows: filling out online questionnaires, testing (personal questionnaire, test for determining the level of

ownership of English), interviews (interviews), training and orientation, conclusion of contractual Relations with ANO «Organizing Committee of Sochi – 2014», direct work in the functional direction at the sports facilities of the event event.

The games in Sochi were followed by a series of sports events that popularize people with disabilities in event projects. Thus, the team of 480 volunteer corps of the XVIII Winter of the Surdlimysk Games included hearing disabilities, who provided the organizers with invaluable assistance in meeting athletes and guests at the airport, navigation, receiving accreditation and when checking the hotel.

Another volunteer program of the FIFA 2018™ World Cup, held in Russia, made a bet on the participation of people with disabilities, emphasizing special images that the presence of disability in the candidate could not affect the decision when they are selected in the volunteer corps of a sports event. The only restriction for volunteers is age. The selection in volunteers based on the results of testing was carried out among all candidates, including with disabilities, on general conditions.

In conclusion, we note that the qualitatively new integration of people with disabilities, the destruction of false stereotypes become the priority tasks of the volunteer programs implemented by large – scale sports events.

Conclusions. In general, as the analysis showed, volunteer programs served as a catalyst for the development of inclusive volunteering, expanding the boundaries of participation and practice of using volunteer work of people with disabilities. Today, not a single significant mass sporting event takes place without the participation of disabled volunteers. However, there is no need to talk about the large-scale inclusion of people with disabilities in the field of sports and physical education on a voluntary basis. In this regard, we have formulated a list of measures to expand the practices of participation of people with disabilities in domestic sports volunteering:

– creation of a barrier-free environment at sports facilities and in places where sports events are held;

– adaptation of all stages and processes of working with people with disabilities, from establishing a communications campaign, recruiting procedures, organizing training and education;

– implementation of support programs (individual and supportive) for people with disabilities before and during volunteer shifts;

– conducting trainings for sports event staff and volunteers without health restrictions on issues of tolerance, understanding of disability, as well as the specifics of interaction with volunteers with different noosologies.

References

1. Gorlova N.I. Istoriya olimpiyskogo volonterstva v Rossii. Krasnodar: Kubanskiy gosudarstvennyy universitet, 2020. 215 p.
2. Gorlova N.I. et al. Inklyuzivnoye dobrovolchestvo: istoriya stanovleniya i sovremennyye tendentsii razvitiya. Moscow: Perspektiva publ., 2018. 156 p.
3. Darcy S., Dickson T. London 2012 Olympic and Paralympic games: including volunteers with disabilities – a podium performance. Event Management. 2015. Vol. 18. pp. 431-446.

Developing adaptability in future professionals in the realm of adaptive physical education

UDC 37.02

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Abstract

Objective of the study was to determine the educational requirements and methods for developing the adaptability of a future professional in the field of adaptive physical education.

Methods and structure of the study. The success of the technology for cultivating professional adaptability in future professionals in the field of adaptive physical education is contingent upon the fulfillment of certain pedagogical requirements: the implementation of a specially designed program for fostering professional adaptability within the framework of the educational process for training professionals in adaptive physical education; the integration of dynamic teaching and nurturing methods and techniques into the educational process, such as workshops, group discussions, strategic planning, scenario analysis, case studies, and more; ongoing assessment of professional adaptability development; and considering the unique characteristics of students when devising strategies for personal professional growth.

To validate the theoretical findings, a practical investigation was carried out, involving 42 students enrolled in the Bachelor's program 49.03.02 «Physical Education for Individuals with Disabilities» at the I.A. Bunin Yelets State University.

Results and conclusions. The implementation of a practical-oriented curriculum, underpinned by specific pedagogical principles, within the context of active learning methods, not only enhances the overall quality of these professionals' education, but also equips them with the skills necessary to thrive in the dynamic professional landscape of the future, where the demands for specialists are constantly evolving.

Keywords: *formation of professional flexibility, specialist in the field of adaptive physical culture, university educational process.*

Introduction. The set of competencies of any employee is currently represented not only by special (professional) competencies (hardskills), but also by general cultural and general professional competencies (softskills). Recently, a stable trend has been noted in the labor market that professionals with highly developed softskills are the most in demand. It seems that the central new formation of a competitive specialist is the ability to effectively solve professional problems in new or changing conditions of instability of the modern world, which actualizes the need for mastering professional flexibility. The process of forming professional flexibility can be carried out in two trajectories and, accordingly, have different features. The first is during the period of training of a specialist in an educational institution, which is distinguished by a purposeful and controlled nature. The second is during the direct performance of professional activities - spontaneously and discretely. The first option seems more effective when focusing special attention on the formation of professional flexibility in the educational environment of the university. It is worth emphasizing that in modern pedagogical science a certain layer of research on professional flexibility has already been formed [1, 3-8], but meanwhile there are few studies that reveal the specifics of the formation of this personality trait in the pro-

cess of professional training of specialists in adaptive physical education [2]. At the same time, the studies of the above-mentioned authors allow us to determine with a fairly large share of specificity that professional flexibility of a future specialist in the field of adaptive physical education should be understood as an integral new formation of a professional, representing the integrity of certain personal qualities (activity, lability, professional motivation, the need for self-realization and self-development, etc.) and professional competencies in the field of pedagogical activity when working with children and adolescents with health problems, which in collaboration are able to ensure the mobility of a specialist in the professional space.

Objective of the study was to determine the educational requirements and methods for developing the adaptability of a future professional in the field of adaptive physical education.

Methods and structure of the study. The technology of developing professional flexibility of future specialists in the field of adaptive physical education included a sequence of motivational-target, activity-based, and reflexive-diagnostic stages. The motivational-target stage is aimed at strengthening students' motivation to study in the chosen profile, interest in future professional activity, and developing a strategy for their growth as a professional. Work at the activity-based stage was carried out comprehensively in the educational environment of the university and simultaneously in several areas: psychological – creating a comfortable atmosphere for students, acquiring skills for constructive interaction with people; pedagogical – providing various opportunities for professional development, defining strategic goals for further self-improvement as a professional; scientific and practical – organizing and implementing an effective educational process for students in accordance with the latest scientific achievements and trends in the modern labor market; social – mastering the skills of adaptation and communication in professional activity. The main purpose of the reflexive-diagnostic stage is aimed at the student's reflection of his personal characteristics and level of readiness as a professional. The effectiveness of the technology for developing professional flexibility in future specialists in the field of adaptive physical education is determined by the implementation of several pedagogical conditions: the implementation of a specially developed program for developing professional flexibility in the educational process of training specialists in adaptive physical education; the introduction of active forms and methods of teaching and education into the educational process: trainings, brainstorming, foresight, analysis of specific situations, case studies, etc.; continuous monitoring of the development of professional flexibility; taking into account the individual characteristics of students in determining the paths of professional self-development.

In order to confirm our theoretical conclusions, an empirical study was conducted with the participation of 42 students in the bachelor's degree program 49.03.02 Physical Education for People with Disabilities (Adaptive Physical Education) of the Federal State Budgetary Educational Institution of Higher Education «Yelets State University named after I.A. Bunin».

The study uses an integrated approach to diagnosing the professional flexibility of students - future specialists in the field of adaptive physical education. For the reliability of the obtained results, the diagnostics of the level of professional flexibility development was carried out according to psychological and social criteria. The set of used assessment tools for each of the criteria allowed us to determine the students' level of development of personality lability, adaptability, reflexivity, professional self-development competencies according to the psychological criterion, and the level of social adaptation, goodwill, sociability, stress resistance, and tact according to the social criterion.

The representativeness of the research results is determined by the observance of comparable indicators of the general and sample combinations. When determining the composition of the sample combination, the calculation of the numerical indicator was made on the basis of the following formula, which allows justifying the representative sample:

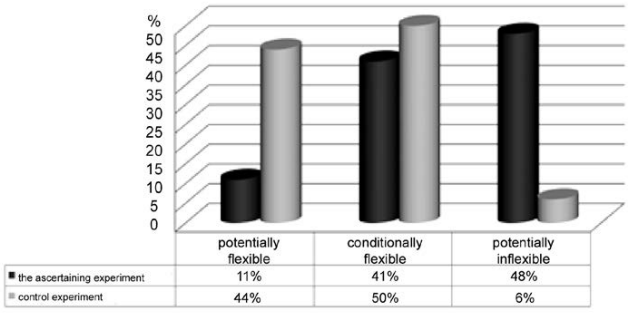
$$n = \frac{t^2 \times W \times (1 - W) \times N}{D^2 \times N + t^2 \times (1 - W)}$$

where – n is the sample size; N is the size of the total combination; W is the fraction of the phenomenon under study (0,25); D is the permissible sampling error (significance coefficient = 0,05); t is the confidence coefficient = 2 (if the frequency of probability of use = 0,954).

Results of the study and discussion. We carried out experiential training during the 2nd-4th years of study, during which the program for developing students' professional flexibility that we had developed was implemented. The program allowed us to develop key characteristics of professional flexibility in a comprehensive manner. Thus, a number of seminars were devoted to the specifics of compiling and using an individual map for each student to build a specific path of professional

self-development, taking into account personal qualities and interests; identifying individual difficulties in developing oneself as a professional; determining specific measures to overcome them commensurate with changes in the requirements of the labor market and the professional environment. When conducting seminars, it was mandatory for them to be practice-oriented. This was achieved through the participation of invited specialists, students completing practical assignments on the relevant topics, solving cases, and playing out professional situations (roleplaying). It was important to discuss the possible modernization of the professional standard in connection with changes in society and the needs of the target audience, and accordingly, students had to offer their creative ideas for the implementation of new methods and technologies that can improve the efficiency of practical work of specialists in the field of adaptive physical education. Of course, we have presented here only a few examples that indicate the vector of our activities, but we consider it important to note that, in general, the technology for developing the professional flexibility of a future specialist in the field of adaptive physical education was built with the help of immersing the student in professional activities through the accumulation of experience in behavior and constructive actions in response to new professional conditions or tasks, finding non-standard solutions that go beyond the usual approaches.

We will clearly demonstrate the results of the positive dynamics of the development of professional flexibility of students - future specialists in the field of adaptive physical education - in a diagram showing the relationship between the data of the ascertaining and control experiments (see figure).



The level of development of professional flexibility in future specialists in the field of adaptive physical education

Conclusions. Thus, targeted work on the formation of professional flexibility of future specialists in the field of adaptive physical education is determined not only by the exceptional importance of the professional field of these specialists, but also by current trends in the labor market. The implementation of a practice-oriented program based on the pedagogical conditions we have defined using active teaching methods allows both, in general, to improve the quality of training of these specialists and specifically make them more competitive in their future professional activities in a rapidly changing world, where the requirements for specialists are constantly being transformed.

References

1. Bakhtiyarova V.F. Osobennosti formirovaniya gotovnosti budushchikh pedagogov k postroyeniyu professionalnoy karyery v izmenyayushchikhsya usloviyakh. Russian Journal of Education and Psychology. 2023. Vol. 14. No. 6. pp. 151-168.
2. Mikhaylova E.Ya., Zakrevskaya N.G. Professionalnaya mobilnost kak faktor professionalnogo sovershenstvovaniya spetsialistov v oblasti fizicheskoy kultury i sporta. Uchenyye zapiski universiteta im. P.F. Lesgafta. 2018. No. 4 (158). pp. 98-101.
3. Morozov A.V. Kachestva podgotovki obuchayushchikhsya v vuze kak indikator razvitiya sistemy vysshego obrazovaniya. Vsemirnyy den kachestva – 2023. Proceedings of the VI international conference. Saratov, 2023. pp. 183-187.
4. Savchenkov A.V. Professionalnaya gibkost kak usloviye podgotovki budushchikh pedagogov k vospitatelnoy i proforiyentatsionnoy deyatelnosti. Izvestiya Rossiyskogo gosudarstvennogo pedagogicheskogo universiteta im. A.I. Gertsena. 2020. No. 197. pp. 180-188.
5. Savchenkov A.V. Ustoychivaya motivatsiya k osushchestvleniyu pedagogicheskoy deyatelnosti kak komponent professionalnoy gibkosti budushchikh pedagogov. Science for Education Today. 2020. Vol. 10. No. 1. pp. 43-61.
6. Syuzyumova L.A. Ponyatiyno-kategorialnoye pole nauchnoy zadachi formirovaniya professionalnoy gibkosti rukovoditeley vysshego zvena predpriyatiy. Vestnik YUUrGU. Seriya «Obrazovaniye. Pedagogicheskiye nauki». 2022. Vol. 14. No. 3. pp. 47-57.
7. Yastreb O.V. Formirovaniye professionalnoy gibkosti predstaviteley farmatsevticheskikh kompaniy sredstvami kouching-tekhnologii. PhD diss. Moscow, 2018. 162 p.
8. Deak G.O. The development of cognitive flexibility and language abilities. Advances in Child Development and Behavior. 2004. No. 31. pp. 271-327.

The influence of physical activity on the emotional and moral qualities of students

UDC 77.03.13

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Abstract
Sport is not only physical activity, but also an opportunity for self-development. Physical education strengthens personal qualities and helps to overcome difficulties. Also, sport forms such important qualities as honesty and respect not only for oneself, but also for the opponent. Physical education and sport not only help students to be healthy, but also form our personality, attitude to life, the importance of balance between mental and physical development. Sport develops determination and self-control, which affect many aspects of life. The purpose of the study was to determine the impact of physical activity on the emotional and moral qualities of students. The group of respondents consisted of 100 students of 1-3 courses of PGUPS. Regular exercise helps develop fairness, integrity, and respect for others. In addition, sports help develop discipline and self-discipline, which is important for success in both academic and professional life. Active participation of students in sports events helps them respect rules, be tolerant, and recognize diversity. Sports also strengthen moral fortitude and a sense of responsibility, which is important for a mature personality. Sports can also develop leadership skills and the ability to work in a team. It teaches decision-making and being honest and open to both oneself and others. To summarize, physical education and sports have a complex effect on the development of students' moral and ethical qualities, which ultimately contributes to their personal growth and the formation of social skills.

Keywords: *physical activity, emotional and moral qualities, regular training, student survey.*

Introduction. Sports are not only a form of physical activity but also an opportunity for self-development. Physical culture strengthens personal qualities and helps overcome challenges. It also cultivates essential values such as honesty and respect not only for oneself but also for opponents. Physical culture and sports not only help students stay healthy but also shape their personality, attitude toward life, and understanding of the importance of balancing mental and physical development. Sports develop determination and self-control, influencing various aspects of life [1].

The aim of the study is to determine the influence of physical culture and sports on the formation of moral and ethical qualities in students.

Methods and Organization of the Study. The study involved 100 students (56 males and 34 females) from the 2nd to 4th years of DSTU. During the survey, which was divided into three sections, the following objectives were addressed:

1. To identify students' attitudes toward physical culture and sports.

2. To determine the impact of physical activity on students' emotional health.

3. To assess the influence of physical activity on students' emotional and moral qualities.

Results of the Study. Regarding the first objective, survey data revealed that 68% of students engage in sports. The time allocated for physical culture and sports is shown in Figure 1.

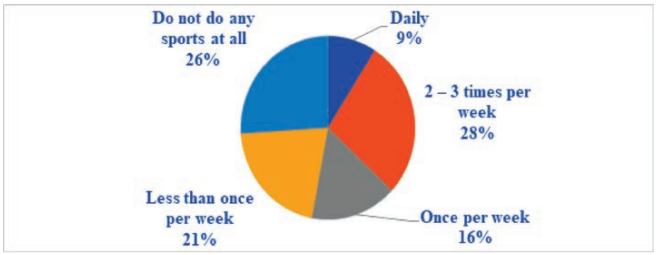

Figure 1 - Time Allocated for Sports

When asked, "What is most important to you in sports?" responses were as follows (Figure 2): victory - 27%; participation - 17%; health - 35%; socialization - 21%.

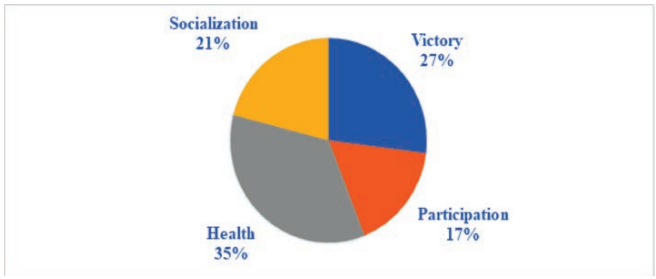

Figure 2 – Key Factors in Sports Participation

Furthermore, the question about changes in attitudes toward sports over time is shown in Figure 3.

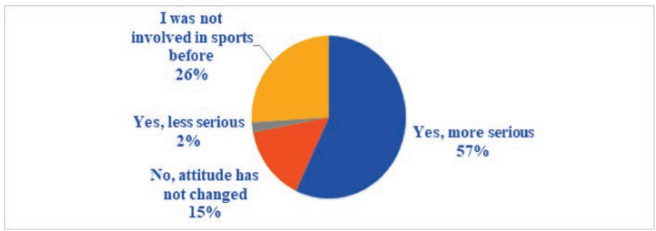

Figure 3 – Attitudes Toward Sports Over Time

Responses to the question "What are your goals in engaging in physical culture?" were as follows: improving physical fitness - 35%; achieving sports results - 25%; entertainment and relaxation - 18%; social interaction - 22%.

The second section aimed to identify whether students see a connection between physical activity and their emotional state.

The question "Do you think regular sports improve your mood?" gave the following results (Fig. 4): yes, it improves - 66%; no, it does not affect - 9%, it worsens - 0%, I find it difficult to answer - 25%.

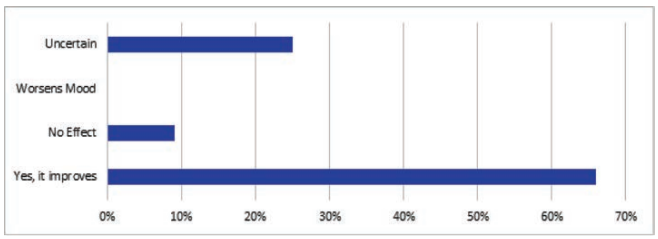

Fig. 4 - The impact of sports on mood.

Then the question was about whether students think that physical activity helps them cope better with their academic workload, the answers were as follows: helps - 23%; does not help - 17%; sometimes helps - 13%; did not notice a connection - 47%.

Then there was the question "Does sports affect your sleep?» the result was as follows (Fig. 5): sleep better - 44%; no change - 18%; sleep worse - 2%; not sure - 26%.

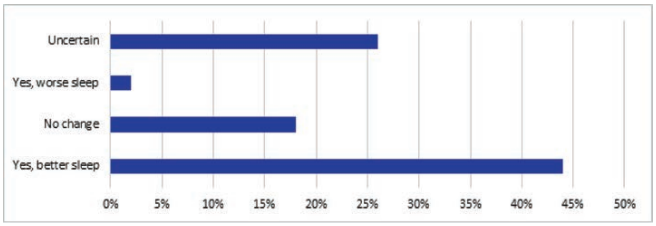

Fig. 5 – The impact of sports on sleep.

The question of whether students believe that sports help them cope with stress gave the following results (Fig. 6): yes – 63%; no – 15%; sometimes – 22%.

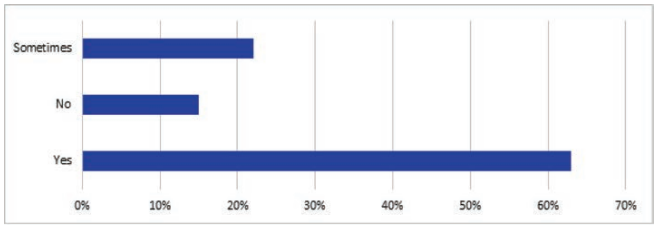

Fig. 6 – Does sport help to fight stress.

The final question in this block was “Does participation in sport events help you feel like part of a team?” and the results were as follows: yes – 72%; no – 17%; difficult to answer – 11%.

Moving on to the third block of questions, we will pay attention to the moral and ethical aspects of physical education and sport. In this part, we will try to understand how regular sports and participation in sport events contribute to the formation of character, strengthening of will and development of such qualities as honesty, fairness and respect for opponents among students, whether they pay attention to this and, in their opinion, whether physical education and sport have an impact on the formation

of these qualities. We will explore whether sport can become a platform for personality development and what moral lessons students can learn from sporting achievements and failures.

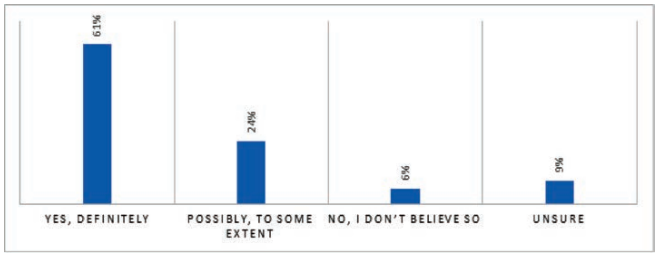

Fig. 7 – Does sport develop a sense of fairness.

The question "Do you think that sport develops a sense of fairness?" showed the following results (Fig. 7): yes, definitely – 61%; perhaps, to some extent – 24%; no, I don't think so – 6%; I find it difficult to answer – 9%.

The respondents were then asked whether participation in sport influences their attitude towards integrity, the answers were: yes, I become more honest – 49%; no influence – 11%; I become less tolerant of dishonesty – 17%; did not notice any change – 23%.

To the question "Do regular sports activities influence your sense of responsibility?" the responses were increases responsibility – 78%; doesn't affect – 21%; decreases responsibility – 1%.

The question "Does sports activity help in decision-making?" yielded the following results: yes – 63%; no – 14%; sometimes – 23%.

When asked whether sports help them be more honest with themselves and others, students responded: yes – 66%; no – 12%; sometimes – 22%.

The question "Does sports improve your self-control?" yielded the following results: improves self-control – 71%; no effect – 18%; worsens self-control – 1%.

Regarding the development of leadership skills, responses were: yes – 47%; no – 20%; sometimes – 33%.

To the question "Do you believe sports foster a respect for laws and rules?" the responses were: yes – 76%; no – 3%; sometimes – 21%.

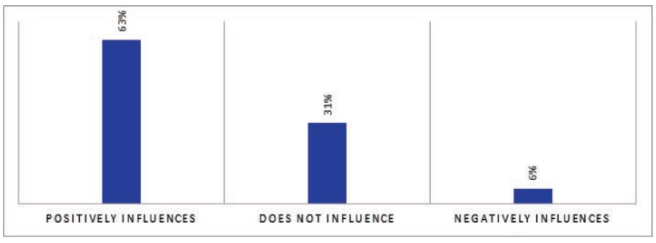

Figure 8 – Influence of Sports on Respect for Rules and Discipline

When asked whether sports activities affect their overall moral resilience, the responses were: yes – 74%; no effect – 24%; weakens moral resilience – 2%.

The question "Does sports activity affect your self-discipline?" received the following responses: yes, it improves – 39%; no effect – 15%; yes, but only on training days – 34%; unsure – 12%.

The final question in this section, "Does participation in sports influence your sense of fairness?" yielded the following results: strengthens the sense of fairness – 67%; no effect – 25%; unsure – 8%.

Conclusions. From the first section of questions, it can be concluded that most students engage in sports, reflecting a high level of involvement in physical activity. However, only a small proportion (9%) engage in sports daily, while most prefer to exercise 2-3 times a week (28%) or less frequently. Health is the top priority (35%), but a significant number also value victory (27%) and socialization (21%). More than half (57%) have developed a more serious attitude toward sports over time, reflecting an increased understanding of its role in life.

From the second and third sections, it can be concluded that the majority of participants (72%) feel part of a team during sports events, highlighting the importance of sports for social integration and team spirit development. These survey results highlight the importance of physical activity not only for physical but also for emotional health.

Regular exercise promotes fairness, decency, and respect for others. In addition, sports help develop discipline and self-discipline, which is important for success in both academic and professional life. Active participation of students in sports events helps them respect rules, be tolerant, and recognize diversity. Sports also strengthen moral fortitude and a sense of responsibility, which is important for a mature personality. Sports can also develop leadership skills and the ability to work in a team. It teaches decision-making, honesty, and openness both to oneself and to others. To summarize, physical education and sports have a complex impact on the development of students' moral and ethical qualities, which ultimately contributes to their personal growth and the formation of social skills.

References

1. Grigan S.A., Belmach V.A., Shengelaya S.A. Rol obrazovaniya v oblasti fizicheskoy kultury v formirovanii lichnosti studentov. Teoriya i praktika fizicheskoy kultury. 2022. No. 10. 8 p.

Content and organization of sports training taijiquan for adults

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UDC 796 Corresponding author: v.bar57@mail.ru Received by the editorial office on 20.12.2024

Keywords: *Taijiquan, training, content, physical activity, training orientation.*

The purpose of the study is to identify the substantive aspects and organizational foundations of adult Taijiquan sports training.

Methodology and organization of research. Content analysis of literary sources; questionnaires. The study was conducted in Zhengzhou, Henan Province, China. A total of 117 specialists of various ages, genders, education and sports qualifications took part in the survey.

Research results and conclusions. Currently, in the People's Republic of China (PRC), there is a fairly widespread involvement of the adult population in active activities in various forms of physical culture. One of the directions is Taijiquan, which is considered by the adult population to a greater extent as an important factor of physical, spiritual and somatic well-being, as well as the formation of a certain lifestyle and lifestyle that meets the needs of the developing Chinese society. At the same time, as noted in a number of scientific studies, a unified approach to the content of adult Taijiquan sports training has not yet been developed, and some attempts to give an organizational form to such classes will not always be successful. It should also be noted that the fact established during the survey process is that the experience of the majority of specialists conducting Tai Chi classes is less than 5 years (41.03%). It is well known that young professionals, as a rule, have certain difficulties in filling the content of classes in the structure of Taijiquan sports training. In this regard, we have attempted to identify the main substantive aspects of organizing adult sports training in China.

The survey revealed a number of important aspects that need to be considered when justifying the content of Taijiquan. Firstly, the frequency of training sessions per week is: once or less – 19.66%; 1-2 times a week – 19.66%; 3-4 times a week – 17.09%; more than 4 times a week – 43.59%. Therefore, students treat this type of physical activity as a kind of sport, and accordingly, the content of classes should have a training focus. Secondly, the overwhelming majority of respondents believe that practicing Tai chi can greatly improve body posture and posture (94.87%), coordination and flexibility of the body (96.58%), increase self-confidence and emotional stability (96.58%); slow down aging and improve immunity (97.44%), which to some extent it indicates the health-improving orientation of training, psychosomatic regulation of the body. Thirdly, experts who practice Taijiquan indicate some gaps in the definition of the content of taijiquan sports training. When answering the question of whether the content and methodology of tai Chi classes have been sufficiently developed to date, the answers were distributed as follows: sufficiently developed – 36.75%; sufficient, but require clarification – 47.01%; insufficiently developed – 11.11%; there is no uniform content and methodology of training – 5.13%. This gives us a basis for further research in substantiating the content and organization of Taijiquan.

Conclusions. The content of adult Taijiquan sports training needs to be adjusted and a more accurate scientific approach to the organization of classes. It is important to take into account such important aspects that a significant part of those involved consider Taijiquan as a sport, engaging in this type of activity at least three times a week. Training sessions have their own specifics, determined to a greater extent by the correction and maintenance of one's body, as well as the psychosomatic regulation of the body.

References

1. Wang Lin Tajczziczyuan: iskusstvo garmonii i metod prodleniya zhizni: ucheb. posobie. Rostov n/D: Feniks: Krasnodar: E`ksperim. kolledzh Kuban. gos. akad. fiz. kul`tury`, 2003 (Rostov n/D: ZAO Kniga). 222 s.
2. Zhu Ts., Baranov V.A.Social`noe znachenie tajczziczyuan` v sovremennom kitajskom obshhestve V sbornike: Molody`e nauke. Materialy` Vserossijskoj nauchno-prakticheskoj konferencii s mezhdunarodny`m uchastiem studentov i molody`x ucheny`x. – Moskva.2022. S. 700-703.
3. Yu Zhijun` Istoki teorii tajczziczyuan`: populyarny`j kommentarij na osnove «Kanona peremen»; per. s kit. A.O. Milyanyuka; Federal`noe gos. byudzhetnoe uchrezhdenie nauki In-t Dal`nego Vostoka RAN, Issledovatel`skoe o-vo «Tajczzi». – Moskva: In-t Dal`nego Vostoka RAN, 2014. 606 s.

The youth of today and the sports of tomorrow

UDC 796.001.1

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Abstract

Objective of the study was to pinpoint the characteristics of student sports engagement with innovative computer technologies in sports, particularly the prevalence of esports games among students.

Methods and structure of the study. The research into the prevalence of esports and digital sports among young people is based on the findings of scholarly publications. To gauge the preferences of students at Ufa State Petroleum Technical University (USPTU), a survey was conducted, which included a questionnaire on their choice of these sports.

Results and conclusions. Our investigation, which draws upon the scientific literature and the perspectives of USPTU students, reveals a growing trend among young people towards computer games and competitions in digital disciplines that utilize advancements in game development, esports, robotics, augmented and virtual reality, information technology, and artificial intelligence.

Keywords: *computer games, phygital sports competitions, innovative computer technologies in sports, physical activity based on computer technologies.*

Introduction. In the context of the general development of innovative computer technologies, eSports is gaining wide popularity all over the world. The International Sports Federation of eSports was founded relatively recently, in 2008. By the order of the Ministry of Sports of the Russian Federation dated April 29, 2016 No. 470, eSports was included in the All-Russian Register of Sports. The Ministry of Science and Higher Education of the Russian Federation oversees the implementation of eSports as an educational discipline. The most important point in the development of such a phenomenon is its interdisciplinary nature and inclusiveness, which allows for the creation of wide ranges of events without territorial restrictions, and the barrier to participation in tournaments is exclusively a set of gaming skills [3].

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Results of the study and discussion. Modern student youth, the so-called generation Z, are engaged in traditional sports and physical activity, in accordance with the curriculum. The period of growing up and adaptation of the younger generation to new living conditions while studying at a university is accompanied by the formation of new value orientations, motivational needs, professional self-determination, incentives for personal development, changes in the psycho-emotional state, that is, in general, the acquisition of social adaptation. As V.V. Kasyanov and co-authors note: «… social adaptation of youth presupposes the optimal functioning of the individual in interaction with the environment, optimal self-realization in interaction with the environment, the degree of

personal integration in the interaction of the individual with the social environment» [2]. There are certain problems of adaptation of youth to a rapidly changing society. «The most typical problems of young people include unrealistic life aspirations, a mismatch between expectations and real opportunities. Therefore, too often, in case of difficulties on the way to the set goal, they have such a tendency as the need to distance themselves, to immerse themselves in the world of illusions and fantasies» says M.P. Chelombitskaya [5]. The most common form of escape from negative emotions and stress of the younger generation is immersion in virtual reality.

One way or another, virtual reality allows a young person to consider himself successful, to achieve what he wants in his own virtual presentation, helps to find solace in interactions in online communications. The types of virtual reality in which modern youth prefer to participate are currently developing and improving. In virtual reality online, you can interact in social networks, participate in virtual games, in e-sports, in sports games in the «phygital» format.

There is a certain opinion of psychologists who consider absolute immersion in the virtual world for a young person undesirable and dangerous because he can no longer live in the ordinary world, interact with ordinary people. Further ordinary life may seem hopeless to him, there will be a shift in value orientations, spiritual devastation. However, there is another point of view, indicating that full-fledged social adaptation of youth, arising as a result of successful interaction in network communications, is beneficial for shy people, having a hidden inferiority complex, unable to create real personal contacts, etc. Such virtual interaction with people similar to oneself prevents the formation of various social deviations and is a preventive measure against deviant behavior among youth.

According to our own research, modern youth, or Generation Z, people of the era of information and digital technologies, do not distinguish between real and virtual spaces - in their view, these are complementary worlds, if not even a single, integral world. Faced with a large flow of information every day, they have learned to quickly analyze and process it, cutting off all the unnecessary and leaving the essence. Their life priorities are maximum comfort and safety, in conditions in which self-identification and self-realization are possible for them [6]. The rapid development of communication and information technologies entails changes in the forms and methods of functional activity of young people. A major breakthrough is observed in the shift of attention of young people, namely student youth, from virtual games to participation in eSports and sports games in the «phygital» format. The official website of the eSports Federation provides a definition of the term «computer sports»: «eSports, electronic sports (English esports) is a type of competitive activity and special practice of preparation for competitions based on computer and/or video games, where the game provides an environment for interaction of control objects, ensuring equal conditions for competition between people or teams». Virtual reality in eSports is a world artificially created by means of computer technologies, with which a person (athlete) can interact, fully or partially immerse himself in it using immersive devices (helmets, gloves, headphones, etc.) and information input devices (keyboard, computer mouse) [1].

Some foreign researchers characterize eSports as «a type of sport in which the main aspects of the sport are facilitated by electronic systems; the input of players and teams, as well as the output of the eSports system, are mediated by human-computer interfaces» [7]. In November 2022, the All-Russian Phygital Sports Federation (ARPS) was established in Russia. It is a public organization that aims to develop, promote, and organize mass sports in the format of functional-digital all-around competitions. Special software superimposes virtual elements on the real world, mixing digital content with the user's physical environment. These technological advances have opened up new opportunities for integrating digital elements into traditional sports and expanded the range of impressions received from competitions. What is important in phygital sports is that competitions include not only interaction with the digital environment, but also the transition to real competitions. Thus, players can initially compete in a video game format, and then go to a site designed for football, basketball, hockey, or martial arts competitions. One way or another, at present, eSports is a world where virtual battles become real events, uniting millions of spectators and fans around the globe.

The format of the competition in phygital disciplines involves the use of developments in the field of game development, eSports, robotics, augmented and virtual reality, information technology and artificial intelligence. Each of the disciplines is a combination of dynamic sports with the most popular video games and technologies [4].

The eSports club of the Ufa State Petroleum Technological University began its existence in October 2017. In total, the university team consists of 69 people of all areas and profiles of training. According to our students, eSports is not just a game, it is a culture where each participant becomes part of a large, exciting process that can change lives and inspire new generations of gamers.

Training is conducted on the Faceit platform, providing players with access to the best conditions for training and improving their skills. USPTU students actively participate in competitions. Over the past year, they have taken part in the All-Russian Student Cybersport League (RSCL), the Republic of Bashkortostan Cybersport Championship, the Russian Cup in Electronic Sports, the Universiade of Universities of the Republic of Bashkortostan, and the Ufa tournament in phygital sports. Competitions become a platform for fighting for titles and recognition, where each match brings new emotions and unpredictable turns of events. Disciplines such as Dota 2, Valorant, FIFA, NHL, and NBA create unique platforms for demonstrating skill and strategic thinking. Players playing Counter-Strike and Tom Clancy's Rainbow Six Siege learn not only to repel enemy attacks, but also to develop their own tactics, turning each competition into an exciting spectacle. League of Legends and Star Craft require intelligence and quick reactions, while Tekken and Overwatch require skill and creativity, where every move matters. In the nearest future, it is planned to launch several more disciplines: World of Tanks, MLBB, Deadlock. We studied the opinion of student youth on the importance of sports activities based on computer technologies for them, analyzed the choice of types of participation in them, etc. Among the student youth of USPTU, 300 students aged 18-21, boys and girls of various fields of study were surveyed. Of these, 205 people (68,3%) note that they fully accept the philosophy of eSports, 16 people of them have already repeatedly participated in eSports games, the rest – 189 people, plan to take part in such games in the future. 29 people (9.7%) do not see the need to engage in «such nonsense», the rest – 66 people (22%), have not decided on this issue, but do not refuse to be spectators, if there is a pleasant company.

Conclusions. Currently, competitions in phygital-disciplines, implying the use of developments in the field of gaming, e-sports, robotics, supplemented and virtual reality, information technology and artificial intelligence, find more and wider support in the youth environment.

Based on the results of an analysis of scientific literature, many students from leading universities in the Russian Federation are members of the All-Russian Student Cybersport League and participate in Russian computer sports cups and the University Universiade in phygital sports.

According to the survey results, the majority of USPTU students surveyed support the choice of modern youth to play eSports and phygital sports.

References

1. Goncharenko D.I., Brovkin A.P. Sushchnost i soderzhaniye ponyatiy «kibersport» i «kompyuternyy sport». Pedagogiko-psikhologicheskiye i mediko-biologicheskiye problemy fizicheskoy kultury i sporta. 2022. No. 17(2). pp. 84-91.
2. Kasyanov V.V., Shkuropiy O.I., Gafiatullina N.Kh. Spetsifika sotsialnoy adaptatsii molodezhi kak mekhanizm profilaktiki povedencheskikh addiktsiy. Gumanitarnyye, sotsialno-ekonomicheskiye i obshchestvennyye nauki. 2019. pp. 70-74.
3. Smirnov V.V. Trendy i perspektivy razvitiya kompyuternogo sporta v Rossii i mire. Innovatsionnyy potentsial molodezhi: sport, kultura, obrazovaniye. Collection of scientific papers. Yekaterinburg: Uralskogo universiteta publ., 2022. pp. 374-378. Available at: http://elar.urfu.ru/handle/10995/113279.
4. Fidzhital-sport Rossiyskoye obshchestvo Znaniye. Available at: https://znanierussia.ru › articles
5. Chelombitskaya M.P. Virtualnaya realnost kak proyavleniye odnoy iz osnovnykh form eskapizma v molodezhnoy srede. Nauchnyy zhurnal «Arkhivarius». 2022. Vol. 7. No. 1 (64). pp. 36-39.
6. Bresler M., Galiullina S., Gerasimova D. Transformation of the values of Generation Z - Residents of the digital society of sustainable development. E3S Web of Conferences, Yekaterinburg, September 28-29, 2020. Vol. 208. Yekaterinburg: EDP Sciences, 2020. pp. 090-43.
7. Hamari J., Sjoblom M. What is eSports and why do people watch it? Internet research. 2017.

The impact of boxing training on the physical condition of first-year students

UDC 796.413.318

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Abstract

Objective of the study was to empirically assess the impact of boxing-specific training on the physical fitness of first-year students.

Methods and structure of the study. The educational experiment was carried out at the Patrice Lumumba Peoples' Friendship University of Russia over the course of one academic year. The participants were first-year students from the Faculty of Physics, Mathematics, and Natural Sciences, with a total of 450 students. At the start of the academic year, we formed two groups: an experimental group and a control group. Each group consisted of 20 students, for a total of 40 students. We used a questionnaire to select the participants for the experiment.

The experimental group focused on boxing. They learned the basic punches of a boxer and incorporated blocking techniques to enhance their special and general physical fitness. At the end of the academic year, we organized boxing competitions to determine the winners among the students in the experimental group. Meanwhile, the control group followed the general physical training program.

Results and conclusions. At the end of the experiment, more significant reliable changes in the level of physical fitness were obtained in the students of the experimental group (boxing). Based on the results obtained, it can be stated that classes in the experimental group using the boxing specialization more effectively affect the level of physical fitness of male students, which indicates the feasibility of using this type of sport in the framework of physical education classes at the university. In the experimental group (GPP), there were also reliable changes, but with a smaller tendency and not for all the indicators under consideration.

Keywords: *physical fitness, students, boxing, physical education.*

Introduction. The younger generation in the third millennium sets new benchmarks for itself, focused on improving the level of physical development, endurance and general fitness. It is possible to achieve these qualities only through persistent work on oneself with high physical potential [1]. At the same time, in the conditions of modern education, negative trends are observed associated with a low level of responsibility for one's own health, which is reflected in the level of physical fitness and entails a low level of physical development.

According to the draft strategy for the development of physical education and sports in the Russian Federation until 2030, one of the main tasks is: "Ensuring further development of the subject "Physical Education" in the system of higher education in order to strengthen and maintain the health of student youth[1]. To attract students to the subject of physical education, a large arsenal of various types of motor activity is used, which is constantly supplemented by various sports previously not used in the process of physical educa-

[1] Proyekt Strategii razvitiya fizicheskoy kul'tury i sporta v Rossiyskoy Federatsii do 2030 goda. Available at: https://minsport.gov.ru/activities/proekt-strategii-2030/ (date of access: 15.09.2020).

tion. This trend allows students to make a choice and engage in the type of motor activity they like. Boxing is one of the most popular sports for young men, it places high demands on physical fitness, develops a real masculine character, the will to win. Doing this sport contributes not only to increasing the level of physical development and fitness, but also to the acquisition of discipline, responsibility, increased self-esteem, overcoming complexes, identifying leadership qualities and the desire for success, which enables students to realize their needs in achieving sports results [2, 3].

Objective of the study was to empirically assess the impact of boxing-specific training on the physical fitness of first-year students.

Methods and structure of the study. The pedagogical experiment was conducted at the Department of Physical Education and Sports of the Peoples' Friendship University of Russia named after Patrice Lumumba. First-year students of the Faculty of Physics, Mathematics and Natural Sciences (n=450) took part in it. At the beginning of the academic year, students' interests in physical education were identified using a questionnaire (Figure 1). As a result, two homogeneous groups were determined for further research: experimental (boxing) and control (GPP), with 20 students in each group (n=20). The pedagogical experiment was conducted during one academic year, within the structure of the educational and training process, classes in both groups were held twice a week for two academic hours. Educational and training classes of the experimental group were held in the boxing specialization, where the main basic punches of a boxer were studied, which were supplemented by blocks on the development of special and general physical training. At the end of the academic year, boxing competitions were held to identify the winners among the students of the experimental group. In the control group, students were engaged in a general physical training (GPT) program.

To determine the indicators of physical fitness of first-year male students, control tests were used to determine the level of physical qualities (see table).

Results of the study and discussion. In order to identify interests in conscious physical education, all first-year students (n=500) were offered a questionnaire to choose a specialization (see figure).

The analysis of the questionnaire conducted on the choice of sports specialization showed the following results: training classes in the boxing specialization were chosen by 11% (n=55) of the first-year students, and classes in general physical training groups were also in demand, these classes were chosen by 12% (n=60). The remaining students who entered the first year for physical education classes chose other types of sports activities used at the Department of Physical Education and Sports at RUDN. Then, all students who

The results of the study of physical fitness of first -year students

Indicators	Testing stage	EG		CG		Reliability of differences p_0
		$\bar{X} \pm m$ n = 20	p_0	$\bar{X} \pm m$ n = 20	p_0	
3000 m run, s	1	14,2±0,2	<0,05	13,9±0,1	>0,05	>0,05
	2	13,7±0,1		13,5 ±0,1		>0,05
Shuttle run	1	10,9±0,8	<0,05	11,4±0,6	>0,05	>0,05
	2	8,3±0,1		10,5±0,3		<0,05
100 m run	1	16,4 ± 1,1	<0,05	17,1±0,9	>0,05	>0,05
	2	13,5±0,8		15,5±0.8		>0,05
Bending and unbending arms in a prone position for 1 min (number of times)	1	41±0,5	<0,05	41±0,4	<0,05	>0,05
	2	47±0,4		45±0,3		<0,05
Jumping rope for 1 min (number of times)	1	100±1,8	<0,05	98±1,9	<0,05	>0,05
	2	141±2,5		124±1,2		<0,05
Basic plank test, in minutes	1	2,1±0,3	<0,05	1,9±0,4	>0,05	>0,05
	2	2,9±0,2		2,2±0,1		<0,05
Pull-ups on a horizontal bar	1	13±1,3	<0,05	12±1,1	<0,05	>0,05
	2	20±1,1		17±1,2		>0,05
Hits on a bag for 3 min (number of times)	1	241±1,5	<0,05	242±1,6	>0,05	>0,05
	2	280±1,1		245±1,3		<0,05

Note: 1 – testing before the experiment; 2 – testing after the experiment; n – sample size; X ± m – arithmetic mean and mean error of the arithmetic mean; p_0 – reliability of the difference in the final values.

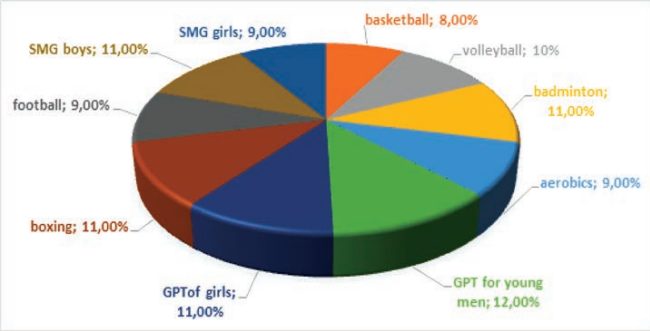

Figure 1. The ratio of interests of 1st year student by sports, n = 450

chose the boxing specialization (n=55) were asked to answer the second part of the questionnaire, where one student could choose several answers. The analysis of this questionnaire allowed us to establish that 84% (n=42) of students would like to improve their physical fitness, 70% (n=35) were interested in being able to stand up for themselves, 86% (n=43) of those involved wanted to gain confidence in their abilities and assert themselves, claiming that this factor is an important point reflecting success not only in sports, but also in the future professional work activity of a specialist. Further, 93% (n=47) of students believed that boxing classes can influence the formation of a strong character and gain willpower, while 95% (n=48) of students noted that boxing classes contribute to self-expression and help to throw out negative emotions. The results of testing the level of physical fitness at the beginning and end of the experiment allow us to speak about a significant increase in their level among students in the experimental group involved in boxing, whose indicators exceed those of those involved in the control group of general physical training.

When analyzing the shuttle run test, reliable changes were found only in the experimental group, where the growth rate was 23% ($p < 0,05$), while in the control group the indicator improved only by 8% ($p < 0,05$), (Table 1). Similar results were found in the 100-meter run test, in the experimental group this indicator statistically significantly increased by 18% ($p < 0,05$), while in the control group by 9% ($p < 0,05$). In the test of flexion and extension of the arms in support, reliable changes occurred in both groups, but with a greater tendency in the experimental group, which was 13% ($p < 0,05$), while in the control group only 9% ($p < 0,05$). Identical reliable results in both groups were obtained in the jump rope test, which amounted to 29% ($p < 0,05$) in the experimental group and 20% ($p < 0,05$) in the control group. In the experimental group, there were reliable changes in the «basic bar» test, the result improved by 27% ($p < 0,05$), while in the control group the result also improved by 13% ($p > 0,05$), these changes did not correspond to the reliable ones. In the pull-up test, reliable changes occurred both in the experimental and control groups, which corresponded to 35% ($p < 0,05$), and 29% ($p < 0,05$), respectively. Reliable changes in the «punches on a bag» test occurred only in the experimental group 14% ($p < 0,05$), these changes were expected, since the test in question is basic for students involved in boxing.

Conclusions. Thus, based on the obtained results, it can be stated that the use of boxing classes in the educational and training process has a more effective effect on the physical fitness of male students, which is confirmed by reliable changes in almost all the studied indicators.

References

1. Vorotilkina I.M., Bazhenova N.G., Bazhenov R.I. Sovremennyye trendy zdorovogo obraza zhizni studentov. Mir nauki. Sotsiologiya, filologiya, kulturologiya. 2022. No. 4 (13). pp. 1-15.
2. Selitrenikova T.A. K voprosu sovershenstvovaniya trenirovochnogo protsessa bokserov na etape nachalnoy podgotovki. Psikhologo-pedagogicheskiy zhurnal gaudeamus. 2019. No. 2 (40). pp. 71-78.
3. Soymonov I.A. Problemy organizatsii i postroyeniya trenirovochnogo protsessa bokserov 19-40 let. Nauchnoye obozreniye. Pedagogicheskiye nauki. Moscow, 2024. No. 4. pp. 21-26.